TENDER DOCUMENT

NIT No DLI/C&E/WI-665/538R

FOR

Tender for Design, Engineering, manufacturing, Inspection at works for Supply & Testing of 105 nos. Lighting Poles & Associated Works for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.

VOLUME- 1

(NOTICE INVITING TENDER)

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7,
Lodhi Road, New Delhi-110003
TEL NO: 011-24361666  FAX NO. 011- 24363426
Design, Engineering, manufacturing, Inspection at works for Supply & Testing of 105 nos. LightingPoles& Associated Works

**CONTENTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Notice Inviting Tender (NIT)</td>
</tr>
<tr>
<td>2.</td>
<td>Memorandum</td>
</tr>
<tr>
<td>3.</td>
<td>Instructions to Tenderers (Suppliers)</td>
</tr>
<tr>
<td>4.</td>
<td>Addendum to ITT (Suppliers)</td>
</tr>
<tr>
<td>5.</td>
<td>General Purchase Conditions (GPC)</td>
</tr>
<tr>
<td>6.</td>
<td>Additional Purchase Conditions (APC)</td>
</tr>
<tr>
<td>7.</td>
<td>Procedure for e-tendering / e-procurement</td>
</tr>
<tr>
<td>8.</td>
<td>Performa for Bank Guarantee in lieu of EMD</td>
</tr>
</tbody>
</table>
ENGINEERING PROJECTS (INDIA) LTD.
(A Govt. of India Enterprise)

NOTICE INVITING e-TENDER (NIT)

DLI/C&E/WI-665/538R

Dated: 14.06.2019

Tender for Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of 105 Nos. Lighting Poles & Associated Works” for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.  

Engineering Projects (India) Ltd. invites the online item rate tender for the above work through e-tendering from eligible suppliers who fulfill the eligibility criteria as per the brief particulars of scope for Bhilai Steel Plant at Chhattisgarh for the following work:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description of work</th>
<th>Period of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Design, Engineering, manufacturing, Inspection at works for Supply &amp; Testing of 105 nos. Lighting Poles &amp; Associated Works for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.</td>
<td>10 weeks from the date of manufacturing clearance given by EPI</td>
</tr>
</tbody>
</table>

The brief scope of work included in this tender shall include (but not limited to) Supply of 105 nos. of Lighting Poles including, testing & Inspection at manufacturer’s works, packing, dispatch, transportation, delivery to site to Bhilai Steel Plant (SAIL)/EPI in Bhilai, Chhattisgarh.

Time schedule of tender activities:

i) Date & Time of downloading of Tender Documents : Up to 04.07.2019 (till 04:00 PM)

ii) Last Date & Time of Online Submission of Tenders : On or before 05.07.2019 upto 11:00 AM

iii) Date & Time of Online Opening Envelope-1 (Techno-Commercial Bid) : 05.07.2019 at 11:30 AM

1.0 Bidders who fulfill the following criteria shall be eligible to apply and offers of only those bidders shall be considered for opening of price-bid who fulfills the eligibility criteria. The joint ventures are invited.

a. Experience of having completed/Substantially completed during the last 5 (Five) years following "similar works” ending on last day of the previous month during which applications are invited.

i) One similar work done of value minimum of Rs. 12.80 Lakh

ii) Two similar works done of value minimum of Rs. 9.60 Lakh each

iii) Three similar works done of value minimum of Rs. 6.40 Lakh each

Similar work means manufacturing, supply of steel tubular Lighting Poles in steel plant/power plant/cement plant/industrial building/other projects.

b. Should have average annual turnover of minimum Rs. 8.00 Lakh during last three financial years ending on 31.03.2018. Copies of Audited balance sheets, all statement of Profit and Loss of FY 2015-16, 2016-17 & 2017-18 to be submitted. Certificate from Charted Accountant is to be enclosed for this purpose.
c. Should have not incurred loss in more than 2 years in last five financial years ending on 31.03.2018. Certificate from Charted Accountant is to be enclosed for this purpose.

d. Should submit “Solvency Certificate” issued by a nationalized/Scheduled Bank for minimum value of Rs. 6.40 Lakh issued within 6 (Six) months from the closing date of submission of tender.

Documentary evidence such as attested copy of award letter/contract, completion certificates/performance certificates of previous works executed by him giving name and address of clients, value of each of the works done, completion period, date of completion, audited balance sheets should be submitted by the bidder failing which the offer shall be rejected.

All the above documents shall be submitted duly signed, stamped by the authorized signatory of bidder and attested by a class -1 gazetted officer/notary public.

2.0 The Bidder should have a valid PAN No. (Permanent Account Number). Copy to be given.

3.0 Bidder should have valid GST Registration No. Copy of GST Registration is to be enclosed.

4.0 Bidder have to submit confirmation letter whether they are registered under MSME Act or not and if yes, then relevant copies of the registration letter (Registered under single point registration scheme of NSIC, Govt. of India, Ministry of MSME, New Delhi vide Gazette Notification dated 26.03.2012 along with the form of Memorandum-2 with the concerned DIC) to be enclosed in Technical- Bid Envelope-1 and a request letter for claiming exemption from submission of Tender fee and EMD.

5.0 Tender documents comprising of the following are available on the website of EPI: www.engineeringprojects.com, CPP Portal: www.eprocure.gov.in and as well as on MSTC portal: https://www.mstcecommerce.com/eprochome/epil

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Volume</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Vol – 1</td>
<td>Notice Inviting Tender (NIT)</td>
</tr>
<tr>
<td>ii)</td>
<td></td>
<td>Memorandum</td>
</tr>
<tr>
<td>iii)</td>
<td></td>
<td>Instructions to Tenderers (Suppliers)</td>
</tr>
<tr>
<td>iv)</td>
<td></td>
<td>Addendum to Instructions to Tenderers (Suppliers)</td>
</tr>
<tr>
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<tr>
<td>vi)</td>
<td></td>
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</tr>
<tr>
<td>vii)</td>
<td></td>
<td>Procedure for e-tendering / e-procurement</td>
</tr>
<tr>
<td>viii)</td>
<td></td>
<td>Performa for Bank Guarantee in lieu of EMD</td>
</tr>
<tr>
<td>ix)</td>
<td>Vol – 2A</td>
<td>General Specifications</td>
</tr>
<tr>
<td>x)</td>
<td>Vol – 2B</td>
<td>Technical Specifications</td>
</tr>
<tr>
<td>xi)</td>
<td>Vol – 3</td>
<td>Price Bid Format</td>
</tr>
<tr>
<td>xii)</td>
<td>Vol – 4</td>
<td>General Technical Specification</td>
</tr>
</tbody>
</table>

6.0 In order to participate, the bidder should have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities.

7.0 Interested bidders have to necessarily register themselves on the portal https://www.mstcecommerce.com/eprochome/epil through M/s MSTC Limited, New Delhi to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get themselves registered at the aforesaid portal for which they are required to contact M/s MSTC Limited, New Delhi at following address to complete the registration formalities:
M/s MSTC Limited,
30 / 31A, 1st Floor, Jeevan Vikas Bhawan, Asaf Ali Rd, New Delhi, Delhi-110006
Contact No.: 033-22901004, 011-23212357, 011-23215163, 011-23217850
Availability: 10 AM to 5:30 PM on all working days.
Email-ID: mstcnro@mstcindia.co.in
Please mention “Helpdesk” as subject while sending emails.

They may obtain further information regarding this tender from ED (C&E) at the address given at Clause No. 16.0 below from 10:00 hours to 17:00 hours on all working days till the last date of online submission of Bidding Documents.

For proper uploading of the bids on the portal namely https://www.mstcecommerce.com/eprochome/epil (hereinafter referred to as the ‘portal’), it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed at the portal as well as by contacting M/s MSTC Limited, New Delhi directly, as and when required, for which contact details are mentioned above. M/s Engineering Projects (India) Ltd. in no case shall be responsible for any issues related to timely or properly uploading/submission of the bid in accordance with the relevant provisions of Section: Instruction to Bidders of the Bidding Documents.

8.0 Bidders can download the bid document from the portal without paying document fees in advance, any time from 18:00 Hrs on ________; however interested bidders have to pay tender fees for participating in the tendering and submitting the bid. For this purpose the interested bidders shall be required to pay ₹ 3,000.00 + GST @ 18% i.e. ₹ 3,540.00 (Rupees Three Thousand Five Hundred Forty Only) as non-refundable document fees in the form of Demand Draft in favour of “Engineering Projects (India) Ltd.” payable at New Delhi.

9.0 E-Bids must be submitted/uploaded after paying the required transaction fees of MSTC along with scanned copies of relevant documents mentioned in Clause No. 1.0 to 3.0 under Single Stage Two Envelope Bidding Procedure on the MSTC portal on or before last date & time of online bid submission. Late bids will not be accepted. Under the above procedure, only first envelope (Technical Part) shall be opened in the presence of the bidders’ representatives who choose to attend in person at the address given below on scheduled date & time of bid opening or may be viewed by the bidders by logging in to the portal as per features available to them. Second envelope i.e. Price Bid part shall be opened only of technically qualified bidders.

The bid must be accompanied by an Earnest Money Deposit (EMD) of ₹ 32,000.00 (Rupees Thirty Two Thousand Only). This can be either in the form of Crossed Demand Draft or Pay Order of any Nationalized Bank/Scheduled Bank for the full amount of EMD favoring “Engineering Projects (India) Ltd.”, payable at New Delhi or in the form of Bank guarantee of any Nationalized Bank/Scheduled Banks, in accordance with the prescribed Performa, favoring “Engineering Projects (India) Ltd.”. The EMD shall be valid for minimum period of 150 days (one hundred fifty) from the last day of submission of tender. Tenders submitted without EMD or inadequate amount of EMD shall be rejected. The Tender shall remain valid for 90 days from date of opening of Price Bid.

Tender fee, EMD (in original), Relevant Documents, NSIC/MSME certificate as per Clause No. 4.0 if bidder is claiming EMD/Tender fee exemption, Affidavit as per Annexure-A and Power of Attorney must be submitted in physical form at the address given at Clause No. 16.0 below on or before last date and time of online bid submission. If the above documents are not received in time then their offer shall not be considered and EPI shall not be
responsible for any postal delay in respect of submission of hard copy part of the bids.

10.0 The Terms & Conditions contained in this NIT and tender documents shall be applicable for the works.

11.0 EPI reserves the right to accept any tender or reject any or all tenders or split the work of tender or annul this tendering process without assigning any reason and liability whatsoever and to re-invite the tender at its sole discretion.

12.0 The corrigendum or addendum, extension, cancellation of this NIT, if any, shall be hosted on the EPI’s website/CPP portal as well as on MSTM portal [https://www.mstcecommerce.com/eprochome/epil]. The bidders are required to check these websites regularly for this purpose, to take into account before submission of tender. All Corrigendum and addendum are to be submitted duly signed & stamped with tender documents as bid Annexure.

13.0 The price bid of those bidders whose bid has been technically accepted on the basis of documents submitted shall only be opened. However, it is made clear that the offer of the L-1 bidders shall be accepted subject to the confirmation of authenticity of the BG & Bank Solvency from the concerned bank.

14.0 Time is the essence of this NIT and timeline of supply will be strictly adhered to.

15.0 In case of tie-tender, where two firms are bidding lowest, EPI reserves the right to split the work among these bidders and/or EPI reserve the right to award the tender to any one of such bidder.

16.0 All correspondence with regard to the above shall be to the following address (By Post/In Person):

Executive Director (Consultancy & Engineering)
ENGINEERING PROJECTS (INDIA) LTD.
3rd Floor, Core-3, Scope Complex,
7 Lodhi Road, New Delhi – 110003

Tel No.: 011-24361666 Ext. 2339, 2322
Fax No.: 011-24363426
E-mail – core@engineeringprojects.com

17.0 EPI reserves the right to place the work order on the bidders from the following addresses:

ENGINEERING PROJECTS (INDIA) LTD.
Core-3, Scope Complex, 7 Lodhi Road, New Delhi – 110003

OR

ENGINEERING PROJECTS (INDIA) LTD.
B-32, Phase II, Surya Vihar, Bhilai – 490020

For more information on EPI, visit our website at: www.engineeringprojects.com
For more information on the e-tender, visit website of M/s MSTM Limited, New Delhi at: https://www.mstcecommerce.com/eprochome/epil
Annexure-A

AFFIDAVIT

(To be submitted by bidder on non-judicial stamp paper of Rs. 100/- (Rupees Hundred only) duly attested by Notary Public)

(To be submitted in Envelop-1 i.e. Technical bid)

Affidavit of Mr. .................................................................S/o................................................................. R/o .................................................................

I, the deponent above named do hereby solemnly affirm and declare as under:

1. That I am the Proprietor/Authorized signatory of M/s ................................................................. Having its Head Office/Regd. Office at.................................................................

2. That the information/documents/Experience certificates submitted by M/s................................................................. along with the tender for ................................................................. (Name of work)............. To EPI are genuine, true and nothing has been concealed.

3. I shall have no objection in case EPI verifies them from issuing authority(ies). I shall also have no objection in providing the original copy of the document(s), in case EPI demand so for verification.

4. I hereby confirm that in case, any document, information & / or certificate submitted by me found to be incorrect / false / fabricated, EPI at its discretion may disqualify / reject / terminate the bid/contract and also forfeit the EMD /All dues.

5. I shall have no objection in case EPI verifies any or all Bank Guarantee(s) under any of the clause(s) of Contract including those issued towards EMD and Performance Guarantee from the Zonal Branch /office issuing Bank and I/We shall have no right or claim on my submitted EMD before EPI receives said verification.

6. That the Bank Guarantee issued against the EMD issued by (name and address of the Bank) is genuine and if found at any stage to be. Incorrect / false / fabricated, EPI shall reject my bid, cancel pre-qualification and debar me from participating in any future tender for three years.

I................................................................., the Proprietor / Authorized Signatory of M/s ................................................................. do hereby confirm that the contents of the above Affidavit are true to my knowledge and nothing has been concealed there from....................... and that no part of it is false.

Verified at .........................this..............................day of..............................

DEPONENT

ATTESTED BY (NOTARY PUBLIC)
MEMORANDUM

REF.: Tender for Design, Engineering, manufacturing, Inspection at works for Supply & Testing of 105 nos. Lighting Poles & Associated Works for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.

NIT No. : DLI/C&E/WI-665/538R

<table>
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<tr>
<th>Sl. No.</th>
<th>ITEMS</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>i)</td>
<td>Name of work</td>
<td>Tender for Design, Engineering, manufacturing, Inspection at works for Supply &amp; Testing of 105 nos. Lighting Poles &amp; Associated Works for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.</td>
</tr>
<tr>
<td>ii)</td>
<td>Owner/Client / Employer</td>
<td>Bhilai Steel Plant (SAIL)</td>
</tr>
<tr>
<td>iii)</td>
<td>Type of Tender</td>
<td>Lump sum</td>
</tr>
<tr>
<td>iv)</td>
<td>Earnest Money Deposit</td>
<td>₹ 32,000.00 (Rupees Thirty Two Thousand Only)</td>
</tr>
<tr>
<td>v)</td>
<td>Estimated Cost</td>
<td>---</td>
</tr>
<tr>
<td>vi)</td>
<td>Time for completion of work</td>
<td>10 (Ten) weeks from date of the manufacturing clearance by EPI</td>
</tr>
<tr>
<td>vii)</td>
<td>Mobilization Advance</td>
<td>NA</td>
</tr>
<tr>
<td>viii)</td>
<td>Interest Rate on Mobilization Advance</td>
<td>NA</td>
</tr>
<tr>
<td>ix)</td>
<td>Number of Instalments for recovery of Mobilization Advance</td>
<td>NA</td>
</tr>
<tr>
<td>x)</td>
<td>Validity of Tender</td>
<td>90 (Ninety) days from the opening of price bid.</td>
</tr>
<tr>
<td>xi)</td>
<td>Security Deposit cum Performance Guarantee</td>
<td>5.00% (Five Percent only) of contract value in the form of Bank Guarantee within 15 days from the date of issue of telegram / letter / telex / FAX of Intent of acceptance of tender and validity of Bank Guarantee upto defects liability period.</td>
</tr>
<tr>
<td>xii)</td>
<td>Time allowed for starting the work</td>
<td>The date of start of contract shall be reckoned 15 (Fifteen) days from the date of issue of</td>
</tr>
</tbody>
</table>
telegram / letter / telex / FAX of Intent of acceptance of tender.

xiii) Defect Liability Period 12 (Twelve) Months from the date of taking over of the equipment by client

xiv) Arbitration Amended

xv) Jurisdiction Courts in DELHI / NEW DELHI

SIGNATURE OF TENDERER

NAME (CAPITAL LETTERS) : _________________________________________

OCCUPATION _________________________________________

ADDRESS _________________________________________

_________________________________________

SEAL OF TENDERER
INSTRUCTIONS TO TENDERERS (Suppliers)

1. Sealed tenders in the prescribed form are invited by Engineering Projects (India) Limited, New Delhi.

2. The tenderer is requested to sign each page of tender document and return the complete tender documents.

3. Tenders shall be submitted in sealed envelope marked with ‘Title’, ‘Number’ and ‘Last Date of receipt of Tender’ for the items as given in the ‘Covering Letter inviting Tender’ at the following address by Registered Post or through messenger with in the last date of receipt of tender given in the letter inviting Tender:

   The Executive Director (Consultancy & Engineering)
   Engineering Projects (India) Limited,
   Core-3, Scope Complex,
   7, Institutional Area,
   Lodhi Road, New Delhi – 110003

4. The tenderer is required to submit their offer in 2 separate sealed and super scripted envelopes indicating the following:-

   1st Envelope (Techno-Commercial Bid)

   The tenderers are requested to furnish the documents as required in clause no. 25 in respect of the credentials of the tenderer in this envelope.

   In this envelope the tenderer should also keep the complete tender documents duly signed and stamped by them on each page as their acceptance, deviation sheet and unpriced copy of price bid and super scribe the envelope with “Techno-Commercial Bid”.

   2nd Envelope (Price Bid)

   The form of Price Bid duly filled in with the item rates both in words and figures in the same form as issued to tenderers should be submitted in this envelope, with superscription “Price Bid” No terms and conditions or deviations if any or any other thing should be kept in this envelope.

   The sealed price bid of such tenderers who are found suitable on scrutiny of documents furnished by them i.e. pre-qualification and technically acceptable shall only be opened. The tenders of all such parties, who are not found suitable, shall not be considered and their earnest money deposit will be returned.

   The two envelopes should be enclosed again in a sealed cover super scribed as mentioned in Para. -3.
5. The bidders should quote in words as well as in figures the item rates quoted by 
them. In absence of which the bids may not be considered and are likely to be 
rejected. The amount of each item should be worked out and requisite totals 
given.

All corrections / cuttings should be signed by the tenderer. Each page of the 
tender should be signed by the tenderer. In the event of discrepancy between 
rate in figures and words the rate quoted in words shall be treated as correct. In 
case there is discrepancy between rate and amount worked out the rate quoted 
shall be taken as correct and not the amount.

6. EPI takes no responsibility for tenders lost / delayed in postal transit and 
therefore, tenderers should lodge their tenders sufficiently in advance.

7. Tenders shall be accompanied by Earnest Money deposit for the amount 
indicated in the ‘Covering Letter inviting Tender’ in the form of crossed Demand 
Draft drawn in favour of “Engineering Projects (India) Ltd.” payable at Delhi or 
Bank Guarantee from a Nationalized Bank / Schedule Bank in the prescribed 
enclosed Performa valid for 120 days from the due date of tender. Tender not 
accompanied with Earnest Money are liable to be rejected.

This must be submitted in 1st envelope super scribed as “Techno –Commercial”. 
The tenderer must not keep Earnest Money with Price Bid in 2nd envelope.

8. The EPI’s format for Bank Guarantee towards ‘Earnest Money Deposit’ and 
“Security Deposit cum Performance Guarantee” is enclosed herewith.

9. EPI reserves the right to postpone the tender due date and issue required 
amendment, if any. There will be no public tender opening. However, selected 
Tenderers may be called for discussions / clarifications after the tenders have 
been scrutinized.

10. Earnest Money shall be returned to the unsuccessful tenderer after decision has 
been taken on award of the contract.

11. Earnest Money of the successful tenderer shall be converted in to a part of the 
security deposit / returned on receipt of Security Deposit and unconditional 
acceptance of the order.

12. Tenders must be duly signed with date and sealed. An attested copy of power of 
attorney / affidavit / Board. Resolute on executed as under shall accompany the 
tender documents.

   a) In case of Sole Proprietorship, an affidavit of Sole Proprietorship and if 
the tender is signed by any other person Power of Attorney by the Sole 
Proprietor in favour of signatory.

   b) In case of Partnership, if document is not signed by all the partners, 
Power of Attorney in favour of the Partner / person signing the documents 
authorizing him to sign the documents. The person signing the

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documents should also have a specific authority to refer disputes with the partnership firm to arbitration.

c) In case of Company, copy of the Board Resolution authorizing the signatory to sign on behalf of the Company.

13. The tenderer shall furnish the name(s) and designation of relative(s) if any, employed by EPI.

14. Tenders with following discrepancies are liable for rejections;

a) Tenders with over-written or erased rates or rates and amounts not written in both figures and words.

b) Tender that is incomplete, ambiguous, and not accompanied by the documents asked for.

c) Tender received after specified date / time whether due to postal or other delays.

d) Tender in respect of which canvassing in any form is resorted to by the tenderer.

e) If the tenderer deliberately gives wrong information in his tender or resorts to unfair methods in creating circumstances for the acceptance of his tender, EPI reserves the right to reject such tender at any stage.

15. No deviation shall be allowed from the terms and conditions stipulated in the tender documents and tender containing deviations are liable to be rejected. Deviations, if insisted upon must be specified in a separate ‘Deviation Sheet’ and kept in 1st envelope along with techno-commercial bid, otherwise, the tenderer shall be deemed to have accepted all conditions specified in these tender documents. Normally no deviation is accepted.

16. EPI reserves the right to split the order.

17. The tender shall remain open for acceptance for a period of 90 days from the due date for receiving the tender by EPI. If any tenderer withdraws his tender before the said period or makes any modifications in the terms and conditions of any other right or remedy shall be at liberty to forfeit the Earnest Money deposited.

18. These instructions to tenderers shall form part of the tender documents.

19. Successful tenderer must furnish Security Deposit as specified in tender documents within the time specified in the letter-communicating acceptance of his offer failing which the Earnest Money will be forfeited. The successful tenderer may also be required to enter into a contract agreement with EPI.

20. Submission of a tender by the tenderer implies that he has read the complete contract documents and has made himself aware of the scope, terms & condition...
and specifications etc. No claim within the purview of this clause shall be entertained at any stage.

21. EPI reserves the right to reject any or all tenders without assigning any reasons thereof and does not bind itself to accept the lowest tender.

22. In case the tender cannot be submitted for any reasons the complete set of Tender Documents in full shall be returned promptly but not later than 15 days from the due date to the address mentioned above for submitting the tender failing which the defaulting tenderer may not be considered for issue of future enquiries by EPI.

23. The order shall be governed by the Indian Laws for the time being in force.

24. Jurisdiction: All disputes shall be subject to Delhi Courts alone.

25. Tenderer shall submit the following documents in respect of their credentials along with their tender in the ‘first envelope’.

   a) List of orders of similar items executed during the last 5 years indicating name of the client, value, date of order and delivery.

   b) List of order under execution indicating name of the client, value, date of order and delivery.

   c) Audited balance sheet and profit and loss account for the last 3 years.

   d) Registration Certificate / Memorandum of Association / Partnership Deed.

   e) Copy of letters of registration with various authorities like CPWD, State PWD, MES and Public Sector Undertakings, etc.

   f) Sales Tax Clearance Certificate.

Seal and signature of
The Tenderer
ADDENDUM TO “INSTRUCTIONS TO TENDERER (SUPPLIERS)”

1.0 **CLAUSE NO. 1 of Instructions to Tenderers (Suppliers)** stands amended as below:

Tender shall be submitted through e-Bids only. Kindly refer “Procedure for e-Tendering/Procurement” for downloading & uploading of tender documents as per NIT.

2.0 **CLAUSE NO. 2 of Instructions to Tenderers (Suppliers)** stands amended as below:

The tenderer is requested to sign & stamp each page of tender document and upload the complete tender documents as per NIT.

3.0 **CLAUSE NO. 3 of Instructions to Tenderers (Suppliers)** stands amended as below:

Tenders shall be submitted through e-Bids only. Kindly refer “Procedure for e-Tendering/Procurement” for downloading & uploading of tender documents as per NIT.

4.0 **CLAUSE NO. 4 of Instructions to Tenderers (Suppliers)** stands amended as below:

The tenderer is required to submit their offer online in 2 separate envelopes indicating the following:-

**1st Envelope (Techno-Commercial Bid)**

The tenderers are requested to upload the documents as required in “Notice Inviting Tender” Clause No. 1.0 in respect of the credentials of the tenderer in this envelope.

In this envelope the tenderer should also enclose the complete tender documents duly signed and stamped by them on each page as their acceptance, and unpriced copy of price bid. Deviations if any, to be submitted in this envelope.

Bidders have to submit confirmation letter whether they are registered under MSME Act or not and if yes, then relevant copies of the registration letter (Registered under single point registration scheme of NSIC, Govt. of India, Ministry of MSME, New Delhi vide Gazette Notification dated 26.03.2012 along with the form of Memorandum-2 with the concerned DIC) to be enclosed in Technical Bid Envelope-1 and a request letter for exemption from submission of Tender fee and EMD.

**2nd Envelope (Price Bid)**

The form of Price Bid duly filled in with the item rates both in words and figures in the same form as issued to tenderers should be enclosed in this envelope. No terms and conditions or deviations if any or any other thing should be kept in this envelope. In case of commercial deviations, the cost of withdrawal of commercial deviations if any, to be submitted in this envelope.
The price bid of such tenderers who are found suitable on scrutiny of documents furnished by them i.e. pre-qualification and technically acceptable shall only be opened. The tenders of all such parties, who are not found suitable, shall not be considered and their earnest money deposit will be returned.

**5.0 CLAUSE NO. 7 of Instructions to Tenderers (Suppliers)** stands amended as below:

Earnest Money deposit for the amount indicated in the ‘Notice inviting Tender’ required to be submitted shall be in the form of crossed Demand Draft drawn in favour of “Engineering Projects (India) Ltd.” payable at New Delhi or Bank Guarantee from a Nationalized Bank / Schedule Bank in the prescribed enclosed Performa valid for 150 days (One Hundred Fifty Days) from the due date of tender. Tender not accompanied with Earnest Money shall be rejected.

**6.0 CLAUSE NO. 11 of Instructions to Tenderers (Suppliers)** stands deleted.

**7.0 CLAUSE NO. 15 of Instructions to Tenderers (Suppliers)** stands deleted.

**8.0 CLAUSE NO. 17 of Instructions to Tenderers (Suppliers)** stands amended as below:

The tender shall remain open for acceptance for a period of 90 days from the date of opening of price bid of the tenderer by EPI. If any tenderer withdraws his tender before the said period or makes any modifications in the terms and conditions of the tender, Engineering Projects (India) Limited without prejudice to any other right or remedy shall be at liberty to forfeit the Earnest Money deposited.

**9.0 CLAUSE NO. 22 of Instructions to Tenderers (Suppliers)** stands deleted.

All other provisions of “Instructions to Tenderers (Suppliers)” shall remain unchanged.
ENGINEERING PROJECTS (INDIA) LTD.  
(A GOVT OF INDIA ENTERPRISE)  
MATERIALS MANAGEMENT DIVISION 
GENERAL PURCHASE CONDITIONS 

1. DEFINITION 

1.1 The Buyer means Engineering Projects (India) Limited, a Company incorporated in 
India and having its registered office and Corporate Office at Core 3, Scope Complex, 
Lodhi Road, New Delhi-110003. 

1.2 Supplier' means the tenderer whose tender has been accepted and shall include 
heists/theirs heirs, executors, administrators or successors and permitted agents as the 
case may be. 

1.3 'Purchase Order' means the letter of memorandum, communicating to the supplier, 
the acceptance of his tender and include an advance acceptance of his tender. 

1.4 'Consignee' means where the stores are required by the purchase order to be 
dispatched by rail, road, air or steamer, the person specified in the Purchase Order 
to whom they are to be delivered at the destination, where the stores are required 
by the Purchase Order to be delivered to a person as an interim consignee for the 
purpose of dispatch to another person, such other person and in any other case the 
person to whom the stores are required by the Purchase Order to be delivered in the 
manner specified therein. 

1.5 'Inspectors': Inspectors deputed by BUYER. 

2. TERMS & EXPRESSIONS 

Terms & expressions not herein defined shall have the same meanings as assigned 
to them in the Indian Sales of Goods Act, 1930, Indian Contract Act, 1872 and 
General Clause Act, 1897. 

3. PRICES 

Prices accepted by the BUYER shall be considered as firm and not subject to 
escalation due to any variations in the prices of materials, labour and/or any other 
reasons whosoever which may occur while the order is being carried out. 

4. Payment Terms 

Unless otherwise agreed upon between the parties, payment for delivery of the 
stores will be made on submission of bills in accordance with instruction given in the 
purchase order by a cheque or demand draft in accordance with the following 
procedure. 

4.1 90% of the price of the equipment/material shall be paid on proof of dispatch to the 
consignee through bank or delivery to an interim consignee, if any, and on 
production of Inspection Note issued by the Inspector, Maker's Test Certificate, the
number- and date of the Railway receipt, postal receipt, bill of lading or consignment note under which the goods charged for in the bill are dispatched by rail, post, sea or a irrespectively and the number and date of the letter with which such railway receipt, post receipt, bill of lading shall also be attached to the bill and in the case of stores dispatched by post, the postal receipt shall be attached in original to the bill. The bank charges shall be borne by the supplier.

4.2 Balance 10% of price of equipment/material shall be released within 30 days after expiry of the warranty period as per Clause No. 17.

5. **Insurance to be arranged by BUYER.**

6. **Inspection, Checking, Testing**

The stores covered by the Purchase Order shall be subject to preliminary inspection and testing at any time prior to shipment and/or dispatch and final inspection within a reasonable time after arrival at the place of delivery. The Inspector shall have the right to carry out the inspection and testing which include raw materials at manufacturer's work and at the time of actual dispatch before and after completion of packing.

The supplier shall inform the BUYER at least 21 days in advance of the exact place, date and time of rendering the stores for required inspection, provide free access to Inspectors during normal working hours at supplier's or his/its sub-supplier's works and places at their disposal, internal test reports, material/component test certificates, approved drawings and all useful means of performing, checking, marking, testing, inspection and final stamping at his own expenses. Stores offered without internal testing shall be treated as a lapse on the part of supplier.

If, after receiving inspection call from the supplier/manufacturer the inspector on reaching the works finds that the equipment/materials offered for inspection is not fully ready or fails to meet vital requirements, it will be deemed to be a fake inspection call. Issue of a fake inspection call shall be treated as a serious lapse on the part of the supplier.

In the event of rejection of stores due to defective workmanship/material/design or fake inspection call, the stores would be offered for re-inspection at the earliest. The BUYER shall have the right to deduct the cost of re-inspection from the supplier’s invoices.

Even if inspections and tests are fully carried out, supplier shall not be absolved to any degree from their responsibilities to ensure that stores supplied, comply strictly with requirements, of the purchase order at the time of delivery, inspection on arrival at site, after its erection or start-up and guarantee period.

In any case, the stores must be strictly in accordance with the Purchase order failing which the BUYER shall have the right to reject goods and hold the supplier liable for non-performance of contract.

7. **Maker's Test Certificate:**

Maker's Test Certificate shall be supplied by the supplier at the time of inspection. Failure to comply may cause delay in the issue of certificate of inspection and consequent delay in delivery and payment.
8. **Packing, Marking and Painting:**

A. The stores shall be dispatched by the supplier adequately packed in appropriate packing which should be suitable for sea and inland carriage and ensure complete safety of goods from any kind of damage in transport both on sea and land and all equipment should be properly lubricated.

B. Each package shall contain packing list in English. Each packing shall bear the following marking in English, in indelible paint:

(i) Address of the Ultimate Consignee  
(ii) Address of the Interim Consignee, if any  
(iii) Name of Railway Station for ultimate and interim consignee,  
(iv) Supplier's name  
(v) Name of Equipment  
(vi) Railway Station from where dispatched  
(vii) Purchase Order  
(viii) No. & Date  
(ix) Package Number  
(x) Gross Weight in Kg  
(xi) Net Weight in Kg  
(xii) Outer Dimension in cm  
(xiii) TOP 'Do NOT TURN OVER' 'HANDLE WITH CARE' etc.

The package shall indicate the centre of gravity with a red vertical line, wherever required, together with marking for slings.

The package which cannot be so marked shall have metal tags with the above marking on them.

As far as possible, size of packing shall remain within the permissible limit allowed by the Indian Railways. If this is not possible, timely information will be given and necessary over dimension sanction obtained.

9. **Security Deposit:**

The successful tenderer shall be required to furnish security deposit equal to 5% of the value of the contract within 7 days from the date of issue of letter of intent (LOI). The security deposit is to be deposited in the form of unconditional irrevocable bank guarantee from a Nationalized Bank (if from any other bank the bank guarantee should be duly countersigned by State Bank/Reserve Bank). The bank guarantee should remain valid till 90 (Ninety) days after expiry of defect liability period.

10. **Dispatch Instructions:**

Dispatches of stores will be arranged by Public Tariff rates. In case of FOR Station of Dispatch stores shall be booked at full wagon rates whenever available and by the most economical route or by most economical tariff available. Failure to do so will render the supplier liable for any avoidable expenditure caused to the BUYER.
11. **Assembly, after sales service and training:**

If required by the BUYER the supplier shall be fully responsible for the assembly of the equipment at destination site and completeness of the machinery from the angle of its end use.

The supplier shall provide necessary "After Sales Service" and also impart training to the Consignee's staff in the operation and maintenance of the equipment free of cost to the satisfaction of the consignee. Furthermore, all tools and plants particularly heavy cranes, which are generally used as well as semi-skilled and unskilled labour for the assembly of such machinery will be provided by the BUYER free of cost to the supplier with consumable stores, like fuel, oil, lubricants, battery acids, cotton waste, grease etc., free of cost for the purpose of starting the machines, testing and putting them into good working order.

12. **Respect of Delivery Date:**

The time and delivery date as agreed to between the BUYER and Supplier shall be the essence of the contract. No variation shall be permitted, except with prior authorization in writing from the Buyer. Goods should be delivered securely packed and in good order and conditions at the place and within the time specified for their delivery.

13. **Penalty for late deliveries:**

The time and date of delivery of stores, materials, equipment as agreed to shall be deemed to be the essence of the contract. In case of delay in execution of the order beyond the date of delivery as agreed to for any reason, the BUYER shall recover from the supplier as penalty a sum equivalent to 0.5% of the value of the entire contract for every week of delay or part thereof limited to an aggregate of 5%.

14. **Risk Purchase on Default**

In case of default on the part of the supplier to supply all the stores or part thereof covered by the contract up to the standard/specifications within the contractual delivery period stipulated in the contract, the BUYER shall have the right to purchase such stores or other of similar description at the risk and cost of the supplier.

However, supplier shall be liable to pay penalty under clause 13 above for resultant delay.

15. **Delay due to force majeure**

If any time during the continuance of the contract the performance in whole or part by either party on any obligation under the contract shall be prevented or delayed by reason of any war, hostility, explosions, epidemics, quarantine restrictions, or other acts of God, then provided, notice of the happening of any such event is given by either party to the other within twenty one days from the date of occurrence thereof, neither party shall be 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 on-performance and delay in performance and deliveries 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 Chairman and Managing Director, EPI, New Delhi as to whether the deliveries so resumed shall be final and binding on both the parties. In
case Force Majeure Condition persists for a period exceeding sixty (60) days, either party may at its option terminate the contract.

BUYER shall be at liberty to take over from the supplier at a price to be fixed by the Chairman and Managing Director, EPI, New Delhi which shall be the final, all unused, undamaged and acceptable material, bought out components and stores in course of manufacture in the possession of the supplier at the time of such termination or portion thereof as the BUYER may deem fit.

16. Rejection, Removal of Rejected Goods and Replacement

In case the testing and inspection at any stage by inspectors reveal that the equipment, material and workmanship do not comply with the specifications and requirements, the same shall be removed by the Supplier at his/its own expenses and risk within the time allowed by the BUYER. The BUYER shall be at liberty to dispose of such rejected goods in such manner as he may think appropriate, in the event the supplier fails to remove the rejected goods within the period as aforesaid. All expenses incurred by the BUYER for such disposal shall be to the account of the supplier. The freight paid by the BUYER, if any, on the inward journey of the rejected material shall be reimbursed by the supplier to the BUYER before the rejected materials are removed by the Supplier. The supplier will have to proceed with the replacement of that equipment or part of equipment without claiming any extra payment if so required by the BUYER. The time taken for replacement in such event will not be added to the contractual delivery period.

17. Warranty

The supplier shall warrant that every material/plant, machinery and equipment to be supplied be new and free from all defects and faults in design, material, workmanship and manufacture and shall be of the highest quality.

The items should be consistent with the established, recognized or stipulated standards for material of the type usually used for the purpose and in full conformity with the specifications and drawings or samples, if any. Equipment offered must be capable, during operation, of withstanding extreme dusty, wet, humid and sultry conditions. The warranty shall continue not withstanding inspection, payment, acceptance of tendered equipment and shall expire except in respect of complaints notified to supplier prior to such date within 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier.

18. Performance Guarantee

The supplier shall guarantee that any/all material used in execution of the Purchase Order shall be in strict compliance with characteristics requirements and specifications agreed upon and that same shall be free from any defects.

The supplier shall guarantee that all material and equipment shall be repaired or replaced as the case may be at his own expense in case the same have been found to be defective in respect of material, workmanship or smooth and rated operation within a period of 12 months after the same has been put in service or 18 months from the date of dispatch of last consignment, whichever is earlier. The guarantee period for the replacement parts shall be 12 months starting from the date on which the replacement parts are commissioned. Acceptance by the BUYER or his inspectors
of any equipment and materials or their replacement will not relieve the supplier of his/its responsibility concerning the above guarantee.

19. **Indemnity**

The supplier shall at all times indemnify the BUYER against all claims which may be made in respect of stores for infringement of any right protected by patent, registration of design or trade mark. Provided always that in the event of any claim in respect of alleged breach of patent, registered designs or trade mark being made against the BUYER, the BUYER shall notify the supplier of the same and the supplier shall at his own expense either settle any such dispute or conduct any litigation that may arise there from.

The supplier shall not be liable for payment of any royalty, license fee or other expenses in respect of or for making of patents or designs with respect to which he is, according to the terms of the contract, to be treated as an agent of the Government for the purpose of making use of the patent or trade mark of fulfillment of the contract.

20. **Spare Parts**

The supplier shall furnish itemized and priced list of spare parts required for two years normal operation of the equipment along with the quotation.

21. **Drawings**

The supplier shall furnish the general arrangements and dimensional drawings in three sets within four weeks from date of placement of order.

22. **Literature of Equipment**

Following literature and documents for the equipment shall be supplied in five copies each free of cost along with the equipment, (a) Operator's instructions (b) Service Manual (c) Illustrated and detailed parts catalogues (d) Specifications (e) A list of service tools required for routine servicing of the equipment.

23. **Arbitration**

Except where otherwise provided for in the contract all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other questions, claim, right matter or thing whatsoever if any, arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or any contradictions or otherwise concerning the purchase order or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the sole arbitration of the Chairman and Managing Director/General Manager (accepting authority) of Engineering Projects (India) Ltd. and if the Chairman and Managing Director/General Manager is unable or unwilling to act to the sole arbitration some other person shall be appointed by the Chairman and Managing Director/General Manager willing to act as such arbitrator. There will be no objection if the arbitrator so appointed is an employee of Engineering Projects (India) Ltd., and that he had to deal with matters to which the contract relates and that in the course of his duties as such he had expressed views on all or any of the matters in disputes or difference.
The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, such Chairman and Managing Director/General Manager as aforesaid at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as an arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is also a term of this contract that no person other than a person appointed by such Chairman and Managing Director/General Manager as aforesaid should act as arbitrator and if for any reason that is not possible, the matter is not to be referred to arbitration at all.

Cases where the amount of award in claim is Rs. 50,000/- (Rupees Fifty Thousand Only) and above, the arbitrator shall give reasons for the award.

Subject as aforesaid the provisions of the arbitration act 1940 or any statutory modification or re-enactment thereof and the rules made there under and for time being in force shall apply to the arbitration proceedings under this clause.

It is a term of the contract that the party invoking arbitration shall specify the disputes or dispute to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

The arbitrator may from time to time with consent of the parties enlarge the time, for making and publishing the award.

The work under the contract shall, if reasonably possible continue during the arbitration proceedings.

The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties fixing the date of the first hearing.

The arbitrator shall give a separate award in respect of each disputes or difference referred to him.

The avenue of arbitration shall be such place as maybe fixed by the Arbitrator in his sole discretion.

The award of the arbitrator shall be final, conclusive and binding on all parties to the contract.

24. Court Jurisdiction

Disputes of any nature that may arise in connection with the execution of the contract shall be subjected to the jurisdiction of courts situated in Delhi/New Delhi only.
Check List for Evaluation & Selection of Suppliers / Vendors

1. Name
2. Address
3. Contact Person
4. Proprietor
5. a) Phone Nos.
b) Fax Nos.
6. Items / Products
7. Manufacturer
Distributor
Dealer
Stockiest
8. Facilities Available In House through External Agency
   a) Testing Facilities
      i) For Incoming materials
      ii) For In process
      iii) For Final Product
   b) Can Issue Test Certificate Yes No
   c) Details of Manufacturing Facilities
   d) Products being manufactured
      (Product Catalogues)
9. Annual Turn Over
10. Whether ISO 9000 certified or not
11. Whether IS certified or not
12. Reference list of important customers during last five years
13. Ability to give after sales service
14. Sample sent or not

To In charge MMD

EPI

Signature of Vendor / Supplier
Name
Designation
Date
For use in EPI

Data has been collected over phone verbally.

Signature of person collecting data

Evaluation & Review

<table>
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<th>Yes</th>
<th>No</th>
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Reviewed the details of vendor Product is suitable

If Yes basis

Sample checked

Specification checked

Supplier’s details reviewed

Enjoys goodwill / Reputation

Testing facilities adequate

Enquiries from customers

of sub suppliers

Past performance with

EPI

–

Approved

Reviewed

Signature

Signature
ADDITIONAL PURCHASE CONDITIONS (APC)

1.0 The following Additional Purchase Conditions shall be read in conjunction with General Purchase Conditions. These Additional Purchase Conditions shall supersede the General Purchase Conditions wherever they are at variance.

2.0 SCOPE OF WORK INCLUDED IN THE CONTRACT


3.0 QUALIFICATION OF TENDERERS

To be eligible for this tender the bidders should fulfil the requirements for eligibility as mentioned in the Notice Inviting Tender (NIT). The Bidders are required to fulfil all the eligibility criteria as stipulated in NIT and elsewhere in the Tender documents. The price bid of bidders who fulfil the eligibility criteria as per evaluation of EPI shall only be opened. The decision of EPI in this regard shall be final & binding on the bidders.

4.0 DISQUALIFICATION

In addition to clause no. 14 of Instructions to Tenderer (Suppliers), the bidders may note that they are liable to be disqualified and may not be considered for the opening of Price Bid if;

a) Representation in the forms, statements and attachments submitted in the pre-qualification document are proved to be incorrect, false and misleading.

b) They have record of poor performance during the past 10 years such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the bidder, inordinate delay in completion, consistent history of litigation/arbitration awarded against the bidder or any of its constituents or financial failures due to bankruptcy etc. in their ongoing/past projects. **A self certificate from the prospective bidder in this respect may be submitted.**

c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.

d) If the bidders attempt to influence any member of the Tender Scrutiny committee.

e) Non-submission of valid NSIC certificate/relevant copies of registration letter (in the form of Memorandum-2 with the concerned DIC) under MSME Act for claiming exemption from payment of Tender fee.

f) Non-submission of valid NSIC certificate/ relevant copies of registration letter (in the form of Memorandum-2 with the concerned DIC) under MSME Act for claiming exemption from EMD submission.

EPI reserves its right to take appropriate action including disqualification of tenderer(s) as may be deemed fit and proper by EPI at any time without giving any notice to the bidder in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the Bidders.
5.0 EPI reserves the right to independently verify the performance of the bidder from the Existing owners/users/owners’ Consultants. In case any installation of the bidder is found to be performing unsatisfactorily, EPI reserves the right to reject the tender and price bid of such bidder shall not be opened, even if the bidder is meeting the technical and other qualifying criteria.

In such circumstances the bidder shall have no claim on EPI of whatsoever nature.

6.0 PAYMENT TERMS

The Clause No. 4 of GPC shall be replaced as under:

The bidder shall reimburse the EPI all costs, charges, damages or expenses which the EPI may have paid or incurred on behalf of the bidder, if and to the extent to which the bidder is liable under this contract to pay within thirty (30) days upon written request of the Engineer in charge of EPI, failing which such costs, charges, damages or expenses shall be deducted by the EPI from any money due or becoming due by the EPI to bidder under this contract or any other contract failing which such amounts shall be considered as debt from the successful bidder to the EPI and shall be recoverable accordingly.

Any Indian Income Tax which EPI may be required to deduct by law or statute, shall be deducted at the source and the same shall be paid to Income Tax Authorities on account of the bidder. EPI shall provide the bidder a certificate for deduction of TDS. The bidder shall indicate their Permanent Account Number with the relevant Income Tax Authority to EPI. Bidder shall maintain books of account and shall get the account audited as per section 44DA of Income Tax Act.

If the bidder is exempted from the deduction/recovery of Income Tax, no such recovery shall be made by EPI provided Bidder shall furnish valid exemption certificate issued by Income Tax Department to this effect.

Following breakup of payment shall be followed:

i) 5% of the total order value specified in Price Schedule excluding taxes, duties (except service tax) shall be released after approval of drawings & QAP from EPI/MECON/BSP.

ii) 90% of the total value specified in Price Schedule excluding taxes, duties shall be released towards progressive payments as per approved billing schedule (Billing Schedule to be submitted by successful vendor for EPI’s approval) on receipt of material at site in good condition and submission of MRC (Material Receipt Certificate) from EPI site office and 100% of taxes and duties shall be released on submission of documentary evidence.

iii) Balance 5% of the total order value specified in Price Schedule excluding taxes, duties shall be released on completion of Testing & commissioning of Lighting Poles in all respect or after 6 months from the date of receipt of last consignment at site, whichever is earlier against submission of Performance Bank Guarantee of equal amount valid till guarantee period as per EPI’s Performa.

7.0 Taxes & Duties:

i) Price quoted by the bidder shall be inclusive of all the taxes & duties including GST as per the price schedule of NIT document. All the columns of taxes & duties shall be duly filled without blank space. The Invoice shall be raised on EPI as per GST Complaint Invoices. Failure to provide Tax Invoices in desired format or non-payment of taxes or non-filling of GST returns/ mismatch of Invoices would lead to non-availability of Input Tax Credit to BSP/EPI. Thereby is to be borne by bidder and EPI shall deduct such amount along with Interest/penalty/late fees, etc., if any paid by EPI on account of disallowance of ITC, from the next payment/dues
due to supplier. Bidder while quoting the rates in the tender must also consider the ITC credit applicable for the works, if any.

ii) In case any tax/duty is not applicable, the bidder has to either write NIL or NA.

iii) Transit Insurance will be in EPIL scope however all documents related to transit insurance will be provided by the bidder.

iv) Bidder must have registration under GST.

v) Taxes & duties/GST besides all direct and indirect cost of works, infrastructures are included in the party’s quoted rates.

8.0 While raising invoice for such goods, the invoice should contain the following

(i) Tax payer Identification Number under GST.

9.0 VARIATION IN TAXES, DUTIES, LEVIES AND IMPOSITION OF NEW TAXES ETC.

In case of any reduction in rate of GST or other taxes in future or the project getting exemption status prior to the late date of bid submission or afterwards, the subcontractor shall pass on the benefit to EPIL immediately, failing which EPIL shall have the right to recover the differential amount from the amounts due to the subcontractor. Further, in case of any increase in rate of GST or other taxes in future or the project losing exemption status prior to last date of bid submission or afterwards, the said increase of taxes shall be paid/reimbursed to the subcontractor, subject to the condition that the client reimburses the said increased taxes to EPIL.

10.0 For Dispatch of materials to Site, the vendor shall mark consignee as “Bhilai Steel Plant, SAIL A/EPIL, Bhilai” and follow dispatch instruction to be given by EPI.

11.0 COMPLETION PERIOD

10 weeks from the date of manufacturing clearance given by EPI.

12.0 The bidder shall comply with legal orders & directions of law of local bodies. The bidder shall give to the Municipality, Police, Local Bodies and concerned Governmental authorities all necessary notices relating to work that may be required under the law and obtain all requisite licenses/permissions. Nothing extra shall be paid by EPI on this account.

13.0 GUARANTEE

The bidder shall guarantee that the materials supplied by him, under these specifications shall be new and first class in every respect including electrical items. He will make good any defect, which may develop within 12 months from the date of commissioning of the installation or 18 months from the date of last lot of supply at site whichever is earlier, without any extra cost to EPI/BSP.

14.0 PERMITS AND INSPECTIONS

The bidder shall obtain all necessary permits from local bodies, provincial or central authorities and shall make arrangement for inspection and tests etc. as required at his own cost.

15.0 LICENCES

The bidder shall arrange for obtaining the license for the operation and approval of drawings for the equipment’s etc. as required from the local Government/authorities at his own cost & nothing extra shall be payable.

16.0 The work shall be carried out in accordance with the drawings approved by the EPI/BSP/MECON. Before the commencement of any item of work, the bidder shall correlate all the relevant drawings/documents/specification issued for the work and
satisfy himself that the information available there from is complete and unambiguous. The discrepancy, if any, shall be brought to the notice of Engineer-In-Charge of EPI before the execution of work. The bidder 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. Nothing extra shall be paid on this account.

17.0 SECURITY DEPOSIT:

The successful tenderer shall be required to furnish security deposit equal to 5% of the value of the contract within 7 days from the date of issue of Letter of Intent. The security deposit is to be deposited in the form of unconditional and irrevocable bank guarantee from a Nationalized Bank/ scheduled bank. Security Deposit is to be released after 90 (Ninety) days from expiry of defect liability period.

18.0 DEFECTS LIABILITY PERIOD

The Contractor shall be responsible for the rectification of defects in the material supplied for a period of 12 (twelve) months from the date of completion of supply. Completion of supply shall be considered from the last item to be supplied by the party mentioned in their scope of work. Any defects discovered and brought to the notice of the Contractor shall be attended to and rectified by him at his own cost and expense.

In case the Contractor fails to carry out these rectifications, the same may be taken up without prejudice to any other right or remedy available, be got rectified by EPI at the cost and expense of the Contractor and the amount shall be recovered from due payments of the contractor/encashment of BG.

19.0 BOQ

i) Bill of Quantities shall be read in conjunction with NIT, Instructions to Tenderers (Suppliers), General Purchase Conditions (GPC), Additional Purchase conditions (APC), Technical Specifications, Drawing, Schedules, and Annexure & Addendum etc. to tender Document.

ii) Quantity variation shall be considered as (+/-) 25% of total order value.

iii) The unit rate for any variation (+/-) shall remain unchanged & the same shall be applicable as quoted in the Price Schedule (Supply).

20.0 ALTERATION IN SPECIFICATION, DESIGN & DRAWING

The Engineer-In-Charge of EPI shall have power to make any alterations in, omissions from, additions to or substitutions for, the original Specifications, Drawings, Designs and Instructions that may appear to him to be necessary during the progress of the work, and the Contractor shall carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-In-Charge of EPI and such alterations, omissions, additions, or substitutions shall not invalidate the contract and any altered, additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work.

The time for the completion of the work shall be extended in the proportion that the altered, additional or substituted work price bears to the original contract work price, and the certificate of the Engineer-In-Charge of EPI shall be conclusive as to such proportion. Over and above this, a further period to the extent of 25 percent of such extension shall be allowed to the Contractor.
The rates for such additional, altered or substituted work under this clause shall be worked out as follows:

The Contractor shall, within 7 days of the date of receipt of order to carry out the work, inform the Engineer-In-Charge the rates which he intends to charge for such class of work, supported by analysis of the rate or rates claimed, and the Engineer-In-Charge of EPI shall determine the rate or rates on the basis of prevailing market rates of the material, Labour, T&P etc. plus 15% (Fifteen percent) to cover the Contractors supervision, overheads and profit and pay the Contractor accordingly. The opinion of the Engineer-In-Charge of EPI as to the current market rates of materials and quantum of labour involved per unit of measurements will be final and binding on the Contractor.

However, the Engineer-In-Charge of EPI, by notice in writing, will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner, as he may consider advisable. But under no circumstances, the Contractor shall suspend the work on the plea of non-settlement of rates of items falling under the clause.

21.0 The bidder has to arrange for inspection and shall submit internal inspection certificate/document and nothing extra shall be paid.

22.0 TEST CERTIFICATE

All manufacturer’s certificates of test showing that the materials have been tested in accordance with the requirements of the relevant standard specification and the copy of the test certificate as well as standard shall be supplied free of cost to EPI for onward submission to BSP/MECON.

23.0 INSPECTION AT MANUFACTURER’S WORK:

The bidder shall provide such facilities at his own cost as will be necessary for inspection of the material before dispatch at his or his associate’s works and also for witnessing such tests as per technical specifications, as are done at the works if so required by BSP/MECON/EPI.

24.0 SECURED ADVANCE AGAINST NON-PERISHABLE MATERIALS:

No secured advance against non-perishable materials will be paid.

25.0 It will be the sole responsibility of bidder to obtain all statutory approvals and completion clearance from all the relevant statutory bodies and for all other services as included in the scope of contract etc. from the concerned departmentas required within the stipulated time frame. Liaison work on behalf of EPI with the local bodies will also have to be done by the bidder. Nothing extra shall be payable to bidder on this account. No claim whatsoever in this regard shall be entertained.

26.0 LIQUIDATED DAMAGES DUE TO DELAY IN “COMPLETION OF THE FACILITIES”:

The Clause No.13 of GPC shall be amended & replaced as under:

If the Successful bidder fails to attain completion of the work within the time of completion or any extension thereof, due to reasons not attributable to the EPI, the EPI shall recover the amount of Liquidated Damages, but not by way of penalty, by making deductions from the Successful bidder’s RA bills or by encashment of their Bank Guarantees at the rate of 0.5% of the Contract Price plus escalation, if any, excluding taxes & duties per complete week of delay or part thereof subject to a maximum of 5% of the contract price plus escalation, if any, excluding taxes & duties.
However, the payment of liquidated damages shall not in any way relieve the successful bidder from any of its obligations to complete the facilities or from any other obligations and liabilities of the successful bidder under the contract.

27.0 CENVAT/ITC ON GST

27.1 The Bidder will ensure dispatches of their own manufactured as well as all bought out plant, equipment & materials directly to work site of the BSP/EPI by issue of Tax Invoice so that the BSP/EPI will get the ITC (input Tax Credit) of GST paid on all such supplies including imported plant & equipment.

27.2 The Bidder shall issue E-way bill under GST as per the rules prescribed under GST Law and requirements if any under GST rules shall also be complied with by BSP/EPI.

28.0 CONCILIATION AND ARBITRATION

Before resorting to arbitration as per the clause given below, the parties if they so agree may explore the possibility of conciliation as per the provisions of Part III of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015. When such conciliation has failed, the parties shall adopt the following procedure for arbitration:

28.1 Except where otherwise provided for in the contract, any disputes and differences relating to the meaning of the Specifications, Design, Drawing and Instructions herein before mentioned and as to the quality of workmanship or materials used in the work or as to any other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the Contract, Designs, Drawings, Specifications, Estimates, Instructions, or these conditions or otherwise concerning the works of the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the Sole Arbitrator appointed by the Chairman & Managing Director (CMD) of Engineering Projects (India) Limited (EPI) or any other person discharging the functions of CMD of EPI. The person approached for appointment as Arbitrator shall disclose in writing circumstances, in terms of Sub-Section (1) of Section (12) of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 as follows:

(i) such as the existence either direct or indirect, of any past or present relationship with or interest in any of the parties or in relation to the subject-matter in dispute, whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to his independence or impartiality; and

(ii) Which are likely to affect his ability to devote sufficient time to the arbitration and in particular his ability to complete the entire arbitration within a period of twelve months.

The Arbitrator shall be appointed within 30 days of the receipt of letter of invocation of arbitration duly satisfying the requirements of this clause.

28.2 If the arbitrator so appointed resigns or is unable or unwilling to act due to any reason whatsoever, or dies, the Chairman & Managing Director aforesaid or in his absence the person discharging the duties of the CMD of EPI may appoint a new arbitrator in accordance with these terms and conditions of the contract, to act in his
place and the new arbitrator so appointed may proceed from the stage at which it was left by his predecessor.

28.3 It is a term of the contract that the party invoking the arbitration shall specify the dispute/ differences or questions to be referred to the Arbitrator under this clause together with the amounts claimed in respect of each dispute.

28.4 The Arbitrator may proceed with the arbitration ex-parte, if either party, in spite of a notice from the arbitrator, fails to take part in the proceedings.

28.5 The work under the contract shall continue as directed by the Engineer-In-Charge, during the arbitration proceedings.

28.6 Unless otherwise agreed, the venue of arbitration proceedings shall be at the venue given in the ‘Memorandum’ to the ‘Form of Tender”.

28.7 The award of the Arbitrator shall be final, conclusive and binding on both the parties.

28.8 Subject to the aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 or any statutory modifications or re-enactment thereof and the Rules made there under and for the time being in force shall apply to the arbitration proceedings and Arbitrator shall publish his Award accordingly.

Note: Not withstanding anything contained herein above, this clause shall not be applicable where the dispute is between EPI and another Public Sector Enterprise or Govt. Department for which a separate Arbitration Clause is provided vide Clause No. A given below:-

29. ARBITRATION BETWEEN PUBLIC SECTOR ENTERPRISES INTERSE/GOVERNMENT DEPARTMENTS.

1. In the event of any dispute of difference relating to the interpretation and application of the provisions of the contracts, such dispute or differences shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 and The Arbitration and Conciliation Act, 2015 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law-Secretary or the Special Secretary/Additional Secretary, when so authorized by the Law-Secretary, whose decision shall bind the Parties finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator”.

2. Subject to any amendment that may be carried out by the Government of India from time to time the procedure to be followed in arbitration shall be as is contained in F. No. 4(1)/2013-DPE(PMA)/FTS-1835 Dated: 11/04/2017 of Department of Public Enterprises, Ministry of Heavy Industries & Public Enterprises or any modification issued in this regard.
**Procedure for e-tendering / e-procurement**

**Bidder’s guide for EPIL portal**:

1. Use browser to go to [https://www.mstcecommerce.com/eprochome/EPIL](https://www.mstcecommerce.com/eprochome/EPIL)

**Digital Signatures**

To login into the portal both Users (EPIL Officials) and Bidders will require a Class 2 or 3 Digital Signature. Bidders should have at least Signing type Digital Signatures.

A digital signature can be obtained from any Certifying Authority (CA) as per the List of CAs issued by Controller of Certifying Authorities, Ministry of Electronics and Information Technology. The list is available at [http://www.cca.gov.in/cca/?q=licensed_ca.html](http://www.cca.gov.in/cca/?q=licensed_ca.html).

The list is as under:

- a) Safescrypt
- b) IDRBT
- c) National Informatics Centre
- d) TCS
- e) GNFC
- f) e Mudhra CA
- g) CDAC CA
- h) Capricorn CA
- i) NSDL e-Gov CA

**System Settings**

- a. This portal is compatible with multiple browsers (Google Chrome, Mozilla Firefox, Internet Explorer, Opera etc.)
- b. On the system where this portal is being used, the user may open the portal and click on Install Components button on the left side as shown below:

![Install Component](https://www.mstcecommerce.com/eprochome/EPIL)

- c. On clicking the button, a new window will open as shown below:
d. In this window, please save the MSTCSIGNER28082018_v2.exe file and install it.

e. Additionally, please click on Add to chrome button, to add the chrome extension, as shown below:

   For other browsers please install the extension as applicable.

2. On the right side of the page click on Register as a Vendor:

3. Fill the form that appears to create username and password.

4. Once the registration is done, login with your user name and password:
5. System will ask you to verify your digital signature

6. Press Ok and select your digital signature from the List:

7. Your digital signature will be verified

8. Once login is complete, a bidder can access My Menu through the left side of the page:

9. Here click on Download NIT/Corrigendum button to download the NIT/Corrigendums. Select Event number and click on download to download the files:

10. To submit the bid a bidder can proceed to Bid Floor through the left side My Menu. In Bid Floor click on live events to view a list of Live events. In live events select the tender number where you wish to submit a bid.
11. On clicking the event number, if the bidder has not paid transaction fee, system will prompt them to pay the transaction fee. They can pay the transaction fee by going to Transaction Fee payment link in their login, and pay the same through online payment (debit card, credit card, net banking etc) or RTGS/NEFT (Challan).

12. Tender can be of multiple types with price bid uploading in Excel or Technical-Price type. The bid floor for each type of event will change automatically. On clicking the tender number one of the following screens will appear:

**For 2 cover with price bid in excel**

![E-Tender Technical cum Price Bid](image)

13. For each type of event the event details including start time and close time the details will be given on the top of the page.

14. To submit the tender the bidder has to start from top left and submit the details one by one.

15. For 2 cover with price bid in excel, the bidder has to submit technical bid, by filling the details and clicking the save button.

![Technical Bid](image)

a. After the technical bid is saved, a bidder can proceed to uploading documents through the link upload docs:
b. Please note that under no circumstance the price bid excel has to be uploaded here.

c. After the documents have been uploaded, the bidder can click on download excel to download the excel format.

d. Fill up the excel sheet as per the details given therein and tender document.

e. To upload the filled up excel click on Upload Price Button, click on browse to select the file and then click on Upload and Save encrypt file.

f. The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. Please note that at the end the bid must be final submit, otherwise the same will not be considered.

16. For E-Tender Technical Cum Price Bid:

a. In the manner similar to above the bidder has to fill up Common terms, then press save button to submit.

b. Then the bidder has to upload documents as per the list shown therein.

c. Once the documents are uploaded the bidder has to submit the Technical and Price bids.

d. The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. Please note that at the end the bid must be final submit, otherwise the same will not be considered.

Bidder’s may note that in each case using the Delete bid button will only delete the bids and then the bidder can resubmit upload tender before closing time.

Using the withdraw button the bid will be withdrawn and the bidder will not be allowed to submit any further bid in that event.

For any assistance regarding the Tender Document and/or term and conditions the bidders may contact at EPIL:

Executive Director (Consultancy & Engineering)
Engineering Projects (India) Ltd.
Core 3, scope complex, Lodhi Road, New Delhi 110003
Tel No. – 011-24361666, Extn: 2339, 2322, Fax No. – 011-24363426
E-mail - core@engineeringprojects.com

For any assistance during bid submission, system settings etc. bidders may contact at MSTC:
Some Bidding related Information for this Tender (Sealed Bid)

The entire bid-submission would be online on MSTC Portal (unless specified for Offline Submissions).

Broad outline of submissions are as follows:
- Submission of Bid-Parts / Envelopes
- Technical-Part
- Financial-Part

Offline Submissions:

The bidder is requested to submit the following documents offline to the under mentioned address before the start of Public Online Tender Opening Event in a Sealed Envelope.

1. Original copy of the Tender Fee of ₹3,540/- (Rupees Three Thousand Five Hundred Forty only) (Including GST @ 18%) in the form of DD in case of not registered with NSIC/MSME.

2. Original copy of the EMD of ₹32,000/- (Rupees Thirty Two Thousand only) in the form of a Bank Guarantee/DD in case of not registered with NSIC/MSME.

3. Original copy of power-of-attorney to sign the tender documents.

4. Documentary evidence with regard to registration with NSIC/MSME as mentioned in Clause No. 1 of NIT for tender fees & EMD waiver.

5. Affidavit as per Annexure-A of NIT.

Contact Persons Name:

Executive Director (Consultancy & Engineering)
Engineering Projects (India) Ltd.
Core 3, scope complex, Lodhi Road, New Delhi 110003
Tel No. – 011-24361666, Extn: 2339, 2322, Fax No. – 011-24363426

Note:

1. The envelope shall bear (the project name), the tender number and the words ’DO NOT OPEN BEFORE’ (due date & time).

2. The Bidder should also upload the scanned copies of all the above mentioned original documents as Bid-Annexures during Online Bid-Submission in addition to PQ documents listed in NIT Clause no. 1.

3. Bidders are required to pay applicable transaction fees on line at the time of bid submission.
PROFORMA FOR BANK GUARANTEE IN LIEU OF EARNEST MONEY DEPOSIT

In consideration of Chairman & managing Director, Engineering Projects (India) Limited, (A Govt. of India Enterprise), Core-3, Scope Complex, Lodhi Road, New Delhi Pin-110003. (hereinafter called the EPI) having agreed to accept bank Guarantee of Rs .................. in lieu of EARNEST MONEY DEPOSIT from ..................................................................... (hereinafter called the Supplier / Contractor/ Sub-Contractor, which expression shall include its heirs, successors and assignees) in respect of the Tender for ...................................................................................................................

We, ........................................ bank having its registered/head office at ................................... (hereinafter referred to as the Bank) do hereby agree and undertake to pay to EPI without demur or protest an amount not exceeding Rs....................... on demand by EPI.

We the above said Bank further agree and undertake to pay the said amount of Rs....................... without any demur on demand within 48 hours. Any demand made on the Bank by EPI shall be conclusive as regards the amount due and payable by the Bank under this guarantee.

We the above said Bank further agree that the guarantee herein contained shall be in full force and in effect until ............................................................... date ........................................

Unless a demand or claim under this guarantee is made on us in writing on or before ............................................. date ............................................. , we shall be discharged from all liabilities under this guarantee thereafter.

We, the above said Bank, further agree that EPI shall have full liberty, without our consent and without affecting in any manner our obligation to verify, modify or delete any of the conditions.

We, the above said Bank, lastly undertake not to revoke this guarantee during its currency except with the prior consent of EPI in writing.

Dated……………………this day of………………200.

For and on behalf of the Bank

NOTE: on a Non-Judicial stamp paper of Rs. 100/- (Rupees One hundred only)
TENDER DOCUMENT

NIT No DLI/C&E/WI-665/538R

FOR

Tender for Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of 105 Nos. Lighting Poles & Associated Works” for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.

VOLUME- 2 A

(GENERAL SPECIFICATION)

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7,
Lodhi Road, New Delhi-110003
TEL NO: 011-24361666   FAX NO. 011- 24363426
### Contents

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Introduction</td>
</tr>
<tr>
<td>(ii)</td>
<td>List of Approved Vendors</td>
</tr>
<tr>
<td>(iii)</td>
<td>General Specification</td>
</tr>
</tbody>
</table>
INTRODUCTION : OHP PART B (PKG-061), BSP-Bhilai

Bhilai Steel Plant, in its approach note for corporate plan 2011-12, indicated that the production potential of BSP would be 7.0 MTPY of crude steel, subject to implementation of strategies to overcome the present constraints and providing certain additional facilities.

Present facilities in OHP to receive, unload & store raw material in OHP is insufficient mostly due to logistical problems in placement of rakes in yard, weighment, placement of rakes in tippler & collection of empty wagons, transportation of raw material to the yard etc. This is causing a lot of wagon detention and thereby heavy demurrages are paid to the Railway authority. Additionally logistics for stockpiling in the manner desired and reclamation also posed bottlenecks.

To overcome this problem, a scheme with one additional Wagon Tippler with all related facilities including conveyor system, interconnection of existing & proposed unloading stream, two additional beds for stockpile in the existing OHP with one Stacker, one Reclaimer, yard conveyors etc. have been envisaged as Part-A.

An immediate measure to ease the unloading of material and to avoid demurrage charges for detention of wagons, an additional Wagon Tippler in-between the existing Wagon Tippler and track-hopper of OHP with all related facilities is being separately considered in PART-A of the Augmentation of Ore Handling Plant. Thus Part-A pertains to solving the present problem posed in OHP so that raw material required at present (no increase in quantity envisaged) is handled with ease causing no delays.

PART-B of the Augmentation of Raw material receipt & handling facilities with new OHP shall consist of all other facilities and pertains to the management of the additional quantity of raw material required to produce 7MTPY of Crude Steel in Bhilai Steel Plant. The major facilities envisaged are a Wagon Tippler, two new Track Hoppers with two unloading tracks and a new OHP (OHP-II) with six numbers of beds of stockpile, three Stackers and four Reclaimers and related conveyors to feed new Blast Furnace BF#8 and SP-III (both modules).
The existing conveyors R101/102 series shall now feed the new RMP plant (RMP III) for new SMS-III with provision of direct feed of bulk materials to SMS III. However original route from existing OHP I to Sinter Plant-III will still exist for emergency.

The bidder shall study the specification along with related documents and satisfy himself thoroughly regarding suitability of the plant and equipment and system, specified in the tender document and take full responsibility for guaranteed operation of the equipment with respect to output, reliable working as well as ease of operation, inspection and maintenance including replacement with minimum down time.

All handling and transport charges of plant and equipment, raw materials for site erected structures etc. including double handling as required for completion of the work in accordance with time schedule are deemed to be included in the scope of work of the bidder.

The bidder shall be responsible for coordinating the supplies covered in the different parts of this specification from different sources and execute the contract within agreed time schedule.

The bidder shall endeavor to use maximum indigenous equipment / facilities which may be available in India / be manufactured in India by Indian associates based on manufacturing drawings to be supplied by the supplier / his sub-suppliers. All indigenous equipment / components shall be selected from the list of Preferred Makes as GTS (GS-013).

Inspection and testing of plant and equipment shall be carried out by consultant/employer at the works of supplier during manufacturing and/or on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved drawings, manufacturing drawings and applicable national/international standards.
<table>
<thead>
<tr>
<th>Page</th>
<th>Description</th>
<th>Approved Vendors</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Panel /Indicating meters</td>
<td>IMP, AE, MECO, L&amp;T, Motwani, Conzerve</td>
</tr>
<tr>
<td>27</td>
<td>LT Air Circuit Breakers</td>
<td>L&amp;T, SIEMENS, Schneider, ABB, GE Power Control</td>
</tr>
<tr>
<td>28</td>
<td>EHT/HT Insulators</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Porcelain insulator</td>
<td>WS-Insulators, Jayashree, BHEL, A-Bond Strand, S&amp;S, AREVA, Oblum</td>
</tr>
<tr>
<td></td>
<td>2. Epoxy insulator</td>
<td>A-Bond Strand, Power Cam Electrical Pvt. Ltd., Baroda Bushings, S &amp; C Electric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co.(America), RISHO KOGYO CO. LTD (Japan)</td>
</tr>
<tr>
<td>29</td>
<td>HT HRC Fuses</td>
<td>S&amp;S, GE Power Control, Busmann, SIEMENS, ABB, Drescher Paniker</td>
</tr>
<tr>
<td>30</td>
<td>HV / LV Bus Duct</td>
<td>Best &amp; Crompton, ECC (Kolkata), Star Drive (Chennai), Enpro (Chennai), Advance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Control (Advance Power Control only for LV Bus Duct)</td>
</tr>
<tr>
<td>31</td>
<td>Moulded Case Circuit Breaker (MCCB)</td>
<td>Schneider (CG &amp; MG), L&amp;T, Andrew Yule, ABB, SIEMENS, BCH(BIL), GE POWER CONTROL,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOELLER</td>
</tr>
<tr>
<td>32</td>
<td>Motor Protection Circuit Breakers. (MPCB)</td>
<td>Schneider (TELEMECANIQUE), L&amp;T, ABB, SIEMENS, GE POWER CONTROL, MOELLER, Rockwell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automation</td>
</tr>
<tr>
<td>33</td>
<td>Miniature Circuit Breaker. (MCB)</td>
<td>SIEMENS, L&amp;T, GE POWER, CONTROL, SCHNEIDER (PROTEC / MG), STANDARD, INDOASIAN,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HAVELLS, MDS (LEGRAND), ABB</td>
</tr>
<tr>
<td>34</td>
<td>Earth Leakage Circuit Breaker</td>
<td>GE POWER CONTROL, STANDARD, HAVELLS, ABB, SIEMENS, SCHNEIDER</td>
</tr>
<tr>
<td>35</td>
<td>Switch, fuse Unit / Fuse Disconnector (Fuse Switch Unit), Air Break switch</td>
<td>GE POWER CONTROL, L&amp;T, SIEMENS, BASANT PRAN &amp; CO.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HAVELLS, STANDARD, INDOASIAN, CONTROL &amp; SWITCH GEAR, ANCHOR</td>
</tr>
<tr>
<td>36</td>
<td>HRC fuse for LT application</td>
<td>GE POWER CONTROL, L&amp;T, SIEMENS, BHARAT LINDER, INDO ASIAN, HAVELLS, STANDARD,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BUSSMAN, CONTROL &amp; SWITCH GEAR, ABB</td>
</tr>
<tr>
<td>37</td>
<td>Power Contactor for Crane / Mill Duty Operation</td>
<td></td>
</tr>
</tbody>
</table>

List of approved vendors

Page 3 of 3
<table>
<thead>
<tr>
<th>Page</th>
<th>Description</th>
<th>Vendors</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>Zero Speed Switch</td>
<td>Schneider -SAMWA, IFM, Rockwell Automation, Siemens, Pepperl+Fuchs, Pyrotech</td>
</tr>
<tr>
<td>69</td>
<td>Sensors / Switches * Light Barriers * Distance * Level</td>
<td>IFM, SICK, ROCKWELL AUTOMATION, PEPPERL+FUCHS, SIEMENS, Schneider, Dimetix AG</td>
</tr>
<tr>
<td>70</td>
<td>Switch Mode Power Supply</td>
<td>SIEMENS, IFM, Rockwell Automation, BHEL, Schneider, Honeywell.</td>
</tr>
<tr>
<td>71</td>
<td>Electronic flow switches for oil / air / water</td>
<td>Everly, NELCO, IFM, Schneider, SIEMENS, Krone, Endress &amp; Hauser (E&amp;H)</td>
</tr>
</tbody>
</table>

6. Panels & Panel components (Low Voltage)

<table>
<thead>
<tr>
<th>Page</th>
<th>Description</th>
<th>Vendors</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>Panel Board ( Fire Retardent Board )</td>
<td>LAMTUF PLASTIC, Hyderabad</td>
</tr>
<tr>
<td>73</td>
<td>Panel Enclosures</td>
<td>EPCC, BCH, RITTAL, TRANSRECT, ADVANCE POWER CONTROL</td>
</tr>
<tr>
<td>74</td>
<td>Terminal blocks</td>
<td>EPCC, ELMEX, PHONIX CONTACT, CONNECT WELL, ESSEN DEINKI, WAGO</td>
</tr>
<tr>
<td>75</td>
<td>Selector Switches &amp; Control Switches</td>
<td>ABB, GE POWER CONTROL, BCH, EPCC, KAYCEE, SIEMENS, TEKNIK, L&amp;T, RECOM</td>
</tr>
<tr>
<td>76</td>
<td>Control Transformers</td>
<td>AEI, UNITECH, EPI, Power &amp; Communications, TRANSRECT, ADVANCE POWER CONTROL, EEW</td>
</tr>
<tr>
<td>77</td>
<td>Mimic Panels &amp; Annuciation Panels</td>
<td>L&amp;T, ADVANI OERLIKON, GE Power Control, BHEL, BCH, TRANSRECT, MINLEC, Tirupati Electronics, ADVANCE POWER CONTROL</td>
</tr>
<tr>
<td>78</td>
<td>M.C.C ( Draw Out Type )</td>
<td>SIEMENS, BCH, L&amp;T, ANDREW YULE, SCHNEIDER ELECTRIC/ CGL, CONTROL &amp; SWITCH GEAR, ABB, ADVANCE POWER CONTROL</td>
</tr>
<tr>
<td>79</td>
<td>M.C.C ( Non Draw Out Type )</td>
<td>SIEMENS, BCH, MAHESWARI ELECT., L&amp;T / ECC, ANDREW YULE, SCHNEIDER ELECTRIC / CGL, CONTROL &amp; SWITCH GEAR, ABB, GE POWER CONTROL, TRANSRECT, ADVANCE POWER CONTROL. TRIAL PARTIES -MEDITRON, SWITCHING CKT.</td>
</tr>
<tr>
<td>80</td>
<td>Power Distribution Boards (PDB) / Roll Table Distribution Boards</td>
<td>ABB, GE POWER CONTROL, ANDREW YULE, BCH, SCHNEIDER ELECTRIC, MAHESWARI ELECT, SIEMENS, L&amp;T, TRANSRECT, HAVELLS, STANDARD, TRICOLITE, ADVANCE POWER CONTROL</td>
</tr>
</tbody>
</table>
1.0 PROJECT SYNOPSIS

1.1 Site Conditions

1.1.1 Location

Bhilai Steel Plant (BSP), SAIL is located at Bhilai in Durg District of the state of Chhatisgarh in the central region of India. The site lies between 21.15° North latitude and 81.22° East latitude. The nearest convenient railhead is Durg which is about 12km west Bhilai. Bhilai /Durg stations are on the Howarh-Mumbai rail line of SEC Railway of the Indian railways.

The location of Bhilai is as follows:

- From New Delhi, the national capital: 1359 kms
- From Kolkata: 868 kms
- From Chennai: 1269 kms
- From Mumbai: 1100 kms

The distance from State Capital Raipur to Bhilai Steel Plant is 30km. It is well connected by the rail and road network. The nearest national highways are NH 6 & NH 43 crossing through Raipur.

1.1.2 Meteorological Data

In the absence of meteorological data at Bhilai/Durg, the data of the state capital Raipur, 30kms away, are considered. The meteorological details at Raipur are given below:

**Ambient Temperature**
- Absolute maximum: 47.7° C
- Absolute minimum: 3.9° C
- Highest of mean monthly: 45.2° C

**Ambient Air**
- Ambient air quality: Industrial

**Relative Humidity**
- Maximum: 100%
- Minimum: 7%

**Climate**
- Tropical Humid

**Rainfall**
- Harvest rainfall in 24 hours: 370.3mm
- Annual Average: 1288.8mm
Wind

Predominant wind direction : SW to NE (Oct- Feb) and West to East (Mar- Sep)
Mean wind speed : 6.8 kmph
Maximum mind speed : 45 kmph

Altitude

Average altitude of the land is 300 m above MSL. Temperature inside shop premises is generally taken as 5° C above ambient, unless otherwise specified.

1.1.3 Infrastructure Facilities Outside the Plant

Railway

Bhilai Steel Plant is connected to Indian Railways network via Bhilai/Durg Stations of SEC Railway on the Howrah-Mumbai line. The track gauge of SEC Railways as well as of the plant tracks are standard broad gauge i.e. 1676 mm.

Road

The plant is well connected to the country by road. National Highways NH6 & NH43 both pass through Raipur.

Sea Port

The nearest sea port is Vishakhapatnam approximately 550 km away from the site by rail.

Air Traffic

The nearest air port connected to the national network is Mana at Raipur, 30kms away.

1.1.4 Infrastructure Facilities Inside the Plant

Railway

The track gauge for the entire plant corresponds to the Indian Railway standard broad gauge i.e. 1676 mm.

Road

Main road and side of the Plant shall have roadways of 7.0m and 4.0m width respectively and the temporary roads provided during the construction stage shall be designed to cater the needs of movement of heavy construction vehicles.
2.0 GENERAL TECHNICAL REQUIREMENTS (GTR)

2.1 General Rules and Regulations

All plant units with respect to their location, layout, general arrangement and design of equipment, structural design, etc. shall be safe to the personnel and conform to the relevant statutory requirements issued by Chhatisgarh Government and the Government of India but not limited to the following.

- Chhatisgarh State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Pollution control measures shall be provided considering the latest norms and international standards. These should satisfy the stipulations of Central Pollution Control Board and Department of Environment and the Forest, Government of India.

2.1.1 Standard

Preferred Makes of Equipment & Supplies
To restrict/minimize stock/inventory of spares, the Purchaser considering will limit the makes of equipment & supplies to those listed in the “preferred makes of equipment and supplies” unless other-wise expressly so agreed

Unit of Measurement
All dimensions & weights shall be given in metric system.

Language
All drawings, documents etc. shall be in English language.

2.2 Safety

2.2.1 Safety Regulations
The Vendor shall comply with the, relevant Safety Rules and Regulations but not limited to the following:
- Chhatisgarh State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (Unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Strict attention shall be paid to all statutory regulations and safety rules for prevention of accidents.

The safety posters/regulations for prevention of accidents shall be displayed by the Vendor at appropriate places. Notices and warning signs shall be displayed for all sources of dangers.

The Vendor is not permitted to construct any temporary road crossing on the rail tracks for the sake of their convenience at work site.

When the work is carried out at night or in the obscure day light, adequate arrangements for flood lighting in the working area shall be made by the Vendor at his own cost and got approved by the Purchaser.

All handling/transport and the rigging equipment including lifting tools and tackles shall be checked at regular intervals and kept in good and safe working condition.

A register is to be maintained regarding the results of periodical tests/checks and other particulars in respect of each and every such equipment.

The Vendor must take sufficient care in moving his construction plant and equipment from one place to another, so that those do not cause any damage to the property of the Purchaser or obstruct construction activities of other Vendors.

The Vendor shall depute a full time safety engineer who will exclusively look after all the jobs pertaining to safety at site and keep close liaison with Purchaser/Consultant. He will be responsible for maintaining safe working conditions at site, promoting safety consciousness among the workmen and reporting to concerned authorities in case of accident/dangerous occurrences.

Before execution of work in hazardous area like

- Gas contamination
- Working at height
- Storage of inflammable materials
- Danger of electric shocks
- Explosion risks
- Excavation more than 2m deep, etc.

A protocol should be prepared in association with the agencies of the Purchaser / Consultants.

2.2.2 Safety while Working with Explosives

Explosives shall not be used on the work site by the Vendor without the written permission of the Purchaser and that too only in the manner and to the extent to which it has been prescribed

Explosives shall be stored in special premises approved by Purchaser and at the cost of the Vendor who shall be liable for all damages, loss or injury to
any person or property and shall be responsible for complying with all statutory obligations in these respects.

2.2.3 Safety Appliances

The Vendor shall provide the safety appliances conforming to the relevant Indian standards to all their workmen and supervisors engaged by them as well as by the sub-contractors.

The Vendor shall ensure that all the workmen and supervisors, are using the safety appliances regularly during work at site.

Any form of compensation in lieu of safety appliances shall not be permitted. Any violation in safety provisions of failure to maintain safe working conditions will lead to serious penalty on the Contractor and finally may lead to termination on the Contract.

The workmen of the Vendor deployed for construction and erection in hazardous areas shall be provided with personnel protective safety appliances of special nature suitable for hazardous working conditions.

2.2.4 Safety during Construction/Execution

The Vendor shall be responsible for the safety of his workmen and employees. The Vendor shall ensure that safety practices are followed so as to present personal injury to his workmen and also to other persons working/passing by in that area.

The Vendor shall ensure that in case of any accidents, the same are reported without delay to the Purchaser/Statutory Authorities as per Rules. In case of any injury/accident the Vendor shall bear all the expenditure for medical treatment and shall pay the compensation in case of permanent disability or death.

The Vendor shall ensure that all personnel employed do not stray into others areas. Any injury caused due to this shall be the sole responsibility of the Contractor.

The Vendor shall ensure that skilled labour required for specific works have necessary trade certificates and adequate experience of the job. This is likely to be checked by the Purchaser. The concerned operator, mechanics, electricians, fitters, riggers, etc. must be fully conversant with the hazards associated in operation/maintenance of their relevant equipment.

2.2.5 Safer Working Platforms

- Vendor shall use strong and secured planks and boards of the right sizes.
- These planks shall be painted at the edges brightly to warn the workers for any misuse (usually zebra paint)
- Vendor shall make sure that scaffolds are erected by the trained scaffolders.
- Supervisors must inspect scaffolds once every week.

2.2.6 Falling Objects and Debris
- No loose materials which can fall down should be kept on the working platforms.
- Overhead shelters should be provided to minimize damage from tailing objects.
- Strong nets to be provided to catch these objects or debris.
- Nets must envelop all sides of the building.

2.2.7 **Personal Safety Equipment**

- Workers must wear approved safety helmets and shoes.
- For those working in high places safety belts shall be provided.
- The safety belts must be attached to strong anchorage points.

2.2.8 **Operating Construction Machine**

- Vendors shall make sure that those operating the construction machinery are well trained for their jobs.
- The keys of such machinery shall be kept with the authorized persons.
- The keys shall be removed after use of the machine.

2.2.9 **Safer Electrical Installations**

- Vendor shall use approved types of electrical sockets and plugs.
- Proper insulators for all electrical wiring shall be provided.
- Wiring should not be allowed to lie on the floor or on the ground.

2.2.10 **Safety in Designing of Equipment**

All machinery and equipment must be equipped with safety devices. The safety provisions shall conform to the recognized standards, safety codes and statues.

All safety measures as required to be adopted as per statutory regulations and the safety rules of the plant shall be strictly followed by the Vendor during the execution of the Contract.

2.3 **Drawing and Documents**

2.3.1 **Drawing**

The drafting standards adopted in preparation of drawing shall be such that good clean and legible print of the drawing can be obtained.

For preparation of original drawing guidelines contained in Indian Standard specification IS: 10164-1985 (preparation of engineering drawing and diagrams) shall be followed

<table>
<thead>
<tr>
<th>Size Code</th>
<th>Working Space (mm)</th>
<th>Cut Size (mm)</th>
<th>Uncut (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>811 X 1144</td>
<td>841 X 1189</td>
<td>880 X 1230</td>
</tr>
<tr>
<td>A1</td>
<td>564 X 796</td>
<td>594 X 841</td>
<td>625 X 880</td>
</tr>
</tbody>
</table>
However, Vendor’s standard drawings are exempted from the above limitations. It is desirable to keep the same size of all drawings for ease of filing, reference and record keeping.

All drawings shall be oriented to match the plant layout drawings and shall have a key plan identifying the plant area to which they apply.

There shall be sufficient reference notes and cross-references on the drawings to permit identification of all related drawing and documents, which are required for proper understanding.

When a drawing is revised by the Vendor/ Sub-Contractor, every change made shall be identified on the drawing by placing the revision number in a small triangle so as to be easily recognizable. In addition, a record of revisions along with the co-ordinates showing the location of revisions shall be indicated at the left hand bottom corner of the drawings as per standard practice. In case of revision of drawing, for which different number is allotted, the new drawing shall clearly indicate the number of the drawing which it supersedes.

Approval of drawings from the statutory authorities such as the Indian Boiler Inspectorate, Inspectorate of Explosives, Electrical Inspector, etc. is the responsibility of the Vendor/ Sub-Contractor.

Any additional drawings not specifically mentioned by the EPI/BSP/MECON but are required for the approval of drawings, shall be submitted by the Vendor/ Sub-Contractor.

The Title block of the drawing shall be enclosed as Annexure I.

### 2.3.2 Approval of Drawings

Approval of Vendor’s drawings will generally be accorded within four (4) weeks of receipt.

Approval of Vendor’s drawings means that these will be checked for conformity with applicable specifications and general conformity with the engineering requirement for the areas covered in the scope of work. It is understood that approval by the Purchaser’s Consultant does not include checking for drafting and other errors but only reviews of basic concepts and general principles involved.

The Vendor shall be responsible for any discrepancy, errors and omissions in the drawings have been approved by the Purchaser/Consultants or not. The Vendor shall bear all extra cost due to alterations necessitated by reasons of any discrepancies, errors or omissions in the drawings and particulars supplied by the Vendor.
Drawing furnished by the Vendor shall be certified as correct for use and shall bear the signatures of responsible persons of the Vendor.

Approval of Vendor’s drawing shall not relieve the Vendor of his responsibility to comply with the intent of the contract; manufacture/fabrication or procurement prior to approval of drawings shall be at the Vendor’s risk.

The Vendor shall submit drawing to EPI/BSP/MECON for approval by the Purchaser /Consultant as per clause 3.4 to 3.6 of GTR.

If the drawing is “Approved” then one print shall be returned back to the Vendor duly stamped “Approved” by Consultant.

If the drawing is “Not approved” or “Approved as Noted”, then one stamped print with appropriate comments shall be returned back to the Vendor for incorporation of comments and re-submission of revised drawings for approval sets with in 7 days as per clause 3.4 to 3.6 of GTR.

After approval of drawings the Vendor shall submit 12 sets of approved drawings to the EPI. The Vendor shall incorporate the following note on the drawing before “Approved by MECON vide letter no............dtd…”

The drawing shall become a contract drawing after approval and there after the Vendor shall not deviate from them in any way whatsoever except with the written permission of the EPI/BSP/MECON.

All reference and information category drawings shall be submitted in 12 sets to EPI. These drawings shall be submitted to Purchaser before forwarding the same to erection Vendor at site for constructive/erection activities.

The information category drawings shall not be approved by the Consultant. However, information category drawings shall be stamped "For Information Only" and one set shall be returned back to the Vendor.

In case any discrepancy is observed on these drawing, same shall be informed to the Vendor by marking the comments on the drawings. The Vendor shall resubmit these drawings after incorporating the comments in 12 sets to the EPI.

After receipt of stamped “For Information Only” the Vendor shall submit 10 sets of drawings to the EPI. The Vendor shall incorporate the following note on the tracing before taking additional prints for submission to the EPI.

Stamped “For Information Only” by MECON vide their letter no........ dtd.......
2. Fabrication drawing for approval of consultants.  
   6 sets  --  4 sets

3. Drawing after approval along with list of Drawings (for distribution)  
   8 sets  2 sets  4 sets

4. Information category drawings  
   8 sets  2 sets  2 sets

5. Information category drawings after stamping “For Information Only” by consultants.  
   8 sets  2 sets  2 sets

6. Erection drawings  
   8 sets  2 sets  4 sets

7. As built drawings  
   --  2 sets  2 sets

8. Spare parts drawings  
   --  2 sets  2 sets

9. Wearing parts drawings  
   --  2 sets  2 sets

**Compact Disc and Reproducibles**

1. As built drawing of approval category  
   --  1 set  1 set

2. As built drawing of information category  
   --  1 set  1 set

3. Spare parts drawings  
   --  1 set  1 set

4. Wearing parts drawings  
   --  1 set  1 set

5. All manuals  
   --  1 set  1 set

**Documents**

1. Erection manual  
   1 set  6 sets  3 sets

2. Operating and maintenance manuals  
   1 set  6 set  2 sets

3. Storage and reconservation manuals  
   1 set  6 set  2 sets

4. Safety manuals  
   1 set  6 set  3 sets

5. List of consumables  
   1 set  6 set  3 sets

6. List of lubricants and hydraulic  
   1 set  6 set  3 sets

7. List of special tools and tackles  
   1 set  6 set  3 sets

8. Test certificates and inspection certificates in bound volume  
   1 set  6 set  2 sets
Soft copy (AutoCad format) of drawings/documents shall be submitted by the successful bidder to EPI during engineering activities for approval and onward submission to client.

2.3.4 Progress Report

The Vendor shall submit a detailed PERT Network showing completion time which would indicate starting and completion dates of all activities of engineering, purchasing, procurement of materials, manufacturing, inspection, dispatch, erection, testing, and commissioning, etc. under his scope of work.

The Vendor shall submit the progress report in such details as may be required by the Purchaser so as to enable them to monitor the progress of work.

The Vendor shall submit the progress report every month in the proforma mutually discussed and agreed.

2.3.5 Coding Scheme

All drawings/documents/equipment/spare parts/shipments shall have a coded number which shall be finalized with the successful tenderer.

2.3.6 Title Block of Drawing

Shall be issued to successful bidder.

3.0 PERFORMANCE GUARANTEE

3.1 General

On completion of erection of the plant units along-with utilities and auxiliaries by respective package bidders as per approved drawings / documents as well as detailed drawings, the successful bidder shall undertake preliminary Acceptance Test (PAT) i.e. cold test, to prove that the unit has been supplied as per agreement and after erection the unit is fit to be started up and commissioned. The PAT shall be followed by commissioning (hot trials) to demonstrate that the unit is fit for commercial production.

3.1.1 Preliminary Acceptance Test (PAT)

Cold tests shall be performed on the individual sub-assemblies of the unit and shall be designed to conduct the systematic check of the components and of the functional operation thereof.

Cold tests shall comprise idle, no-load tests. Cold tests shall be conducted by the successful bidder under his sole responsibility. The employer will provide skilled operating personnel during the cold test. A detailed programme of cold tests shall be drawn up by the successful bidder and shall be subject to the approval of the employer / consultant.
Such programme may be revised and adjusted as may be required by the employer during the test run.

Results of cold tests shall be recorded jointly by the successful bidder and the employer.

On successful completion of preliminary acceptance tests, and liquidation of the defects list, preliminary acceptance certificates shall be issued by the employer.

### 3.1.2 Successful Commissioning (Hot Trials)

After issue of preliminary acceptance certificates, the successful bidder shall start-up and commission the unit in an integrated manner under his sole responsibility.

During the start-up and commissioning, the successful bidder shall perform the required adaptation, adjustment and hot run the Plant & Equipment to demonstrate its production capacity.

The employer shall, for the purpose of start-up and commissioning, provide operating personnel as may be available with him for normal operation, who shall work under the instructions and guidance of the successful bidder.

Start-up and commissioning of the unit shall be taken up only when material handling system, electrical power system, inter-plant fluid system and auxiliaries serving the unit as well as the preceding / succeeding plant units are under normal operation and / or feed material is available. The successful bidder shall rectify the defects observed during commissioning.

The quantities of starting material and facilities necessary for conducting the commissioning shall be mutually determined by the successful bidder and employer.

Commissioning of the unit shall be deemed to be successfully completed, after ten (10) days of rated material is successfully transported, for the particular circuit.

Results of start-up tests and commissioning shall be recorded jointly by the successful bidder and the employer.

On successful completion of commissioning of the unit and its commencement of commercial production as per above mentioned clause, commissioning certificate shall be issued by the employer within 15 days.

The unit shall be taken over by the employer when:

a) Commissioning certificate as per clause 08.01.02.008 has been issued by the employer.

b) The successful bidder has submitted all final documents in compliance with the provisions of this specification.
c) The successful bidder has supplied all consumables, change parts, special tools and tackles and commissioning spares.

d) The successful bidder has met, to the satisfaction of the employer, all the observation, if any, contained in the Preliminary Acceptance certificate.

### 3.1.3 Performance Guarantee Tests (PG)

After successful commissioning of the plant & equipment, the bidder shall offer the plant for conducting performance guarantee tests as mutually agreed upon between the employer and bidder.

The bidder shall supervise and carry out the operation under their instruction and guidance during performance guarantee tests and shall take full responsibility of the operation. The employer will make available necessary operating and maintenance personnel as per the agreed manning schedule as well as the raw materials, utilities and services etc, as specified.

The bidder shall submit the scope, general preconditions, test procedures and test evaluation methods which shall be finalised during tender discussion.

The performance tests for all plant equipment shall be carried out to satisfy all operating parameters as per the relevant clauses of the Technical specification for the equipment under consideration.

#### Performance Guarantee Test

<table>
<thead>
<tr>
<th>SI No</th>
<th>Description</th>
<th>Acceptable</th>
<th>Acceptable with penalty</th>
<th>Liquidated Damages</th>
<th>Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Wagon Tippler</td>
<td>20 tippling per hour</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than 20 wagons per hour</td>
</tr>
<tr>
<td>2.0</td>
<td>Yard Machines</td>
<td>As per rated capacity</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than rated capacity</td>
</tr>
<tr>
<td></td>
<td>Stacker – 1500tph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reclaimer-1500tph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Conveying capacity</td>
<td>As per rated capacity</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than rated capacity</td>
</tr>
<tr>
<td>4.0</td>
<td>Environment Norms</td>
<td>As specified in TS</td>
<td>-</td>
<td>Not applicable</td>
<td>Not achieving norms</td>
</tr>
</tbody>
</table>

The performance guarantee test shall be performed for each sub section continuously for 10 days. Continuity of operation however, be limited by availability of raw materials for unloading and stacking and availability of storing capacity on delivering end. Wherever equipment in the sub section
is of stand by nature, each such equipment shall operate for at least 10 hours on load in the period.

The performance guarantee test shall also be performed for the complete system for 5 days on round the clock basis.

In case test is disrupted due to reasons attributable to employer, the same shall be repeated two more times attending to the reasons of the employer. If the PG test is disturbed even after this, the PG test shall be on the basis of uninterrupted operation of system for 100 hours of total system, excluding the stoppages due to fault of the bidders. However, there should not be any failure of the equipment supplied by Bidder between starts and finish of this time counting. If the operation stops due to failure of any item supplied by bidder, the operating hours prior to such failure will not be counted.

In case some equipment can not be tested within the period of testing because of failure of equipment or facility provided by others, the same will be accepted on the basis of load test result for the limited period or no load test result where load test could not be performed at all.

The bidder shall prepare and submit a draft performance test procedure for each equipment and system within 12 months of order. The final performance test procedure will be prepared jointly by the employer / consulting engineers and the bidder based on the draft performance test prepared by the bidder and various requirement indicated in the contract specification and the order.

4.0 GENERAL SPECIFICATION ON QUALITY SYSTEM, INSPECTION & TEST OF PLANT & EQUIPMENT AT MANUFACTURER’S PREMISES

4.1 General

Inspection & testing of plant & equipment shall be carried out by BSP/MECON/EPI at the works of successful tenderer during manufacturing and/or on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved drawings, manufacturing drawings applicable national / international standards.

4.2 Quality System Requirements

The successful tenderer must recognise the importance of quality and follow defined quality programme in all stages of manufacturing and quality control activities of the product. Vendor / Contractor must define and implement the tasks and control that will provide needed assurance, in case manufacturing of product is sub-contracted either partly or fully and/or for the procured from vendors which are duly approved by the project authority.

BSP/MECON/EPI reserve the right to verify the quality programme of tenderer & its vendors/sub-vendors to assure the effectiveness of the programme to meet the intended and specified quality of the product.
4.3 **Quality Assurance Plan (QAP)**

4.3.1 The successful tenderer shall furnish Quality Assurance Plan (QAP) for respective equipment after completion of detailed engineering and finalisation of billing schedule / equipment identification number for Consultant’s approval at least one month prior to start of manufacturing.

4.3.2 QAP shall be prepared & furnished by Vendor / Contractor for structural & mechanical equipment, electrical equipment and refractory materials etc., QAPs must be submitted in four (4) sets duly signed and stamped by tenderer for BSP/MECON/EPI approval.

4.3.3 The successful tenderer shall indicate procurement source and furnish to BSP/MECON/EPI, during the submission of QAP, copies of P.O., Sub-P.O., T.S., approved GA drawings/ data sheets & detailed manufacturing drawings, as backup reference materials for scrutiny & final approved by BSP/MECON/EPI. The submission & subsequent approval of QAPs shall be ensured to be restricted to one round only.

4.3.4 Inspection and test requirements shall be decided with due consideration of factors like safety, duty cycle, operating conditions, equipment life, environmental conditions, place of installation and statutory regulations, as applicable, for a particular equipment. Any, additional type or special tests or routine tests if found necessary to establish the intended quality after detailed engineering then the same shall have to be incorporated in the QAP without any commercial implication.

4.3.5 Detailed QAP shall be prepared by the successful tenderer in consultation with their Sub-contractors / Manufacturers to avoid any complicacy later.

4.4 **Calibration of Measuring Equipment**

4.4.1 All the measuring equipment used for inspection & testing shall be calibrated and appropriate accuracy class of measuring equipment shall be used. Calibration standards used for calibration of measuring equipment shall be traceable to national standards of National Physical Laboratory (NPL), New Delhi with unbroken chains of comparison.

4.4.2 Valid calibration certificate for all measuring equipment used during inspection and testing at manufacturer’s works, with traceability to national standards of NPL/ NABL accredited laboratories shall be furnished prior to undertaking inspection by BSP/MECON/EPI.

   Calibration certificate shall also indicate reference no. of calibration standards calibrated by NPL/NABL accredited laboratories and copies of such calibration certificates of calibration standards shall be included in the complied dossiers of inspection/test results.

4.5 **Test Certificates and Documents**

4.5.1 For each of the items being manufactured as per approved QAP, following test certificates and documents, as applicable for each of the equipment, in requisite copies including original, duly endorsed by the Manufacturer/successful tenderer with appropriate linkage to project,
purchase order and acceptance criteria etc shall be submitted to Consultant/Purchaser.


ii) WPS, PQR & WPQ documents as per applicable code.

iii) Details of stage wise inspection & rectification records for fabricated items, castings, forgings and machined articles.

iv) Control dimension chart with records of alignment, squareness etc.

v) Manufacturer’s material and performance/ relevant test certificates for all bought-out items.

vi) Details of heart-treatment and stress relieving charts as per specification.

vii) Non-Destructive Test reports as per respective code.

viii) Static/dynamic balancing certificate for rotating components/machines.

ix) Hardness test certificate.

x) Pressure/Leakage Test Certificates.

xi) Performance Test Certificates for all characteristics.

xii) Routine / type / calibration / acceptance / special test (Type Tests etc) certificates for electrical items.

xiii) Surface preparation and painting certificates.

xiv) Certificates from competent authority for the items coming under statutory regulations.

4.5.2 Where physical and chemical test certificates of material are not available, the successful tenderer/Sub-contractor shall arrange to have specimens and test samples of the materials, tested in his own laboratory at his cost and submit the copies of test results in requisite numbers to BSP/MECON/EPI for review. Number of test samples against each heat/cast/lot or batch of materials, as applicable shall be as per relevant Indian or International Standards.

4.5.3 Where facilities for testing do not exist in the successful tenderer/Sub-contractor’s laboratories or in case of any dispute, samples and test pieces shall be drawn by the successful tenderer/Sub-contractor in presence of BSP/MECON/EPI and sealed sample shall be sent to any Govt. approved /NABL accredited laboratory for necessary tests at former’s own cost.

4.5.4 The BSP/MECON/EPI shall have the right to be present and witness all tests being carried out by the successful tenderer/Sub-contractor at their own
laboratory or approved laboratories. Also, the Inspection Agency shall reserve the right to call for confirmatory test on samples, at his discretion.

4.6 **Internal Inspection by Successful Tenderer/Manufacturer**

4.6.1 Inspection and tests shall be carried out by Contractor/Manufacturer in accordance with approved drawing, T.S., P.O., and approved QAP. They shall maintain records of each inspection and test carried out and signed documents shall be submitted to Purchaser/Consultant for verification.

4.6.2 The successful tenderer shall carry out their internal inspection & obtain clearance from statutory bodies e.g. IBR, CCE, TAC, Weights & Measures, safety, IE rules etc. prior to offering any equipment for BSP/MECON/EPI's inspection in accordance with approved QAP.

4.6.3 The successful tenderer/Manufacturers shall identify all the inspected equipment/component/raw materials & shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification/rework, rejected etc.

4.6.4 The successful tenderer shall establish and maintain procedures to ensure that the product that does not conform to specified requirements is prevented from inadvertent use or installation. The description of non-conformity that has been accepted subsequently by BSP/MECON/EPI by concession and/or of repairs, shall be recorded.

Repaiired and reworked product shall be offered for re-inspection to BSP/MECON/EPI along with records of corrective action taken.

4.7 **Manufacturing and Inspection schedule**

All Vendors/contractors shall submit the schedule for manufacturing and inspection indication equipment/components, sub-assembly/assembly. Date of approval of drawings/data sheets. Address of manufacturer with contact person and scheduled date of inspection. Such reports shall be submitted to respective Consultant Inspecting Offices with a copy to Inspection Co-ordinating Office once in a month. These monthly reports shall state the planning for next three months. Submission of first reports must commence one month prior to commencement of manufacturing activities of the product.

4.8 **Method of Undertaking Inspection & Testing by Consultant / Purchaser**

4.8.1 Inspection call shall be given only on readiness of the equipment/assembly/sub-assembly & after approval of all relevant drawings and QAP, In case equipment/assembly/sub-assembly offered for inspection are found not ready, all the cost of visit of Consultant's engineer shall have to be borne by the successful tenderer.

If the equipment/assembly/sub-assembly after inspection found not acceptable, require rework and involve Consultant's re-inspection, all the cost of such re-inspections shall also have to be borne by the successful tenderer.
4.8.2 Inspection call shall be floated to BSP/MECON/EPI, in the approved duly filled in, with ten days clear margin, enclosing all documents like test Certificates, Internal Inspection Reports, P.O., Sub-P.O., T.S., Approved QAP, approved GA drawings/ data sheets and manufacturing drawings. Inspection calls without above documents shall be treated as invalid and shall be ignored. The hard copy of such documents must also accompany a CD (comprising computer readable files) containing the identical documents.

4.8.3 The successful tenderer shall offer substantial quantities for economical inspection consistent with the size of order.

4.8.4 On receipt of the Inspection call, pertaining to particular package / equipment / item, QA & Inspection group of MECON, Ranchi (Overall co-ordinating office for Inspection activities) shall organize inspection visit or will issue Inspection assignment to other Consultant’s office (based on nearness to the vendor’s manufacturing works / relevant job expertise ). For further inspection pertaining to the same package / equipment / item, successful tenderer may forward the subsequent inspection calls to the respective Consultant’s offices (as identified per initial assignment ), with a copy to QA & Inspection Section, Ranchi.

4.9 Obligations of Successful Tenderer

4.9.1 The successful tenderer shall provide all facilities and ensure full and free access of the Inspection Engineer of BSP/MECON/EPI to their own or their Sub-Contractor’s premises at any time, during contract period, to facilitate him to carry out inspection & testing of the product during or after manufacture of the same.

4.9.2 The successful tenderer shall delegate a Representative / Co-ordinator to deal with BSP/MECON/EPI on all inspection matters. Representative of successful tenderer shall be present during all inspection at Sub-Contractor’s works.

4.9.3 The successful tenderer shall comply with instructions of BSP/MECON/EPI fully and with promptitude.

4.9.4 The successful tenderer/ Sub-Contractor shall provide all instruments, tools, necessary testing & other inspection facilities to BSP/MECON/EPI free of cost for carrying out inspection.

4.9.5 The cost of testing welds by ultrasonic, radiographic and dye penetration tests etc. in the fabrication workshop shall be borne by the successful tenderer. These tests need to be witnessed by ASNT/ISNT Level-II qualified NDT personal.

4.9.6 The successful tenderer shall ensure that the equipment/ assembly/ component of the plant and equipment required to be inspected, are not dismantled or dispatched before inspection.

4.9.7 The successful tenderer shall not offer equipment for inspection in painted condition unless otherwise agreed in writing by BSP/MECON/EPI.

4.9.8 The successful tenderer shall not offer equipment and materials once rejected by the BSP/MECON/EPI, are not re-used in the manufacture of the plant and
equipment. Where parts rejected during inspection have been rectified as per agreed procedures laid down in advance, such parts shall be segregated for separate inspection and approval, before being used in the work.

4.10 Stamping and Issue of Inspection Documents

4.10.1 Inspection Memo: For rejected items/items, which do not conform to Technical Specification in one or more quality characteristics requiring rectification/rework, Inspection Memo shall be issued indicating therein the details of observation & remarks. All the non-conformities with respect to specification of the product shall be indicated in the Inspection Memo for further quality control by successful tenderer.

4.10.2 Inspection Certificate: On satisfactory completion of final inspection & testing. All accepted plant & equipment shall be stamped suitably and Inspection Certificate shall be issued by the Consultant for the accepted items.

4.11 General Clause

4.11.1 Inspection & tests carried out by Consultant/Purchaser shall no absolve the responsibility of the successful tenderer/Manufacturer to provide acceptable product as per the terms of contract nor shall it preclude subsequent rejection.

4.11.2 Purchaser/Consultant reserve the right to inspect any product at any stage of manufacturing beyond pre-identified stages & hold points of approved QAP.

4.12 Format

Performa for inspection of all equipment shall be as per EPI / EPI's clients requirement.

5.0 PAINTING

5.1 General

5.1.1 This specification covers the materials, tools, facilities and quality requirement for surface preparation and painting of steel structures, equipment, piping, ducts, chutes, wood work etc.

5.1.2 This is only a general guideline of the painting scheme to be followed by the Tenderer. However, in case a specific painting procedure is stipulated in any tendering specification, then this general guideline shall be superseded. Any special case which may arise from time to time shall be dealt with individually on the merit of each case.

5.1.3 The term “painting” referred herein covers rust preventive, fungus/insects preventive and decorative coating along with surface protection of the following area but not limited to the areas indicated below.

   i) Structural steel works
   ii) Mechanical equipment
5.1.4 Surfaces made of asbestos, aluminum, brass, bronze, galvanized steel, stainless steel, cast iron and other corrosion resistant alloys and rubber/synthetic polymer/fiber reinforcement plastic and buried pipe work are not required to be painted unless specified except for aesthetic purposes or for identification bands, wherever relevant.

5.1.5 The complete paint system for any item includes the following basic activities:

i) Proper surface preparation
ii) Application of primer coats
iii) Application of intermediate coats
iv) Application of finished coats

All the above coats shall be of quality paint products and of approved make. The scope of work shall also include supply of all paint materials as per specification described herein.

5.1.6 If the contractor desires to adopt alternative paint system for any specific item for an improvement or equivalent to the system specified here-in or as per recommendations of paint manufacturer, may do so subject to purchaser’s approval in advance.

5.2 Surface Preparation

5.2.1 Surface preparation required for paint application, shall be such as to clean the surface thoroughly of any material which will be conducive to premature failure of the paint substrates.

5.2.2 All surfaces shall be cleaned of loose substances, and foreign materials, such as dirt, rust, scale, oil, grease, welding flux, etc. in order that the prime coat is rigidly anchored to the virgin metal surface. The surface preparation shall confirm to pictorial representation of surface quality grade of Swedish Standards Institution SIS – 055900 or equivalent standards such as SSPC – VIS – 1.67 or DIN 55928 (Part 4) or BS 4232 or IS 1477 – 1971 (Part I).

5.2.3 The acceptable surface preparation quality /grade are described under each paint system. The procedures include solvent cleaning, hard tool cleaning, power tool cleaning, blast cleaning, wood surface cleaning, flame cleaning and pickling. The will ensure surface quality as required by the specific primer paint. For ready reference surface preparation quality grade to be adopted in respect of SIS 055900 and DIN 55928 (Part – 4) is given in Annexure -01.

5.2.3.1 Solvent Cleaning

The surface shall be cleaned by wiping, immersion, spraying or vapour contacting of a suitable solvent or washing with an emulsion or alkaline solution to remove oil, grease, dirt, old paint, etc. Solvent cleaning shall not remove rust, scales, mill scales or weld flux. Therefore, before application of
paint, solvent cleaning shall be followed by other cleaning procedures as stated in subsequent clauses.

5.2.3.2 **Hand Tool Cleaning**

The surface shall be cleaned manually by vigorous wire brushing as per grade St -2 quality of Swedish Standard Institution SIS 055900 and DIN 555928. This method effectively removes loosely adherent materials, but would not affect residues of rust or mill scales that are intact are firmly adherent. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation the surface shall have a faint metallic shine. The appearance shall correspond to the prints designated St-2.

5.2.3.3 **Power Tool Cleaning**

The surface shall be cleaned by electric or pneumatic tools, such as brushes, sanding machines, disc abrasive grinder, rotary disc scaler etc, to St -3 quality. The tools shall be used carefully to prevent excessive roughening of surface and formation of ridges and burrs. This method will remove loosely adherent materials but would not affect residues of rust or mill scales that are firmly adherent and intact.

5.2.3.4 **Blast Cleaning**

The surface shall be cleaned by impingement of abrasive materials, such as graded sand at high velocity created by clean and dry compressed air blast as per the grade according to Swedish Standard Institution SIS 055900. This method will remove loosely adherent materials as well as adherent scales and mill scales. Prior to application of blast, heavy deposit of oil and grease are removed by solvent cleaning excessive surface scales are removed by hand tools or power tool cleaning. The extent of removal of adherent scales is varied, depending on the application and are defined by the surface quality grades Sa 1, Sa 2, Sa 2.5 and Sa 3 in the order of increasing cleanliness. The blast cleaning is not recommended for sheet metal work.

5.2.3.5 **Flame Cleaning**

The surface is cleaned by rapid heating by means of oxyacetylene flame to loosen the adherent scales, followed immediately by wire brushing. This method will remove loosely adherent materials as well as most of the adherent scales and mill scales. In order to minimize or prevent distortion flame cutting shall not be used on members having thickness of 6 mm and lower.

5.2.3.6 **Pickling**

In this method the surface is cleaned of mill scales, rust or rust scales by chemical reaction or electrolysis or both.

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5.3 **Paint Application**

5.3.1 **Paints**
5.3.1.1 Paint shall be applied in accordance with paint manufacturer’s recommendations. The work shall generally follow IS 1477 – 1971 (Part II) for jobs carried out in India and SSPC-PA-1 or DIN 55928 of equivalent for jobs carried out outside India.

5.3.1.2 General compatibility between primer and finishing paints shall be established by the paint manufacturer supplying the paints.

5.3.1.3 In the event of conflict between this general procedure on painting and the paint manufacturer’s specification, the same shall be immediately brought to the notice of the Purchaser. Generally in cases of such conflicts, Manufacturer’s specifications / recommendations shall prevail.

5.3.1.4 Before buying the paint in bulk, it is recommended to obtain sample of paint and establish “Control Area of Painting”. On Control Area, surface preparation and painting shall be carried out.

5.3.1.5 If required, samples of paint shall be tested in laboratories to establish quality of paint with respect to:
   (i) Viscosity
   (ii) Adhesion/Bond of paint in steel surfaces.
   (iii) Adhesion/Simulated salt spray test.
   (iv) Chemical analysis (percentage of solids by weight).
   (v) Normal wear resistance as encountered during handling & erection.
   (vi) Resistance against exposure to acid fumes, etc.

5.3.1.6 Whole quantity of paint for a particular system of paint shall be obtained from the same manufacturer.

5.3.1.7 The main Contractor shall be responsible for supply of paints and this responsibility shall not be passed on to the sub-contractor.

5.3.1.8 The painting material as delivered to the Contractor, must be in the manufacturer’s original container bearing thereon manufacturer’s name brand and description. Paint/Painting material in containers without labels or with illegible labels shall be rejected, removed from the area and shall not be used.

5.3.1.9 Thinners wherever used shall be those recommended by the paint manufacturers and shall be obtained in containers with manufacturer’s name and brand name of thinner legibly printed, failing which the thinner is liable to be rejected and shall not be used.

5.3.1.10 All paint containers shall be clearly labeled to show the paint identification, date of manufacture, batch number, special instruction, shelf life etc. The container shall be opened only at the time of use.

5.3.1.11 All paints shall be stored in accordance with the requirements of laid down procedure by the paint manufacturer.

5.3.1.12 All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments before use and during application to maintain homogeneity.
5.3.1.13 The proposed make, quality and shade of the paint shall have the approval of the client.

5.3.1.14 The colour code of the finishing paint to be followed shall be intimated to the successful Tenderer after finalisation of order. The undercoat shall have different tint to distinguish the same from the finishing coat.

5.3.1.15 The Contractor shall furnish paint manufacturer’s test report or technical data sheet pertaining to the paint selected. The data sheet shall indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash point, method of application, quality of surface preparation required, corrosion resistance properties and colour shades available.

5.3.1.16 For details of paint materials refer Annexure -02.

5.3.2 **General**

5.3.2.1 Each coat of paint shall be continuous, free of pores and of even film thickness without thin spots.

5.3.2.2 Each coat of paint shall be sufficiently dry before application of next coat.

5.3.2.3 Paint shall be applied at manufacturer’s recommended rates. The number of coats shall be such that the minimum dry film thickness specified is achieved. The dry film thickness of painted surfaces shall be checked with ELCOMETER of measuring gauges to ensure application of specified DFT.

5.3.2.4 Zinc rich primer paints which have been exposed several months before finishing coat is applied shall be washed down thoroughly to remove soluble zinc salt deposits.

5.3.2.5 The machine finished surfaces shall be coated with white lead and tallow before shipment or before being put out into the open air.

5.3.2.6 Areas which become inaccessible after assemble shall be painted before assembly (after obtaining painting clearance from the inspecting authority) after requisite surface cleaning as specified.

5.3.2.7 Paint shall not be applied when the ambient temperature is 5 deg C and below or 45 deg C and above. Also paint shall not be applied in rain, wind, fog or at relative humidity of 80% and above unless the manufacturer’s recommendations permit. Applications of paint shall be only be spraying or brushing as per IS 486 – 1983 and IS 487 -1985.

5.3.2.8 Primer paint shall be applied not later than 2 -3 hours after preparation of surface, unless specified otherwise.

5.3.2.9 Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of the required thickness.

5.3.2.10 Surfaces which cannot be painted but require protection shall be given a coat of rust inhibitive grease according to IS 958 – 1975 or solvent deposited compound according to IS 1153 – 1975 or IS 1674 – 1960.
5.3.2.11 Surfaces in contact during shop assembly shall not be painted. Surfaces which will be inaccessible after assembly shall receive minimum two coats of specified primer.

5.3.2.12 Surfaces to be in contact with wood, brick or other masonry shall be given one shop-coat of the specified primer.

5.3.3 **Site/Field Painting**

5.3.3.1 Wherever shop primer painting is scratched, abraded or damaged, the surface shall be thoroughly cleaned using emery paper and power driven wire brush wherever warranted, and touched up with corresponding primer. Touching up paint shall be matched and blended to eliminate conspicuous marks.

5.3.3.2 If more than 50% of the painted surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats shall be applied followed by intermediate and finishing coats as per painting specification.

5.3.3.3 All field welded areas on shop painted items shall be mechanically cleaned (including the weld area proper, adjacent areas contaminated by weld spatter or fumes and areas where existing primer paint is burnt). Subsequently, new primer and finishing coats of paint shall be applied as per painting specification.

5.3.3.4 The first coat of finish paint at site shall be applied preferable within three months of the shop paint.

5.3.4 **Structural**

5.3.4.1 All fabricated steel structure, fabricated steel pipes, etc. shall have a minimum of two coats of primer paint before dispatch to site.

5.3.4.2 Parts of steel structures embedded in concrete shall be given a protective coat of Portland cement slurry immediately after fabrication and after surfaces of this part is thoroughly cleaned from grease, rust mill scales, etc. No paint shall be applied on this part.

5.3.4.3 All structures shall receive appropriate number of primer and finishing coats in order to achieve overall DFT as per design drawings/specification.

5.3.5 **Hot Surfaces**

5.3.5.1 Total DFT for heat resistant paints should no exceed 100 – 120 microns, otherwise flaking occurs (as per paint manufacturer's recommendations).

5.3.5.2 Heat resistant paints should be applied by brush.

5.3.5.3 Primer coat should not be applied on the surfaces having temperature condition more that 120 deg C.
5.4 **Painting Schemes**

For a complete painting scheme of any item being printed, all types of paints are to be procured from the same manufacturer as approved by the purchaser.

5.4.1 **Legend**

- **SP** - Surface preparation quality as per SIS standard
- **2P1** - Two (2) coats of Primer paint type P1
- **1I1** - One (1) coats of Intermediate paint type I1
- **2F1** - Two (2) coats of Finish paint type F1
- **DFT** - Dry Film Thickness in microns developed
- **CRT** - Clean and Retouch

Type of paint products like P1 to P9, I1 to 14 and F1 to F10 have been specified under Annexure-02.

5.4.2 The painting scheme to be followed for various structure/equipment exposed to different condition is briefly given in Annexure-03 for guidance to the tenderer.

5.4.3 The colour code for different applications are indicated in Annexure-04. Wherever colour codes are not specified, the same is to be mutually agreed between the Purchaser and Contractor.

5.5 **Guarantee**

5.5.1 The Contractor shall guarantee that the physical and chemical properties of the paint materials conform with the specification of paint products.

5.5.2 The Contractor shall submit internal test reports from paint manufacturers regarding the quality of paint whenever asked by the BSP/MECON/EPI.

5.5.3 Guarantee period shall commence from the date of completion of finishing coat of paint. The guarantee period will be indicated depending on the type of surface preparation and system of painting. To fulfill this obligations the Contractor may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.
## Surface Preparation Grade

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Surface Preparation</th>
<th>Swedish Std SIS 055900</th>
<th>DIN Std. Din 55928 (Part 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blast cleaning to white metal: Removal of all visible rusts, mill-scales, paint and foreign matters.</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>2</td>
<td>Blast cleaning to near white metal: 95% of any section of surface area is free from all rusts, mill-scales and visible residues.</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
</tr>
<tr>
<td>3</td>
<td>Blast cleaning to commercial quality: At least 2/3 of any section of the surface area is free from all rusts, mill-scales and visible residues.</td>
<td>Sa 2</td>
<td>Sa 2</td>
</tr>
<tr>
<td>4</td>
<td>Brush-off blast cleaning: Removal of all loose mill-scales, rust and foreign matters etc.</td>
<td>Sa 1</td>
<td>Sa 1</td>
</tr>
<tr>
<td>5</td>
<td>Power tool cleaning: Very thorough scrapping and wire brushing to remove loose mill-scale, rust and foreign matters to have pronounced metallic shine.</td>
<td>St 3</td>
<td>St 3</td>
</tr>
<tr>
<td>6</td>
<td>Hand tool cleaning: Removal by hand brushing of loose mill-scale, loose rust and foreign matters.</td>
<td>St 2</td>
<td>St 2</td>
</tr>
</tbody>
</table>
PAINT MATERIALS

01. PRIMER PAINTS (P)

Primer paint products shall be applied only on dry and clean surfaces.

01.01 Primer Paint – P1 (Phenolic – Alkyd Based)

A single pack air drying phenolic modified alkyd composition with zinc phosphate as a primer paint conforming generally to IS : 2074.

- Air drying time: About 60 minutes (touch dry)  
  Overnight (hard dry)
- Dry film thickness (DFT)/ Coat: 40 microns (min)
- Temperature resistance: Upto 100°C dry heat

01.02 Primer Paint – P2 (Chlororubber Based)

A single pack air drying high build chlorinated rubber based zinc phosphate primer.

- Percent chlororubber: 20 to 22 (% Chlorine above 65% in Chlororubber)
- Air drying time: About 15 minutes (touch dry)  
  Overnight (hard dry)
- DFT/ Coat: 50 microns (min)
- Temperature resistance: Up to 65°C dry heat

01.03 Primer Paint – P3 (PVC Copolymer Alkyd Based)

Polyvinyl chloride (PVC) - Alkyd zinc phosphate – redioxide Based primer

- Ratio: PVC copolymer + alkyd reisn (1.1)
- Pigments: Zinc phosphate & Fillers
- Air drying time: 24 hours
- DFT/Coat: 80 microns
- Temperature: Upto 80°C dry heat

01.04 Primer Paint – P4 (Epoxy Based)
A two pack air drying Epoxy polyamide resin based red oxide – zinc phosphate primer.

Epoxy content (% wt.) - 15 to 18
Air drying time - About 30 minutes (touch dry)
- overnight (hard dry)
DFT/Coat - 30 microns (min)
Temperature resistance - Upto 120°C dry heat

01.05 **Primer Paint – P5 (Epoxy Based)**

A two pack air drying Epoxy polyamide with zinc dust of at least 92% zinc dust on the dry film

Epoxy content (% wt.) - 8 to 10
Air drying time - Less than 10 minutes (touch dry)
- Less than 2 hours (hard dry)
DFT/Coat - 40 microns (min)
Temperature - Upto 300°C dry heat

01.06 **Primer Paint – P6 (Poly – Vinyl Butyral Resin Based)**

A two pack air drying polyvinyl butyral resin based wash primer with rust inhibitive pigments.

Air drying time - 5 to 7 minutes (touch dry)
- 2 hours (hard dry)
DFT/Coat - 8 microns
Temperature resistance - Upto 65°C dry heat
Application for - Galvanised iron, aluminium, light alloys etc. on which the adhesion of conventional paints are poor.

01.07 **Primer Paint – P7 (Ethyl Zinc Silicate, EZS Based)**

A two pack heavy duty zinc dust rich silicate primer which protects the surface with just a single coat.

Total solids (3 wt) - 84 +/- 2
Density (g / cc) - 3. 07 +/- 0.05
Air drying time - To top coat 16 hours
DFT / Coat - 60 microns
Temperature resistance - Upto 450 deg C dry heat
01.08 **Primer Paint – P8 (high Build Coal Tar Epoxy)**

A two pack cold cured H. B. epoxy coal tar coating – no primer is required.

Mixing ratio - Base: Hardener (4:1 by vol.)
Air drying time - 48 hours (hard dry)
DFT / Coat - 100 microns

01.09 **Wood Varnish – P9**

Treated oil based primer pigmented with suitable pigments:

Air drying time - 16 hours for application of top coat.
Coverage - 10 to 14 sq. m/litre

02. **INTERMEDIATE PAINTS (I)**

These paints shall be applied over primer coats as an intermediate layer to provide weather proof seal of primer coats.

02.01 **Intermediate Paint-II (Phenolic alkyd based)**

A single pack high build phenolic based paint with micaceous iron oxide (M 10).

Air Drying Time - 4 to 6 hours (touch dry)
2 days (hard dry)
DFT / Coat - 75 microns (min)
Temperature resistance - Upto 100 deg C dry heat
Compatible with - Primer P1

02.02 **Intermediate Paint -12 (Chlororubber based)**

A single pack air drying high build chloro based paint with MIO.

Air Drying Time - 15 minutes (touch dry)
- 24 hours (hard dry)
DFT/Coat - 70 microns (min)
Temperature resistance - Upto 65 deg C dry heat
Compatible with - Primer P2, P3 & P4

02.03 **Intermediate Paint -13 (PVC – Alkyd Based)**

PVC Coploymer - Resin 1 : 1
Pigments - Micaceous iron oxide (MIO)
DFT/Coat - 80 microns
Temperature resistance - Upto 80 deg C dry heat
Compatible with - Primer P2 & P3

02.04 **Intermediate Paint -14**

A two pack air drying high build epoxy resin based paint with MIO.
Air drying time - 6 to 8 hours (touch dry) 
- 7 days (full cure)
DFT / Coat - 100 microns
Temperature - Up to 180°C dry heat
Compatible with - Primer P4 & P5

03. **FINISH PAINTS (F)**

Finish paint costs shall be applied over primer coats and intermediate coats after proper cleaning and touch up of primed surface.

03.01 **Finish Paint – F1**

A single pack air drying high gloss phenolic alkyd modified synthetic enamel paint suitably pigmented.

Air drying time - 3 to 4 hours (touch dry) 
- 24 hours (hard dry)
DFT/Coat - 25 microns (min)
Temperature - Upto 100°C dry heat
Compatible with - Primer P1
Intermediate I1
Colour - Generally all shades

03.02 **Finish Paint – F2**

A single pack air drying polyurethane enamel of high gloss and hard finish suitably pigmented.

Air drying time - 2 to 2 ½ hours (touch dry) 
- 6 hours (hard dry)
DFT/Coat - 30 microns (min)
Temperature resistance - Upto 100°C dry heat
Compatible with - Primer P1 & P8 and Intermediate I1
Colour - Generally all shades

03.03 **Finish Paint – F3**

A two pack air drying bituminous aluminum paint.

Air drying time - 1 to 2 hours (touch dry) 
- 21 hours (hard dry)
DFT/Coat - 25 microns (min)
Temperature resistance - Upto 100°C dry heat
Compatible with - Primer P1 and Intermediate I1
Colour - Bright metallic

03.04 **Finish Paint – F4**
A ready mixed oil –alkyd based synthetic enamel paint of high gloss and hard wearing properties.

Air drying time - 6 to 8 hours
Coverage - 14 to 16 Sq. m/litre
Temperature resistance - Upto 60°C dry heat
Compatible with - P8
Colour - Generally all shades

03.05 **Finish Paint – F5**
A single pack air drying plasticized chlororubber paint suitably pigmented.

Air drying time - 30 minutes (touch dry)
- 24 hours (hard dry)
DFT/Coat - 35 microns (min)
Temperature resistance - Primer 65°C dry heat
Compatible with - Primer P2 & P3, Intermediate I2 & I3
Colour - Nearly all shades except few.

03.06 **Finish Paint – F6**
A PVC - Copolymer alkyd based enamel.

Density - 1.17 ± 0.05
Total solids (1 wt) - 55 ± 2
DFT/Coat - 40 microns
Compatible with - P2 and P3

03.07 **Finish Paint – F7**
A two pack air drying epoxy polyamide enamel suitably pigmented.

Air drying time - 2 to 3 hours (touch dry)
- 7 days (full cure)
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<tbody>
<tr>
<td><strong>DFT/Coat</strong></td>
<td>- 40 microns (min)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature resistance</strong></td>
<td>- Up to 130°C dry heat</td>
<td></td>
</tr>
<tr>
<td><strong>Compatible with</strong></td>
<td>- Primer P4 &amp; P5, Intermediate 14</td>
<td></td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>- Generally all shades.</td>
<td></td>
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</tbody>
</table>

**03.08 Finish Paint – F8**

A single pack synthetic rubber based aluminum paint.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Air drying time</strong></td>
<td>- 2 hours (touch dry)</td>
<td></td>
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<tr>
<td></td>
<td>- 24 hours (hard dry)</td>
<td></td>
</tr>
<tr>
<td><strong>DFT/Coat</strong></td>
<td>- 25 microns (min)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature resistance</strong></td>
<td>- Upto 200°C dry heat</td>
<td></td>
</tr>
<tr>
<td><strong>Compatible with</strong></td>
<td>- No Primer paint except primer P6 is applicable in case of non-ferrous substrate.</td>
<td></td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>- Smooth aluminium.</td>
<td></td>
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# PAINTING SCHEME

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme At Shop</th>
<th>Painting Scheme At Site</th>
<th>Total DFT</th>
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<tbody>
<tr>
<td>1.0</td>
<td><strong>Steel Structures</strong> <em>(Temp. not exceeding 80°C)</em></td>
<td></td>
<td></td>
<td>(Refer Note-1)</td>
</tr>
<tr>
<td>1.1</td>
<td>Technological steel structures for plant and equipment</td>
<td>SP – Sa 2.5 2P1</td>
<td>CRT 2F1</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>Indoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outdoor</td>
<td>SP – Sa 2.5 2P1</td>
<td>CRT 2F1</td>
<td>205</td>
</tr>
<tr>
<td>1.2</td>
<td>Fabricated steel structures at site for rung ladders, cat-ladders, gates, rolling shutters, etc. <em>(Springs/rubbing surfaces excluded)</em></td>
<td>SP – St-2 and / Or St-3 2P1</td>
<td>CRT 2F1</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>- Indoor / Outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Walkways, stairs, platforms etc. which are of wearing surface</td>
<td>SP – St-2 and / Or St-3 2P1</td>
<td>CRT 2F1</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP-St2 and / Or St-3 2P1</td>
<td>CRT 2F1</td>
<td>205</td>
</tr>
<tr>
<td>1.4</td>
<td>Steel doors and windows</td>
<td>SP-St-2 and / Or St-3 2P1</td>
<td>CRT 2F2</td>
<td>215</td>
</tr>
<tr>
<td></td>
<td>- Indoor / outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Painting Scheme</td>
<td>Total DFT</td>
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<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------</td>
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<tr>
<td></td>
<td></td>
<td>At Shop</td>
<td>At Site</td>
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</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>2.0</td>
<td><strong>MECHANICAL EQUIPMENT</strong></td>
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<tr>
<td>2.1</td>
<td>Mechanical equipment (Temp. not exceeding 80°C)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.1.1</td>
<td>Static equipment like storage tanks, vessels, bins, bunkers, heat exchangers,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>coolers, Cyclones, scrubbers, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>SP –Sa 2.5</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P2/2P3</td>
<td>2F5/2F6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP –Sa 2.5</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P2/2P3+1/2 / 1/3</td>
<td>2F5/2F6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>170/240</td>
<td></td>
</tr>
<tr>
<td>2.1.2</td>
<td>Rotary/moving equipment and machineries like crushers, mills, vibratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>screens, bin activators, blowers, fan, air/gas compressors, pumps, gear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>boxes, machine housings etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>SP –Sa 2.5</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P3/2P4</td>
<td>2F6/2F7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP –Sa 2.5</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P3+1/3 / 1/4</td>
<td>2F6/2F7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>240/140</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td><strong>Pipe / Duct work (Overground)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Non – insulated (temperature up to 80°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>SP –St2 and</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or St3 2P1</td>
<td>2F1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP –St2 and/ or</td>
<td>CRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>St3 2P1 + 111</td>
<td>2F1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>Insulated (hot)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor / Outdoor</td>
<td>SP – St2 and/ or</td>
<td>Remove</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>St3 1P1</td>
<td>paint and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>insulate</td>
<td></td>
</tr>
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</table>
### 4.0 **Oxygen Plant**

<table>
<thead>
<tr>
<th>4.1 Outdoor steel structures</th>
<th>SP – St2 and/or St3 2P1 + 1I1</th>
<th>CRT 2F3</th>
<th>205</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2 Rotary equipment like air compressors</td>
<td>Sa 2.5 2P4</td>
<td>CRT 2F7</td>
<td>140</td>
</tr>
</tbody>
</table>

#### 5.0 **Others**

| 5.1 Standard mobile equipment like chasis of trucks, dumpers, crawler cranes bulldozers, Railway rakes, chasis of slag cars, ladle cars, etc. | As per manufacturer’s standards |
| 5.2 Laboratory equipment like ovens, screens, magnetic stirrers, samplers, etc. | Stove enamelling | CRT | 110 |
| 5.3 Steel structures partly immersed in water | SP – Sa 2.5 2P8 | CRT | 200 |

**Notes:-**

1. Painting scheme of all fabricated steel structures, fabricated pipe work, building structures, conveyor galleries, pipe trestles etc. is indicated in the Technical Specification of steel structures.

2. **Primer Paint**

   Primer coat shall be suitable for intended temperature applications as per manufacturer’s recommendation. The primer selection shall be generally in line with the specification laid down in Annexure -02.

3. **Finish Paint**

   In case of Aluminiums cladding final painting will not be required.
COLOUR CODE

The colour codes are mentioned for all the items including pipe work. Shades of finish coat of paint applied over respective item indicated below are tentative and subject to alteration as per Purchaser’s request or due to compatible paint system adopted. The service for which colour code/bands are not specified are to be mutually agreed for by the Purchaser & the Contractor.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items Painted</th>
<th>Colour</th>
<th>Colour No. of IS:5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Structures</td>
<td>Aircraft grey</td>
<td>693</td>
</tr>
<tr>
<td></td>
<td>Building frames including bracings, side</td>
<td>Azure blue</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Crane girders</td>
<td>Post office red</td>
<td>538</td>
</tr>
<tr>
<td></td>
<td>Crane stops</td>
<td>Black bituminous</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Gutter</td>
<td>Signal red</td>
<td>537</td>
</tr>
<tr>
<td></td>
<td>Fire escape platforms ladders, etc.</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>General hand railing, top runners</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>Rung ladders</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>All members blocking passages for movement</td>
<td>Lemon yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trestles, towers and pipe bridges</td>
<td>Dark admiralty grey</td>
<td>632</td>
</tr>
<tr>
<td></td>
<td>Conveyor gallery structures</td>
<td>Aircraft grey</td>
<td>693</td>
</tr>
<tr>
<td></td>
<td>Steel chimneys</td>
<td>Aluminium</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Equipment and Machinery</td>
<td>Light grey</td>
<td>631</td>
</tr>
<tr>
<td></td>
<td>General indoor equipment</td>
<td>Dark admiralty</td>
<td>632</td>
</tr>
<tr>
<td></td>
<td>General outdoor equipment</td>
<td>Base : Lemon yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crane bridges, trolleys, hooks etc. and other mobile equipment</td>
<td>Stripes : Black (100 mm wide)</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>Furnaces</td>
<td>Aluminium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tanks</td>
<td>Base : Same as for general equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire-fighting equipment</td>
<td>Signal red</td>
<td>537</td>
</tr>
</tbody>
</table>

3. **Pipe work**

Colours shall be as given below. The base colour shall be applied throughout entire length except on surfaces of materials such as asbestos, aluminium, brass, bronze, galvanized steel, stainless steel and other corrosion resistant alloys and rubber / synthetic polymers. In such cases identification colour bands of at least 500mm width shall be provided near each branch, valve and at distances not exceeding 10m either as local colour coatings or coloured adhesive type of suitable material or label attached to the pipe work. Additional identification bands superimposed over the base colour shall be provided near each branch, valve and at distance not exceeding 10m. The bands shall be atleast 25mm wide except in case of double bands where the first band shall be about 100mm wide. Direction of flow shall be clearly marked on the pipelines at intervals not exceeding 10m and all branches and change of directions.
<table>
<thead>
<tr>
<th>Service</th>
<th>Colour</th>
<th>Colour No. of IS:5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea or river water (untreated)</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band - White</td>
<td></td>
</tr>
<tr>
<td>Cooling water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band - White</td>
<td>166</td>
</tr>
<tr>
<td>Boiler feed water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td>Condensate</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – Light brown</td>
<td>410</td>
</tr>
<tr>
<td>Drinking water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>First band - French blue</td>
<td>166</td>
</tr>
<tr>
<td></td>
<td>Second band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Industrial water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td>Compressed air</td>
<td>Base – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td>Instrument air</td>
<td>Base – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Band – Light brown</td>
<td>410</td>
</tr>
<tr>
<td>Drainage</td>
<td>Base – Black</td>
<td>-</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>Base – Light brown</td>
<td>410</td>
</tr>
<tr>
<td></td>
<td>Band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Coke oven/BF gas/other fuel gases</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Argon</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – French blue</td>
<td>166</td>
</tr>
<tr>
<td>Acetylene</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – Dark violet</td>
<td>796</td>
</tr>
<tr>
<td>LP Gas (LPG)</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>First band – Signal read</td>
<td>537</td>
</tr>
<tr>
<td></td>
<td>Second band – Traffic green</td>
<td>267</td>
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<tr>
<td>Nitrogen</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – Black</td>
<td>-</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – White</td>
<td>-</td>
</tr>
<tr>
<td>Non-acidic slurries</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – White</td>
<td>-</td>
</tr>
<tr>
<td>Fire-fighting system</td>
<td>Base – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Rain water down pipes</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td>Duct work</td>
<td>Base – Aluminium</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** For these services, hazard marking as per fig. 4C of IS: 2379 shall also be provided.

### 6.0 LIST OF APPROVED MAKES

Approved makes for all the items to be supplied shall be as per BSP / MECON’s list, which is enclosed / attached.

Please Refer:
1. Preferred makes (Chapter – 13 of GTS of BSP)
TENDER DOCUMENT

NIT No DLI/C&E/WI-665/538R

FOR

Tender for Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of 105 Nos. Lighting Poles & Associated Works” for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part– B (Package- 061) at Bhilai Steel Plant (SAIL)”.

VOLUME- 2 B

(TECHNICAL SPECIFICATION)

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7,
Lodhi Road, New Delhi-110003
TEL NO: 011-24361666  FAX NO. 011- 24363426
Contents

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Scope Of Work (Lighting Pole)</td>
</tr>
<tr>
<td>(ii)</td>
<td>Painting</td>
</tr>
<tr>
<td>(iii)</td>
<td>Drawings</td>
</tr>
</tbody>
</table>
Scope of Work
For lighting poles & associated works

Scope of work for lighting poles & accessories shall include (but not limited to): Design, Engineering, Manufacturing, Inspection / Testing at works & Supply of 105 Nos. of 9M height Lighting Poles & Associated Works for the project of "Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)".

- The supply of lighting poles including MCB JB Terminal Box (Loop & Loop Out type), and other materials required for testing of the same conform to the codes of Bureau of Indian Standards and other applicable International standards. In case of any contradiction, the requirements of this specification shall include:
  (a) Supply of lighting poles Structure including MCB JB Terminal Box
  (b) Supply of 50 mm GI Pipe for incoming & outgoing cable imbedded along with the pole foundation / muff.
  (c) Control JB shall have sufficient space for termination of at least two cables of minimum size of 4C X 16 Sq.mm

- Supply of lighting poles complete in all respects including all the components, accessories required to make suitable for operation/testing.

- The scope of bidder shall be deemed to include all such items which although are not specifically mentioned in the specifications but needed to make system complete in all respect with all mountings, fittings and standard accessories etc. as required.

- Lighting poles shall be manufactured as mentioned in price schedule.
- GTS is to be referred for designing of equipment. In addition to this, following points will be considered.

- All Lighting poles shall be provided with earthing points at two places.

  The design of equipment or any components / accessories used shall be or selected as per supply voltage mentioned in the GTS.

- This specification defines the requirements for supply (Inclusive of control MCB JB) of lighting poles, testing.

- Supply of Lighting poles complete in all respects with all the components, accessories required as per following details:-

  The lighting poles will be 09 meter's high and designed confirming to 410-SP-29

  Pole Construction

  The lighting poles will be fabricated from GI of specified section with joints swag together when hot and beveled on outside edge along with weatherproof sheet steel junction box(JB) at the bottom of the pole along with the suitable rating of MCB, Neutral Link, Bolted type terminal, grounded stud etc.

  Vendor has to deliver lighting poles at site in good condition, No site welding or bolted joints will be accepted. Earthing terminal will be provided on the lighting poles base as per relevant IS.

  All lighting performances will be checked holding the lux meter in horizontal plane at ground level.

- Bidder has to submit Basic engineering, detailed engineering and reference category of drawings, operating software and documents in requisite copies for approval of BSP / MECON. Further the successful bidder will furnish final basic & detailed engineering drawings, manufacturing drawings
Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of 105 Nos. Lighting Poles & Associated Works

- of fast wearing items and non-standard items, as built drawings, erection drawings/documents, operating software, operation and maintenance manuals in soft editable format.
- Getting BSP/MECON approval of the drawings, documents and calculation to be submitted by the successful bidder.
- Supply of all commissioning & start-up spares, special tools & tackles and insurance spares. A list of such commissioning & start-up spares and insurance spares shall be indicated separately in the offer. Bidder shall furnish separately priced list for two years O&M spares.
- Providing all drawings and documents with operation & maintenance manuals.

Bidders are required to quote the prices as per price bid only in original. In addition to prices as per price schedule for SUPPLY, TESTING, RECOMMENDED SPARE (OPTIONAL NOT TO BE CONSIDERED FOR BID EVALUATION). The rate quoted by the bidder remain same if any Addition/Deletion in quantity is required for LIGHTING POLES (included control/module JB) as per schedule enclosed in the price bid. These rates will be applied during any changes occurring at detail engineering stage.

**Drawings/Documents Submission**

**Documents/Information to be submitted by bidder with offer:**

- List of commissioning spares and start up spares.
- List of special tools and tackles if required.
- Price schedule for supply & installation, calibration, testing and commissioning work as per the format.
- List of recommended spare parts for 2 (Two) years trouble free operation and maintenance as per the format.
- Technical specifications, Catalogues/Leaflets and O&M manuals
- Reference list of customers for similar supply of items.
- Unpriced copy of price schedules (with technical bid).
- No deviation declaration to NIT technical and commercial terms and conditions and duly signed with date and stamped copy of NIT Vol-1, Vol-2 (2A, 2B), Vol-3 & Vol-4.
- Approximate weight of the equipment.

**Documents/Information to be submitted by successful bidder for Approval/Reference**

- Mounting arrangement Drawings
- Bill of materials
- Technical specifications
- Wiring Diagram and termination drawings.
- Technical data sheet of all components, cables; electronic devices etc. for lighting poles
- Total power consumption details
- Approximate weight of the equipment
- Internal test reports and certificates
- Accuracy/Performance check reports
- Test reports for degree of protection on enclosure of sensing element.
- Quality assurance for the Lighting poles & other related components.
- Operation and maintenance manuals
- Other drawings/documents as per BSP/MECON requirement for the system and drgs as per the recommendation of manufacturer & exclusion if any.
PAINTING

(CHAPTER-09)
GENERAL SPECIFICATION
FOR
PAINTING
(GS – 09)
## CONTENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>GENERAL</td>
<td>1</td>
</tr>
<tr>
<td>02</td>
<td>SURFACE PREPARATION</td>
<td>1</td>
</tr>
<tr>
<td>03</td>
<td>PAINT APPLICATION</td>
<td>3</td>
</tr>
<tr>
<td>04</td>
<td>PAINTING SCHEMES</td>
<td>6</td>
</tr>
<tr>
<td>05</td>
<td>GUARANTEE</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>ANNEXURE-01 – SURFACE PREPARATION GRADE</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>ANNEXURE-02 – PAINT MATERIALS</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>ANNEXURE-03 – PAINTING SCHEME</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>ANNEXURE-04 – COLOUR CODE</td>
<td>18</td>
</tr>
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</table>
01  GENERAL

01.01  This specification covers the materials, tools, facilities and quality requirement for surface preparation and painting of steel structures, equipment, piping, ducts, chutes, wood work etc.

01.02  This is only a general guideline of the painting scheme to be followed by the Tenderer. However, in case a specific painting procedure is stipulated in any tendering specification, then this general guideline shall be superceded. Any special case which may arise from time to time shall be dealt with individually on the merit of each case.

01.03  The term “painting” referred herein covers rust preventive, fungus/insects preventive and decorative coating along with surface protection of the following area but not limited to the areas indicated below.

   i) Structural steel works
   ii) Mechanical equipment
   iii) Electrical equipment
   iv) Instrumentation and control equipment.
   v) Pipe work
   vi) Oxygen plant, etc.

01.04  Surfaces made of asbestos, aluminum, brass, bronze, galvanized steel, stainless steel, cast iron and other corrosion resistant alloys and rubber/synthetic polymer/fiber reinforcement/plastic and buried pipework are not required to be painted unless specified except for aesthetic purposes or for identification bands, wherever relevant.

01.05  The complete paint system for any item includes the following basic activities:

   i) Proper surface preparation
   ii) Application of primer coats
   iii) Application of intermediate coats
   iv) Application of finished coats

All the above coats shall be of quality paint products and of approved make. The scope of work shall also include supply of all paint materials as per specification described herein.

01.06  If the contractor desires to adopt alternative paint system for any specific item for an improvement or equivalent to the systems specified herein or as per recommendations of paint manufacturer, may do so subject to purchaser’s approval in advance.

02  SURFACE PREPARATION

02.01  Surface preparation required for paint application, shall be such as to clean the surface thoroughly of any material which will be conducive to premature failure of the paint substrates.
All surfaces shall be cleaned of loose substances, and foreign materials, such as dirt, rust, scale, oil, grease, welding flux, etc. in order that the prime coat is rigidly anchored to the virgin metal surface. The surface preparation shall confirm to pictorial representation of surface quality grade of Swedish Standards Institution SIS – 055900 or equivalent standards such as SSPC – VIS – 1.67 or DIN 55928(Part 4) or BS 4232 or IS 1477 – 1971 (Part I)

The acceptable surface preparation quality / grade are described under each paint system. The procedures include solvent cleaning, hand tool cleaning, power tool cleaning, blast cleaning, wood surface cleaning, flame cleaning and pickling. This will ensure surface quality as required by the specific primer paint. For ready reference surface preparation quality grade to be adopted in respect of SIS 055900 and DIN 55928 (part-4) is given in Annexure-01.

**Solvent Cleaning**

The surface shall be cleaned by wiping, immersion, spraying or vapor contacting of a suitable solvent or washing with an emulsion or alkaline solution to remove oil, grease, dirt, old paint, etc. Solvent cleaning shall not remove rust, scales, mill scales or weld flux. Therefore, before application of paint, solvent cleaning shall be followed by other cleaning procedures as stated in subsequent clauses.

**Hand Tool Cleaning**

The surface shall be cleaned manually by vigorous wire brushing as per grade St-2 quality of Swedish Standards Institution SIS 055900 and DIN 55928. This method effectively removes loosely adherent materials, but would not affect residues of rust or mill scales that are intact are firmly adherent. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation the surface shall have a faint metallic shine. The appearance shall correspond to the prints designated St – 2.

**Power Tool Cleaning**

The surface shall be cleaned by electric or pneumatic tools, such as brushes, sanding machines, disc abrasive grinder, rotatory disc scaler etc. to St-3 quality. The tools shall be used carefully to prevent excessive roughening of surface and formation of ridges and burrs. This method will remove loosely adherent materials but would not affect residues of rust or mill scales that are firmly adherent and intact.

**Blast Cleaning**

The surface shall be cleaned by impingement of abrasive materials, such as graded sand at high velocity created by clean and dry compressed air blast as per the grade according to Swedish Standard Institution SIS 055900. This method will remove loosely adherent materials as well as adherent scales and mill scales. Prior to application of blast, heavy deposit of oil and grease are removed by solvent cleaning excessive
surface scales are removed by hand tools or power tool cleaning. The extent of removal of adherent scales is varied, depending on the application and are defined by the surface quality grades Sa1, Sa2, Sa2.5 and Sa3 in the order of increasing cleanliness. The blast cleaning is not recommended for sheet metal work.

02.03.05

**Flame Cleaning**

The surface is cleaned by rapid heating by means of oxyacetylene flame to loosen the adherent scales, followed immediately by wire brushing. This method will remove loosely adherent materials as well as most of the adherent scales and mill scales. In order to minimize or prevent distortion flame cuttings shall not be used on members having thickness of 6 mm and lower.

02.03.06

**Pickling**

In this method the surface is cleaned of mill scales, rust or rust scales by chemical reaction or electrolysis or both.

03.

**PAINT APPLICATION**

03.01

**Paints**

03.01.01

Paint shall be applied in accordance with paint manufacturer's recommendations. The work shall generally follow IS 1477 – 1971 (Part II) for jobs carried out in India and SSPC-PA-1 or DIN 55928 or equivalent for jobs carried out outside India.

03.01.02

General compatibility between primer and finishing paints shall be established by the paint manufacturer supplying the paints.

03.01.03

In the event of conflict between this general procedure on painting and the paint manufacturer's specification, the same shall be immediately brought to the notice of the Purchaser. Generally in cases of such conflicts, manufacturer's specifications/recommendations shall prevail.

03.01.04

Before buying the paint in bulk, it is recommended to obtain a sample of paint and establish "Control Area of Painting". On Control Area, surface preparation and painting shall be carried out.

03.01.05

If required, samples of paint shall be tested in laboratories to establish quality of paint with respect to:

(i) Viscosity
(ii) Adhesion/Bond of paint in steel surfaces
(iii) Adhesion/Simulated salt spray test.
(iv) Chemical analysis (percentage of solids by weight)
(v) Normal wear resistance as encountered during handling & erection.
(vi) Resistance against exposure to acid fumes, etc.

03.01.06

Whole quantity of paint for a particular system of paint shall be obtained from the same manufacturer.
03.01.07 The main Contractor shall be responsible for supply of paints and this responsibility shall not be passed on to the sub-contractor.

03.01.08 The painting material as delivered to the Contractor, must be in the manufacturer's original container bearing thereon manufacturer's name brand and description. Paint/Painting material in containers without labels or with illegible labels shall be rejected, removed from the area and shall not be used.

03.01.09 Thinners wherever used shall be those recommended by the paint manufacturers and shall be obtained in containers with manufacturer's name and brand name of thinner legibly printed, failing which the thinner is liable to be rejected and shall not be used.

03.01.10 All paint containers shall be clearly labeled to show the paint identification, date of manufacture, batch number, special instruction, shelf life etc. The container shall be opened only at the time of use.

03.01.11 All paints shall be stored in accordance with the requirements of laid down procedure by the paint manufacturer.

03.01.12 All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments before use and during application to maintain homogeneity.

03.01.13 The proposed make, quality and shade of the paint shall have the approval of the client.

03.01.14 The colour code of the finishing paint to be followed shall be intimated to the successful Tenderer after finalisation of order. The undercoat shall have different tint to distinguish the same from the finishing coat.

03.01.15 The Contractor shall furnish paint manufacturer's test report or technical data sheet pertaining to the paint selected. The data sheet shall indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash point, method of application, quality of surface preparation required, corrosion resistance properties and colour shades available.

03.01.16 For details of paint materials refer Annexure - 02

03.02 General

03.02.01 Each coat of paint shall be continuous, free of pores and of even film thickness without thin spots.

03.02.02 Each coat of paint shall be sufficiently dry before application of next coat.

03.02.03 Paint shall be applied at manufacturer's recommended rates. The number of coats shall be such that the minimum dry film thickness specified is achieved. The dry film thickness of painted surfaces shall be checked with ELCOMETER of measuring gauges to ensure application of specified DFT.
03.02.04 Zincrich primer paints which have been exposed several months before finishing coat is applied shall be washed down thoroughly to remove soluble zinc salt deposits.

03.02.05 The machine finished surfaces shall be coated with white lead and tallow before shipment or before being put out into the open air.

03.02.06 Areas which become inaccessible after assemble shall be painted before assembly (after obtaining painting clearance from the inspecting authority) after requisite surface cleaning as specified.

03.02.07 Paint shall not be applied when the ambient temperature is 5 deg C and below or 45 deg C and above. Also paint shall not be applied in rain, wind, fog or at relative humidity of 80 % and above unless the manufacturer's recommendations permit. Applications of paint shall be only by spraying or brushing as per IS 486 – 1983 and IS 487 – 1985.

03.02.08 Primer paint shall be applied not later than 2 – 3 hours after preparation of surface, unless specified otherwise.

03.02.09 Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of the required thickness.

03.02.10 Surfaces which cannot be painted but require protection shall be given a coat of rust inhibitive grease according to IS 958 – 1975 or solvent deposited compound according to IS 1153 – 1975 or IS 1674 – 1960.

03.02.11 Surfaces in contact during shop assembly shall not be painted. Surfaces which will be inaccessible after assembly shall receive minimum two coats of specified primer.

03.02.12 Surfaces to be in contact with wood, brick or other masonry shall be given one shop-coat of the specified primer.

03.03 Site/Field Painting

03.03.01 Wherever shop primer painting is scratched, abraded or damaged, the surface shall be thoroughly cleaned using emery paper and power driven wire brush wherever warranted, and touched up with corresponding primer. Touching up paint shall be matched and blended to eliminate conspicuous marks.

03.03.02 If more than 50% of the painted surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats shall be applied followed by intermediate and finishing coats as per painting specification.

03.03.03 All field welded areas on shop painted items shall be mechanically cleaned (including the weld area proper, adjacent areas contaminated by weld spatter or fumes and areas where existing primer paint is burnt).
Subsequently, new primer and finishing coats of paint shall be applied as per painting specification.

03.03.04 The first coat of finish paint at site shall be applied preferable within three months of the shop paint.

03.04 Structural

03.04.01 All fabricated steel structure, fabricated steel pipes, etc. shall have a minimum of two coats of primer paint before dispatch to site.

03.04.02 Parts of steel structures embedded in concrete shall be given a protective coat of Portland cement slurry immediately after fabrication and after surfaces of this part is thoroughly cleaned from grease, rust, mill scales, etc. No paint shall be applied on this part.

03.04.03 All structures shall receive appropriate number of primer and finishing coats in order to achieve overall DFT as per design drawings/specification.

03.05 Hot Surfaces

03.05.01 Total DFT for heat resistant paints should not exceed 100 – 120 microns, otherwise flaking occurs (as per paint manufacturer’s recommendations).

03.05.02 Heat resistant paints should be applied by brush.

03.05.03 Primer coat should not be applied on the surfaces having temperature condition more that 120 deg C.

04 Painting Schemes

For a complete painting scheme of any item being printed, all types of paints are to be procured from the same manufacturer as approved by the purchaser.

04.01 Legend

SP - Surface preparation quality as per SIS standard
2P1 - Two (2) coats of Primer paint type P1
1I1 - One (1) coat of Intermediate paint type I1
2F1 - Two (2) coats of Finish paint type F1
DFT - Dry Film Thickness in microns developed
CRT - Clean and Retouch

Types of paint products like P1 to P9, I1 to I4 and F1 to F10 have been specified under Annexure-02.

04.02 The painting scheme to be followed for various structure/equipment exposed to different condition is briefly given in Annexure-03 for guidance to the tenderer.
04.03 The colour code for different applications are indicated in Annexure-04. Wherever colour codes are not specified, the same is to be mutually agreed between the Purchaser and Contractor.

05. **GUARANTEE**

05.01 The Contractor shall guarantee that the physical and chemical properties of the paint materials conform with the specification of paint products.

05.02 The Contractor shall submit internal test reports from paint manufacturers regarding the quality of paint whenever asked by the Purchaser/Consultant.

05.03 Guarantee period shall commence from the date of completion of finishing coat of paint. The guarantee period will be indicated depending on the type of surface preparation and system of painting. To fulfill this obligations the Contractor may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Surface Preparation</th>
<th>Swedish Std SIS 055900</th>
<th>DIN Std. Din 55928 (Part 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blast cleaning to white metal</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td></td>
<td>Removal of all visible rusts, mill-scales, paint and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>foreign matters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Blast cleaning to near white metal:</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
</tr>
<tr>
<td></td>
<td>95% of any section of surface area is free from all</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rusts, mill-scales and visible residues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blast cleaning to commercial quality:</td>
<td>Sa 2</td>
<td>Sa 2</td>
</tr>
<tr>
<td></td>
<td>At least 2/3 of any section of the surface area is free</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>from all rusts, mill-scales and visible residues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brush-off blast cleaning:</td>
<td>Sa 1</td>
<td>Sa 1</td>
</tr>
<tr>
<td></td>
<td>Removal of all loose mill-scales, rust and foreign</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>matters etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Power tool cleaning:</td>
<td>St 3</td>
<td>St 3</td>
</tr>
<tr>
<td></td>
<td>Very thorough scrapping and wire brushing to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>remove loose mill-scale, rust and foreign matters to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>have pronounced metallic shine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hand tool cleaning:</td>
<td>St 2</td>
<td>St 2</td>
</tr>
<tr>
<td></td>
<td>Removal by hand brushing of loose mill-scale, loose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rust and foreign matters.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PAINT MATERIALS

01. PRIMER PAINTS (P)

Primer paint products shall be applied only on dry and clean surfaces.

01.01 Primer Paint – P1 (Phenolic – Alkyd Based)

A single pack air drying phenolic modified alkyd composition with zinc phosphate as a primer paint conforming generally to IS : 2074.

- Air drying time
  - About 60 minutes (touch dry)
  - Overnight (hard dry)
- Dry film thickness (DFT)/Coat
  - 40 microns (min)
- Temperature resistance
  - Upto 100 °C dry heat

01.02 Primer Paint – P2 (Chlororubber Based)

A single pack air drying high build chlorinated rubber based zinc phosphate primer.

- Percent chlororubber
  - 20 to 22 (% Chlorine above 65% in chlororubber)
- Air drying time
  - About 15 minutes (touch dry)
  - Overnight (hard dry)
- DFT/Coat
  - 50 microns (min)
- Temperature resistance
  - Up to 65 °C dry heat

01.03 Primer Paint – P3 (PVC Copolymer Alkyd Based)

- Polyvinyl chloride (PVC)
  - Alkyd zinc phosphate – redoxide based primer
- Ratio
  : PVC copolymer + alkyd resin (1:1)
- Pigments
  : Zinc phosphate & Fillers
- Air drying time
  - 24 hours
- DFT/Coat
  - 80 microns
- Temperature resistance
  - Upto 80 °C dry heat
01.04 **Primer Paint – P4 (Epoxy Based)**

A two pack air drying epoxy amide resin based red oxide-zinc phosphate primer.

- **Epoxy content (% wt.)** - 15 to 18
- **Air drying time** - About 30 minutes (touch dry)
  - overnight (hard dry)
- **DFT/Coat** - 30 microns (min)
- **Temperature resistance** - Upto 120 °C dry heat

01.05 **Primer Paint – P5 (Epoxy Based)**

A two pack air drying epoxy amide with zinc dust of at least 92% zinc dust on the dry film

- **Epoxy content (% wt.)** - 8 to 10
- **Air drying time** - Less than 10 minutes (touch dry)
  - Less than 2 hours (hard dry)
- **DFT/Coat** - 40 microns (min)
- **Temperature resistance** - Upto 300 °C dry heat

01.06 **Primer Paint – P6 (Poly – Vinyl Butyral Resin Based)**

A two pack air drying polyvinyl butyral resin based wash primer with rust inhibitive pigments.

- **Air drying time** - 5 to 7 minutes (touch dry)
  - 2 hours (hard dry)
- **DFT/Coat** - 8 microns
- **Temperature resistance** - Upto 65 °C dry heat
- **Application for**
  - Galvanised iron, aluminium, light alloys etc. on which the adhesion of conventional paints are poor.

01.07 **Primer Paint – P7 (Ethyl Zinc Silicate, EZS Based).**

A two pack heavy duty zinc dust rich silicate primer which protects the surface with just a single coat.

- **Total solids (3 wt)** - 84 +/- 2
- **Density (g/cc)** - 3.07 +/- 0.05

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General Technical Specification

Air drying time - Top coat 16 hours
DF T/C coat - 60 microns
Temperature resistance - Up to 450 deg C dry heat

01.08 Primer Paint - P8 (High Build Coal Tar Epox)

A two pack cold cured H. B. epoxy coal tar coating – no primer is required.

Mixing ratio - Base : Hardener (4:1 by vol.)
Air drying time - 48 hours (hard dry)
DF T/C coat - 100 microns

01.09 Wood Varnish - P9

Treated oil based primer pigment ed with suitable pigments:

Air drying time - 16 hours for application of top coat.
Cover age - 10 to 14 sq. metre

02. Intermediate Paints (I)

These paints shall be applied over primer coats as an intermediate layer to provide weather proof seal of primer coats.

02.01 Intermediate Paint - I1 (Phenolic alkyd based)

A single pack high build phenolic based paint with micaceous iron oxide (M10).

Air Drying Time - 4 to 6 hours (touch dry) 2 days (hard dry)
DF T/C coat - 75 microns (min)
Temperature resistance - Up to 100 deg C dry heat
Compatible with - Primer P1

02.02 Intermediate Paint - I2 (Chlororubber based)

A single pack air drying high build chlorobased paint with MIO.

Air Drying Time - 15 minutes (touch dry) 24 hours (hard dry)
DF T/C coat - 70 microns (min)
Temperature resistance - Up to 65 deg C dry heat
Compatible with - Primer P2, P3 & P4

02.03 Intermediate Paint - I3 (PVC - Alkyd Based)

PVC Copolymer - Resin 1:1
Pigments - Micaceous iron oxide (MIO)
DF T/C coat - 80 microns (min)
## General Technical Specification

<table>
<thead>
<tr>
<th>Temperature resistance</th>
<th>Up to 80°C dry heat</th>
<th>Primer P2 &amp; P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatibl e with</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 02.04 Intermediate Paint - I4

A two pack air drying high build epoxy resin based paint with MIO.

<table>
<thead>
<tr>
<th>Air drying time</th>
<th>6 to 8 hours (touch dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFT / Coat</td>
<td>7 days (full cure)</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>Upto 100°C dry heat</td>
</tr>
<tr>
<td>Compatibl e with</td>
<td>Primer P4 &amp; P5</td>
</tr>
</tbody>
</table>

### 03. Finish Paints (F)

Finish paint costs shall be applied over primer coats and intermediate coats after proper cleaning and touch up of primed surface.

#### 03.01 Finish Paint – F1

A single pack air drying high gloss phenolic alkyl modified synthetic enamel paint suitably pigmented.

<table>
<thead>
<tr>
<th>Air drying time</th>
<th>3 to 4 hours (touch dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFT / Coat</td>
<td>24 hours (hard dry)</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>Upto 100°C dry heat</td>
</tr>
<tr>
<td>Compatible with</td>
<td>Primer P1</td>
</tr>
<tr>
<td>Colour</td>
<td>Generally all shades</td>
</tr>
</tbody>
</table>

#### 03.02 Finish Paint – F2

A single pack air drying polyurethane enamel of high gloss and hard finish suitably pigmented.

<table>
<thead>
<tr>
<th>Air drying time</th>
<th>2 to 2 ½ hours (touch dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFT / Coat</td>
<td>6 hours (hard dry)</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>Upto 100°C dry heat</td>
</tr>
<tr>
<td>Compatible with</td>
<td>Primer P1 &amp; P8 and Intermediate I1</td>
</tr>
<tr>
<td>Colour</td>
<td>Generally all shades</td>
</tr>
</tbody>
</table>
03.03 **Finish Paint – F3**

*At two pack air drying bituminous aluminunm paint.*

- **Air drying time**
  - 1 to 2 hours (touch dry)
  - 21 hours (hard dry)

- **DFT/Coat**
  - 25 microns (min)

- **Temperature resistance**
  - Upto 100°C dry heat

- **Compatible with**
  - Primer P1 and Intermediate I1

- **Colour**
  - Bright metallic

03.04 **Finish Paint – F4**

*Readymixed oil-alkyd based synthetic enamel paint of high gloss and hard wearing properties.*

- **Air drying time**
  - 6 to 8 hours

- **Coverage**
  - 14 to 16 Sq. m /litre

- **Temperature resistance**
  - Upto 60°C dry heat

- **Compatible with**
  - P8

- **Colour**
  - Generally all shades

03.05 **Finish Paint – F5**

*Asingle pack air drying plasticized chlororubber paint suitably pigmented.*

- **Air drying time**
  - 30 minutes (touch dry)
  - 24 hours (hard dry)

- **DFT/Coat**
  - 35 microns (min)

- **Temperature resistance**
  - Upto 65°C dry heat

- **Compatible with**
  - Primer P2 & P3, Intermediate I2 & I3

- **Colour**
  - Nearly all shades except few.
03.06  **Finish Paint – F6**

*APVC – Copolymeric alkyd based enamel.*

- **Density**
  - 1.17 ± 0.05
- **Total solids (1 wt)**
  - 55 ± 2
- **DFT/Coat**
  - 40 microns
- **Compatible with**
  - P2 and P3

03.07  **Finish Paint – F7**

*Two pack air drying epoxy polyamide enamel suitably pigmented.*

- **Air drying time**
  - 2 to 3 hours (touch dry)
  - 7 days (full cure)
- **DFT/Coat**
  - 40 microns (min)
- **Temperature resistance**
  - Up to 130 °C dry heat
- **Compatible with**
  - Primer P4 & P5, Intermediate I4
- **Colour**
  - Generally all shades.

03.08  **Finish Paint – F8**

*Single pack synthetic rubber based aluminium paint.*

- **Air drying time**
  - 2 hours (touch dry)
  - 24 hours (hard dry)
- **DFT/Coat**
  - 25 microns (min)
- **Temperature resistance**
  - Upto 200 °C dry heat
- **Compatible with**
  - No Primer paint except primer P6 is applicable in case of non-ferrous substrate.
- **Colour**
  - Smooth aluminium.
## PAINTING SCHEME

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme</th>
<th>Total DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>At Shop</td>
<td>At Site</td>
</tr>
<tr>
<td>1.0</td>
<td><strong>Steel Structures</strong> <em>(Temp. not exceeding 80 C)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td><strong>Technological steel structures for plant and equipment</strong></td>
<td>SP – Sa 2.5</td>
<td>CRT 2F1</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>2P1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP – Sa 2.5</td>
<td>CRT 2F1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P1 1I1</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>**Fabricated steel structures at site for rung ladders, cat-ladders, gates,</td>
<td>SP – St-2 and/</td>
<td>CRT 2F1</td>
</tr>
<tr>
<td></td>
<td>rolling shutters, etc. <em>(Springs/rubbing surfaces excluded)</em></td>
<td>or St-3 2P1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor / Outdoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td><strong>Walkways, stairs, platforms etc. which are of wearing surface</strong></td>
<td>SP – St-2 and/</td>
<td>CRT 2F1</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>or St-3 2P1</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP – St2 and/</td>
<td>CRT 2F1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or St-3 2P1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1I1</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td><strong>Steel doors and windows</strong></td>
<td>SP–St-2 and /</td>
<td>CRT 2F2</td>
</tr>
<tr>
<td></td>
<td>- Indoor / outdoor</td>
<td>or St-3 2P1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1I1</td>
<td></td>
</tr>
</tbody>
</table>

### Sl. No. | MECHANICAL EQUIPMENT

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme</th>
<th>Total DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td><strong>MECHANICAL EQUIPMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Mechanical equipment <em>(Temp. not exceeding 80 C)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1.1</td>
<td>Static equipment like storage tanks, vessels, bins, bunkers, heat exchanging, coolers,</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### General Technical Specification

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme</th>
<th>Total DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>At Shop</td>
<td>At Site</td>
</tr>
<tr>
<td></td>
<td>cyclones, scrubbers, etc.</td>
<td>SP – Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>2P2/2P3</td>
<td>2F5/2F6</td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP – Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>2P2/2P3+1I2/1I3</td>
<td>CRT</td>
<td>2F5/2F6</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Rotary/moving equipment and machineries like crushers, mills, vibratory screens, bin activators, blowers, fan, air/gas compressors, pumps, gear boxes, machine housings etc.</td>
<td>SP – Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>2P3/2P4</td>
<td>2F6/2F7</td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP-Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>2P3 + 1I3/1I4</td>
<td>CRT</td>
<td>2F6/2F7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pipe / Duct work (Overground)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Non – insulated (temperature up to 80 °C)</td>
<td>SP – St2 and or St3</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>2P1</td>
<td>2F1</td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>SP – St2 and / or St3</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td>2P1 + 1I1</td>
<td>CRT</td>
<td>2F1</td>
</tr>
<tr>
<td>3.2</td>
<td>Insulated (hot)</td>
<td>SP- St2 and/ or St3</td>
<td>Remove paint and insulate</td>
</tr>
<tr>
<td></td>
<td>- Indoor/Outdoor</td>
<td>1P1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>Oxygen Plant</td>
<td>SP – St2 and / or St3</td>
<td>CRT</td>
</tr>
<tr>
<td>4.1</td>
<td>Outdoor steel structures</td>
<td>SP – St2 and / or St3</td>
<td>CRT</td>
</tr>
</tbody>
</table>
## General Technical Specification

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme</th>
<th>Total DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>At Shop</td>
<td>At Site</td>
</tr>
<tr>
<td>4.2</td>
<td>Rotary equipment like air compressors</td>
<td>2P1 + 1I1</td>
<td>2F3</td>
</tr>
<tr>
<td>5.0</td>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Standard mobile equipment like chasis of trucks, dumpers, crawler cranes bulldozers, railway rakes, chasis of slag cars, ladle cars, etc.</td>
<td>Sa 2.5 2P4 CRT 2F7</td>
<td>140</td>
</tr>
<tr>
<td>5.2</td>
<td>Laboratory equipment like ovens, screens, magnetic stirrers, samplers, etc.</td>
<td>Stove enamelling CRT</td>
<td>110</td>
</tr>
<tr>
<td>5.3</td>
<td>Steel structures partly immersed in water</td>
<td>SP – Sa 2.5 2P8</td>
<td>CRT</td>
</tr>
</tbody>
</table>

### Notes:

1. Painting scheme of all fabricated steel structures, fabricated pipe work, building structure, conveyor galleries, pipe trestles etc. is indicated in the Technical Specification of steel structures.

2. Primer Paint

   Primer coat shall be suitable for intended temperature applications as per manufacturer's recommendation. The primer selection shall be generally in line with the specification laid down in Annexure-02.

3. Finish Paint

   In case of Aluminium cladding final painting will not be required.
### COLOUR CODE

The colour codes are mentioned for all the items including pipe work. Shades of finish coat of paint applied over respective item indicated below are tentative and subject to alteration as per Purchaser’s request or due to compatible paint system adopted. The service for which colour code/bands are not specified are to be mutually agreed for by the Purchaser & the Contractor.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items Painted</th>
<th>Colour</th>
<th>Colour No. of IS:5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Structures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building frames including bracings, side girts, louvers etc.</td>
<td>Aircraft grey</td>
<td>693</td>
</tr>
<tr>
<td></td>
<td>Crane girders</td>
<td>Azure blue</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Crane stops</td>
<td>Post office red</td>
<td>538</td>
</tr>
<tr>
<td></td>
<td>Gutters</td>
<td>Black bituminous aluminium</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Fire escape platforms ladders, etc.</td>
<td>Signal red</td>
<td>537</td>
</tr>
<tr>
<td></td>
<td>General hand railing, top runners</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>Rung ladders</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>All members blocking passages for movement</td>
<td>Lemon yellow</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>Trestles, towers and pipe bridges</td>
<td>Dark admiralty grey</td>
<td>632</td>
</tr>
<tr>
<td></td>
<td>Conveyor gallery structures</td>
<td>Aircraft grey</td>
<td>693</td>
</tr>
<tr>
<td></td>
<td>Steel chimneys</td>
<td>Aluminium</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Equipment and Machinery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General indoor equipment</td>
<td>Light grey</td>
<td>631</td>
</tr>
<tr>
<td></td>
<td>General outdoor equipment</td>
<td>Dark admiralty</td>
<td>632</td>
</tr>
</tbody>
</table>
|         | Crane bridges, trolleys, hooks etc. and other mobile equipment | Base : Lemon yellow  
|         |                                                   | Stripes : Black (100 mm wide) | 355                |
|         | Furnaces                                           | Aluminium                    |                    |
|         | Tanks                                              | Base : Same as for general equipment  
|         |                                                   | Strips : Same shade as for piping around the tnk at half the tank height |                    |
|         | Fire-fighting equipment                            | Signal red                   | 537                |

3. **Pipe work**

Colours shall be as given below. The base colour shall be applied throughout entire length except on surfaces of materials such as asbestos, aluminium, brass, bronze, galvanized steel, stainless steel and other corrosion resistant alloys and rubber / synthetic polymers. In such cases identification colour bands of at least 500mm width shall be provided near each branch, valve and at distances not exceeding 10m either as local colour coatings or coloured adhesive type of suitable material or label attached to the pipe work. Additional identification bands superimposed over the base colour shall be provided near each branch, valve and at distance not exceeding 10m. The bands shall be at least 25mm wide except in case of double bands where the first band shall be about 100mm wide. Direction of flow shall be clearly marked on the pipelines at intervals not exceeding 10m and all branches and change of directions.
### General Technical Specification

<table>
<thead>
<tr>
<th>Service</th>
<th>Colour</th>
<th>Colour No. of IS:5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea or river water (untreated)</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band - White</td>
<td></td>
</tr>
<tr>
<td>Cooling water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band - White</td>
<td>166</td>
</tr>
<tr>
<td>Boiler feed water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td>Condensate</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – Light brown</td>
<td>410</td>
</tr>
<tr>
<td>Drinking water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>First band - French blue</td>
<td>166</td>
</tr>
<tr>
<td></td>
<td>Second band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Industrial water</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – Light orange</td>
<td>557</td>
</tr>
<tr>
<td>Compressed air</td>
<td>Base – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td>Instrument air</td>
<td>Base – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Band – Light brown</td>
<td>410</td>
</tr>
<tr>
<td>Drainage</td>
<td>Base – Black</td>
<td>-</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>Base – Light brown</td>
<td>410</td>
</tr>
<tr>
<td></td>
<td>Band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Coke oven/BF gas/other fuel</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td>gases</td>
<td>Band – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Argon</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – French blue</td>
<td>166</td>
</tr>
<tr>
<td>Acetylene</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – Dark violet</td>
<td>796</td>
</tr>
<tr>
<td>LP Gas (LPG)</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>First band – Signal read</td>
<td>537</td>
</tr>
<tr>
<td></td>
<td>Second band – Traffic green</td>
<td>267</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – Black</td>
<td>-</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Base – Canary yellow</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>Band – White</td>
<td>-</td>
</tr>
<tr>
<td>Non-acidic slurries</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – White</td>
<td>-</td>
</tr>
<tr>
<td>Fire-fighting system</td>
<td>Base – Signal red</td>
<td>537</td>
</tr>
<tr>
<td>Rain water down pipes</td>
<td>Base – Sea green</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Band – Sky blue</td>
<td>101</td>
</tr>
<tr>
<td>Duct work</td>
<td>Base – Aluminium</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note**: For these services, hazard marking as per fig. 4C of IS:2379 shall also be provided.
STEEL TUBULAR POLE
410 SP - 29

FURTHER SPECIFICATIONS
Load Applied from Top at a Distance of: 30 cm
Approx. Weight of Pole (without M.S. Base Plate): 125 Kgs.
Breaking Load: 390 Kgs.
Crippling Load: 277 Kgs.
Load for Permanent Set Not Exceeding 13 mm: 190 Kgs.
Load for Temporary Deflection of 157.5 mm: 83 Kgs.

© THE NATIONAL TUBING COMPANY
DRAWING No. NTC/410 SP 29
NOT TO SCALE
Integral, single piece, cast aluminium with full glass cover luminaire

### NOMINAL DIMENSIONS IN mm

<table>
<thead>
<tr>
<th>Cat. Ref.</th>
<th>A</th>
<th>B</th>
<th>Max. Width - C</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEST 70 SV/MH FG SHN IP66</td>
<td>445</td>
<td>110</td>
<td>210</td>
</tr>
<tr>
<td>BGEST 150 SV/MH FG SHN IP66</td>
<td>545</td>
<td>140</td>
<td>280</td>
</tr>
<tr>
<td>BGEST 250 SV/MH FG SHN IP66</td>
<td>575</td>
<td>140</td>
<td>280</td>
</tr>
</tbody>
</table>

Tolerance +/-5

### Application
- Highway
- Main roads
- Multi-level junctions
- Traffic round-abouts
- Civic centers etc.

### Specification
- Epoxy grey powder coated single piece die-cast aluminium housing.
- Electrochemically brightened, polished and **GLASKOTE**™ finish computer aided pot optic aluminium reflector for tubular lamp
- Heat resistant toughened clear glass.
- Synthetic rubber gasket.
- Control gear suitable for 70/150/250W SV/MH lamp
- ES (E27) lamp holder (For 70W SV/MH-T / 150W MH SE) prewired upto the terminal block.
- GES (E40) lamp holder (For 150/250W SV/MH-T) prewired upto the terminal block.
- Side entry mounting suitable for 40 to 50 mm OD pipe bracket.
- Maintenance from bottom. Glass to be open by unlocking the SS toggle for lamp & accessories maintenance.
- Degree of protection: IP 66

### Electrical Data

<table>
<thead>
<tr>
<th>Product code no.</th>
<th>Cat. Ref.</th>
<th>Lamp Type &amp; Wattage (W)</th>
<th>Nominal Voltage (V)</th>
<th>Mains Current in Amps. At 240 V</th>
<th>Capacitor Mfd.</th>
<th>Power Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>188505</td>
<td>BGEST 70 SV FG SHN IP66</td>
<td>HPSV-T 70</td>
<td>220/240</td>
<td>0.40</td>
<td>10</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188506</td>
<td>BGEST 70 MH FG SHN IP66</td>
<td>HPMH-T 70</td>
<td>220/240</td>
<td>0.40</td>
<td>10</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188507</td>
<td>BGEST 150 SV FG SHN IP66</td>
<td>HPSV-T 150</td>
<td>220/240</td>
<td>0.80</td>
<td>20</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188508</td>
<td>BGEST 150 MH FG SHN IP66 (E40)</td>
<td>HPMH-T 150</td>
<td>220/240</td>
<td>0.80</td>
<td>20</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188509</td>
<td>BGEST 150 MH FG SHN IP66 (E27)</td>
<td>MH SE 150</td>
<td>220/240</td>
<td>0.80</td>
<td>20</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188510</td>
<td>BGEST 250 SV FG SHN IP66</td>
<td>HPSV-T 250</td>
<td>220/240</td>
<td>1.30</td>
<td>30</td>
<td>≥ 0.85</td>
</tr>
<tr>
<td>188511</td>
<td>BGEST 250 MH FG SHN IP66</td>
<td>HPMH-T 250</td>
<td>220/240</td>
<td>1.30</td>
<td>30</td>
<td>≥ 0.85</td>
</tr>
</tbody>
</table>

Data subject to variation due to change/improvement in the design, materials and processes.

*E-mail: luminaires@bajajelectricals.com*
TENDER DOCUMENT

NIT No. DLI/C&E/WI-665/538R

FOR

Tender for Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of “105 Nos. Lighting Poles & Associated Works” for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part– B (Package- 061) at Bhilai Steel Plant (SAIL)”.

VOLUME – 3

(PRICE-BID)

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7, Lodhi Road, New Delhi-110003 TEL NO: 011-24361666 FAX NO. 011- 24363426
### PRICE SCHEDULE (SUPPLY)

**Project:** Augmentation of Raw Material Receipt & Handling Facilities with new OHP, Part-B (Package No. 061) of Bhilai Steel Plant (SAIL)

**Lighting poles and associated works**

**NIT NO. DLI/C&E/WI-665/538R**

Our prices for the above package of above mentioned project as per the technical specifications, drawings, terms & conditions given in the tender enquiry are as given below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Volume of work</th>
<th>Unit Price</th>
<th>Total Basic Price</th>
<th>GST on 6</th>
<th>Inland Freight upto site</th>
<th>Transit Insurance</th>
<th>Taxes &amp; Levies (Bidder to specify)</th>
<th>TOTAL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit</td>
<td>In Figure</td>
<td>In Words</td>
<td>(₹)</td>
<td>(₹)</td>
<td>(₹)</td>
<td>(₹)</td>
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<tr>
<td></td>
<td></td>
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<td>Qty</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Design, Engineering, manufacturing, Inspection at works for Supply &amp; Testing of 105 Nos. Lighting Poles &amp; Associated Works</td>
<td>Nos.</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Lighting poles complete, all mechanical &amp; electricals accessories as per technical specification.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Supply of Commissioning Spares itemwise price for lighting pole as follows with same rating &amp; specification as provided in Lighting pole</td>
<td>5% of Each type &amp; rating (minimum 1 set/No.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>MCB</td>
<td>- DO -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Neutral Link</td>
<td>- DO -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Bolted type terminal</td>
<td>- DO -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Price (ii(a) to (c))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Price (i) to (iii)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL PRICE IN WORDS</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. Bidders to indicate the Break-up of Taxes & Duties, etc. The break-up is also required for evaluation of offers and the position of L1. The unpriced copy of Price Bid should indicate the Break-up’s i.e. "Quoted" or "Not Quoted" so as to facilitate evaluation of offers.

Signature with stamp
TENDER DOCUMENT

NIT No. DLI/C&E/WI-665/538R

FOR

Tender for Design, Engineering, Manufacturing, Inspection at works for Supply & Testing of 105 Nos. Lighting Poles & Associated Works” for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) at Bhilai Steel Plant (SAIL)”.

VOLUME - 4
(GENERAL TECHNICAL SPECIFICATIONS)
## Contents

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>General Technical Specification</td>
</tr>
</tbody>
</table>
GENERAL SPECIFICATION FOR ELECTRICAL SYSTEM (GS – 03)
<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Chapter No.</th>
<th>Contents</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td></td>
<td>Contents</td>
<td>2</td>
</tr>
<tr>
<td>2.0</td>
<td>1.01</td>
<td>General</td>
<td>7</td>
</tr>
<tr>
<td>3.0</td>
<td>1.01.01</td>
<td>Standards</td>
<td>7</td>
</tr>
<tr>
<td>4.0</td>
<td>1.01.02</td>
<td>Climatic Conditions</td>
<td>7</td>
</tr>
<tr>
<td>5.0</td>
<td>1.01.02.01</td>
<td>Environmental condition</td>
<td>7</td>
</tr>
<tr>
<td>6.0</td>
<td>1.01.02.02</td>
<td>Ambient conditions of shop units</td>
<td>8</td>
</tr>
<tr>
<td>7.0</td>
<td>1.01.03</td>
<td>Standard Voltage levels</td>
<td>9</td>
</tr>
<tr>
<td>8.0</td>
<td>1.01.03.01</td>
<td>Symmetrical short circuit ratings</td>
<td>10</td>
</tr>
<tr>
<td>9.0</td>
<td>1.01.03.02</td>
<td>Permissible variations</td>
<td>10</td>
</tr>
<tr>
<td>10.0</td>
<td>1.01.04</td>
<td>Criteria for selection of voltage levels for motors &amp; Power devices</td>
<td>11</td>
</tr>
<tr>
<td>11.0</td>
<td>1.01.05</td>
<td>Design criteria &amp; reliability conditions</td>
<td>11</td>
</tr>
<tr>
<td>12.0</td>
<td>1.01.05.01</td>
<td>Power Distribution system</td>
<td>11</td>
</tr>
<tr>
<td>13.0</td>
<td>1.01.06</td>
<td>Cabling</td>
<td>12</td>
</tr>
<tr>
<td>14.0</td>
<td>1.01.07</td>
<td>Motor starting and permissible voltage dips</td>
<td>13</td>
</tr>
<tr>
<td>15.0</td>
<td>1.01.08</td>
<td>Maximum Demand of MCC</td>
<td>13</td>
</tr>
<tr>
<td>16.0</td>
<td>1.01.09</td>
<td>Incomer rating selection for MCC</td>
<td>14</td>
</tr>
<tr>
<td>17.0</td>
<td>1.01.10</td>
<td>Outgoing Feeder Selection for MCC</td>
<td>14</td>
</tr>
<tr>
<td>18.0</td>
<td>1.01.11</td>
<td>Power Factor Compensation</td>
<td>15</td>
</tr>
<tr>
<td>19.0</td>
<td>1.01.12</td>
<td>Cable selection</td>
<td>15</td>
</tr>
<tr>
<td>20.0</td>
<td>1.01.12.01</td>
<td>Incomers of MCC / PDB / MLDB</td>
<td>15</td>
</tr>
<tr>
<td>21.0</td>
<td>1.01.12.02</td>
<td>Motors</td>
<td>15</td>
</tr>
<tr>
<td>22.0</td>
<td>1.01.12.03</td>
<td>Illumination System</td>
<td>15</td>
</tr>
<tr>
<td>23.0</td>
<td>1.01.12.04</td>
<td>Automation System</td>
<td>16</td>
</tr>
<tr>
<td>24.0</td>
<td>1.01.12.05</td>
<td>General</td>
<td>16</td>
</tr>
<tr>
<td>25.0</td>
<td>1.01.13</td>
<td>Ventilation and Air Conditioning</td>
<td>16</td>
</tr>
<tr>
<td>26.0</td>
<td>1.01.13.01</td>
<td>Substation building, MCC Rooms and Cable Cellar</td>
<td>17</td>
</tr>
<tr>
<td>27.0</td>
<td>1.01.13.02</td>
<td>Electrical rooms with electronic equipment / Central Control rooms</td>
<td>17</td>
</tr>
<tr>
<td>28.0</td>
<td>1.01.13.03</td>
<td>Small local Control Rooms/pulpits</td>
<td>17</td>
</tr>
<tr>
<td>29.0</td>
<td>1.01.13.04</td>
<td>Cable tunnels</td>
<td>17</td>
</tr>
<tr>
<td>30.0</td>
<td>1.01.13.04</td>
<td>General</td>
<td>18</td>
</tr>
<tr>
<td>31.0</td>
<td>1.01.14</td>
<td>Variable Speed AC Drives.</td>
<td>18</td>
</tr>
<tr>
<td>32.0</td>
<td>1.01.15</td>
<td>Control Philosophy</td>
<td>18</td>
</tr>
<tr>
<td>33.0</td>
<td>1.01.15.01</td>
<td>General</td>
<td>18</td>
</tr>
<tr>
<td>34.0</td>
<td>1.01.15.02</td>
<td>Modes of operation</td>
<td>19</td>
</tr>
<tr>
<td>Section</td>
<td>Subsection</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>35.0</td>
<td>1.01.16</td>
<td>Spares Philosophy</td>
<td>21</td>
</tr>
<tr>
<td>36.0</td>
<td>1.01.17</td>
<td>Uninterrupted Power Supply (UPS)</td>
<td>21</td>
</tr>
<tr>
<td>37.0</td>
<td>1.01.18</td>
<td>Colour coding of equipment</td>
<td>22</td>
</tr>
<tr>
<td>38.0</td>
<td>1.01.19</td>
<td>Drawings and documents</td>
<td>22</td>
</tr>
<tr>
<td>39.0</td>
<td>1.02</td>
<td>EQUIPMENTS</td>
<td>23</td>
</tr>
<tr>
<td>40.0</td>
<td>1.02.01</td>
<td>TRANSFORMER</td>
<td>23</td>
</tr>
<tr>
<td>41.0</td>
<td>1.02.02</td>
<td>VCB (Transformer Isolation)</td>
<td>32</td>
</tr>
<tr>
<td>42.0</td>
<td>1.02.03</td>
<td>415V Switchgear</td>
<td>36</td>
</tr>
<tr>
<td>43.0</td>
<td>1.02.04</td>
<td>LT busduct</td>
<td>45</td>
</tr>
<tr>
<td>44.0</td>
<td>1.02.05</td>
<td>Power Distribution Board (PDB)</td>
<td>48</td>
</tr>
<tr>
<td>45.0</td>
<td>1.02.06</td>
<td>Motors &amp; Field devices</td>
<td>49</td>
</tr>
<tr>
<td>46.0</td>
<td>1.02.06.01</td>
<td>Low voltage squirrel cage induction motors</td>
<td>49</td>
</tr>
<tr>
<td>47.0</td>
<td>1.02.06.02</td>
<td>Low voltage slip ring induction motors</td>
<td>51</td>
</tr>
<tr>
<td>48.0</td>
<td>1.02.06.03</td>
<td>Roller Table Motors (Torque motors)</td>
<td>54</td>
</tr>
<tr>
<td>49.0</td>
<td>1.02.06.04</td>
<td>High voltage squirrel cage induction motors</td>
<td>54</td>
</tr>
<tr>
<td>50.0</td>
<td>1.02.06.05</td>
<td>Synchronous Motors</td>
<td>57</td>
</tr>
<tr>
<td>51.0</td>
<td>1.02.06.06</td>
<td>LT Inverter Duty Motor</td>
<td>59</td>
</tr>
<tr>
<td>52.0</td>
<td>1.02.06.07</td>
<td>DC Electromagnetic brake</td>
<td>63</td>
</tr>
<tr>
<td>53.0</td>
<td>1.02.06.08</td>
<td>Field Switches</td>
<td>64</td>
</tr>
<tr>
<td>54.0</td>
<td>1.02.06.09</td>
<td>Power Resistance</td>
<td>64</td>
</tr>
<tr>
<td>55.0</td>
<td>1.02.07</td>
<td>Individual Drive Control Level</td>
<td>65</td>
</tr>
<tr>
<td>56.0</td>
<td>1.02.07.01</td>
<td>Variable Frequency Drive (VFD)</td>
<td>65</td>
</tr>
<tr>
<td>57.0</td>
<td>1.02.07.02</td>
<td>AC Line Reactor</td>
<td>73</td>
</tr>
<tr>
<td>58.0</td>
<td>1.02.07.03</td>
<td>Load Commutated Inverter (LCI)</td>
<td>73</td>
</tr>
<tr>
<td>59.0</td>
<td>1.02.08</td>
<td>Intelligent type MCC</td>
<td>75</td>
</tr>
<tr>
<td>60.0</td>
<td>1.02.09</td>
<td>Stand Alone Starter</td>
<td>83</td>
</tr>
<tr>
<td>61.0</td>
<td>1.02.10</td>
<td>Soft Starter</td>
<td>86</td>
</tr>
<tr>
<td>62.0</td>
<td>1.02.11</td>
<td>Specifications of major components</td>
<td>91</td>
</tr>
<tr>
<td>63.0</td>
<td>1.02.11.01</td>
<td>Moulded Case Circuit Breaker (MCCB)</td>
<td>91</td>
</tr>
<tr>
<td>64.0</td>
<td>1.02.11.02</td>
<td>AC Contactors</td>
<td>92</td>
</tr>
<tr>
<td>65.0</td>
<td>1.02.11.03</td>
<td>Current transformers</td>
<td>93</td>
</tr>
<tr>
<td>66.0</td>
<td>1.02.11.04</td>
<td>Control transformers</td>
<td>93</td>
</tr>
<tr>
<td>67.0</td>
<td>1.02.11.05</td>
<td>Indicating instruments</td>
<td>93</td>
</tr>
<tr>
<td>68.0</td>
<td>1.02.11.06</td>
<td>Thermal Overload Relays</td>
<td>94</td>
</tr>
<tr>
<td>69.0</td>
<td>1.02.11.07</td>
<td>Magnetic Overload Relays</td>
<td>94</td>
</tr>
<tr>
<td>70.0</td>
<td>1.02.11.08</td>
<td>Push Buttons</td>
<td>95</td>
</tr>
<tr>
<td>71.0</td>
<td>1.02.11.09</td>
<td>Indicating Lamps</td>
<td>95</td>
</tr>
<tr>
<td>72.0</td>
<td>1.02.11.10</td>
<td>Miniature Circuit Breakers (MCB)</td>
<td>96</td>
</tr>
<tr>
<td>73.0</td>
<td>1.02.11.11</td>
<td>Selector Switches</td>
<td>97</td>
</tr>
<tr>
<td>74.0</td>
<td>1.02.12</td>
<td>Local Control Stations</td>
<td>97</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>75.0</td>
<td>1.02.13 Control Desk</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>76.0</td>
<td>1.02.14 Control System Concept And Philosophy</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>77.0</td>
<td>1.02.15 Automation System</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>78.0</td>
<td>1.02.15.01 General</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>79.0</td>
<td>1.02.15.02 Programmable Logic Controller (PLC)</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>80.0</td>
<td>1.02.15.03 Human Machine Interface (HMI), Work Station &amp; Engineering Station</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>81.0</td>
<td>1.02.15.04 Server</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>82.0</td>
<td>1.02.15.05 Software</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>83.0</td>
<td>1.02.16 Large Screen Display System</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>84.0</td>
<td>1.02.17 Uninterrupted Power Supply</td>
<td>127</td>
<td></td>
</tr>
<tr>
<td>85.0</td>
<td>1.02.18 Electronic Weighing System</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>86.0</td>
<td>1.02.19 CABLES</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>87.0</td>
<td>1.02.19.1 HT Cables</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>88.0</td>
<td>1.02.19.1.i 33 kV kV(UE) XLPE cables</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>89.0</td>
<td>1.02.19.1.ii 6.6 / 11 kV (UE) XLPE cables</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>90.0</td>
<td>1.02.19.2 LT CABLES</td>
<td>143</td>
<td></td>
</tr>
<tr>
<td>91.0</td>
<td>1.02.19.2.i 1.1 kV Power Cable</td>
<td>143</td>
<td></td>
</tr>
<tr>
<td>92.0</td>
<td>1.02.19.2.ii 1.1 KV Grade Control Cable</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>93.0</td>
<td>1.02.19.2.iii 1.1 KV Grade Screened /Special Cable</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>94.0</td>
<td>1.02.19.2.iv Heat resistant cable</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>95.0</td>
<td>1.02.19.2.v Trailing cable</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>96.0</td>
<td>1.02.19.2.vi Flame Retardant Low Smoke (FRLS) Cables</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>97.0</td>
<td>01.02.20 EOT Cranes</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trolley lines and power supply arrangements for cranes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98.0</td>
<td>1.02.21 Erection Specification</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>99.0</td>
<td>1.02.21.01 Guidelines for design of system and engineering the layout of electrical equipment.</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>100.0</td>
<td>1.02.21.01.01 General</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>101.0</td>
<td>1.02.21.01.02 Electrical premises</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>102.0</td>
<td>1.02.21.01.03 Control rooms/pulpits</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>103.0</td>
<td>1.02.21.01.04 Cable tunnels</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>104.0</td>
<td>1.02.21.01.05 Cable shafts</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>105.0</td>
<td>1.02.21.01.06 Clearances inside the electrical rooms</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>106.0</td>
<td>1.02.21.01.07 Transformer rooms</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>107.0</td>
<td>1.02.21.02 Guide-line for erection of Electrical equipment and accessories</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>108.0</td>
<td>1.02.21.02.01 General</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>109.0</td>
<td>1.02.21.02.02 Rotating machines</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Sub-section</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>110.0</td>
<td>1.02.21.02.03</td>
<td>Sheet metal enclosed panels, open control panels, control desks and boxes</td>
<td>169</td>
</tr>
<tr>
<td>111.0</td>
<td>1.02.21.02.04</td>
<td>Static converters</td>
<td>170</td>
</tr>
<tr>
<td>112.0</td>
<td>1.02.21.02.05</td>
<td>Transformers and reactors</td>
<td>170</td>
</tr>
<tr>
<td>113.0</td>
<td>1.02.21.02.06</td>
<td>Battery installation</td>
<td>171</td>
</tr>
<tr>
<td>114.0</td>
<td>1.02.21.02.07</td>
<td>Busbar</td>
<td>171</td>
</tr>
<tr>
<td>115.0</td>
<td>1.02.21.02.08</td>
<td>Crane Trolley Lines</td>
<td>171</td>
</tr>
<tr>
<td>116.0</td>
<td>1.02.21.02.09</td>
<td>Resistance Box</td>
<td>171</td>
</tr>
<tr>
<td>117.0</td>
<td>1.02.21.02.10</td>
<td>Cables Installations</td>
<td>172</td>
</tr>
<tr>
<td>118.0</td>
<td>1.02.21.02.11.1</td>
<td>Laying in tunnels/surface ducts/on structures</td>
<td>172</td>
</tr>
<tr>
<td>119.0</td>
<td>1.02.21.02.11.2</td>
<td>Structures for cable laying</td>
<td>173</td>
</tr>
<tr>
<td>120.0</td>
<td>1.02.21.02.11.2</td>
<td>Cable Joint/termination accessories</td>
<td>176</td>
</tr>
<tr>
<td>121.0</td>
<td>1.02.21.02.12</td>
<td>Exposed conduits</td>
<td>177</td>
</tr>
<tr>
<td>122.0</td>
<td>1.02.22</td>
<td>Earthing and lightning protection</td>
<td>177</td>
</tr>
<tr>
<td>123.0</td>
<td>1.02.22.01</td>
<td>Earthing</td>
<td>179</td>
</tr>
<tr>
<td>124.0</td>
<td>1.02.22.02</td>
<td>Conductor sizes for ground connections</td>
<td>179</td>
</tr>
<tr>
<td>125.0</td>
<td>1.02.22.03</td>
<td>Earthing electrodes</td>
<td>179</td>
</tr>
<tr>
<td>126.0</td>
<td>1.02.22.04</td>
<td>Lightning protection</td>
<td>180</td>
</tr>
<tr>
<td>127.0</td>
<td>1.02.23</td>
<td>Repair network</td>
<td>181</td>
</tr>
<tr>
<td>128.0</td>
<td>1.02.23.01</td>
<td>General</td>
<td>181</td>
</tr>
<tr>
<td>129.0</td>
<td>1.02.23.02</td>
<td>Switch socket outlets</td>
<td>181</td>
</tr>
<tr>
<td>130.0</td>
<td>1.02.23.03</td>
<td>Cables</td>
<td>181</td>
</tr>
<tr>
<td>131.0</td>
<td>1.02.24</td>
<td>Ventilation and Air-Conditioning of Electrical Premises/Control Rooms</td>
<td>182</td>
</tr>
<tr>
<td>132.0</td>
<td>1.02.24.01</td>
<td>General</td>
<td>182</td>
</tr>
<tr>
<td>133.0</td>
<td>1.02.24.02</td>
<td>Switchgear rooms, MCC rooms, Cable cellar</td>
<td>182</td>
</tr>
<tr>
<td>134.0</td>
<td>1.02.24.03</td>
<td>Electrical rooms with electronic equipment</td>
<td>182</td>
</tr>
<tr>
<td>135.0</td>
<td>1.02.24.04</td>
<td>Central Control rooms, Rooms for PLC, Servers, Computers and Level-1/2 automation system equipment.</td>
<td>183</td>
</tr>
<tr>
<td>136.0</td>
<td>1.02.24.05</td>
<td>Small local Control Rooms/pulpits</td>
<td>183</td>
</tr>
<tr>
<td>137.0</td>
<td>1.02.24.06</td>
<td>Cable tunnels and basements</td>
<td>183</td>
</tr>
<tr>
<td>138.0</td>
<td>1.02.25</td>
<td>Testing</td>
<td>183</td>
</tr>
<tr>
<td>139.0</td>
<td>1.02.25.01</td>
<td>Type &amp; Routine</td>
<td>184</td>
</tr>
<tr>
<td>140.0</td>
<td>1.02.25.01.01</td>
<td>Transformers</td>
<td>184</td>
</tr>
<tr>
<td>141.0</td>
<td>1.02.25.01.02</td>
<td>Busduct</td>
<td>184</td>
</tr>
<tr>
<td>142.0</td>
<td>1.02.25.01.03</td>
<td>Power Control Centre and LT switchgear</td>
<td>185</td>
</tr>
<tr>
<td>143.0</td>
<td>1.02.25.01.04</td>
<td>Load Break Isolator</td>
<td>185</td>
</tr>
<tr>
<td>144.0</td>
<td>1.02.25.01.05</td>
<td>Current Transformer and voltage transformer</td>
<td>185</td>
</tr>
<tr>
<td>145.0</td>
<td>1.02.25.01.06</td>
<td>Final Test of Materials of Grounding and lightning</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>146.0</td>
<td>1.02.25.01.07</td>
<td>Cables 186</td>
<td></td>
</tr>
<tr>
<td>147.0</td>
<td>1.02.25.01.08</td>
<td>Motors 187</td>
<td></td>
</tr>
<tr>
<td>148.0</td>
<td>1.02.25.01.09</td>
<td>Site tests and checks 188</td>
<td></td>
</tr>
<tr>
<td>149.0</td>
<td>1.02.25.01.09.01</td>
<td>General 188</td>
<td></td>
</tr>
<tr>
<td>150.0</td>
<td>1.02.25.01.09.02</td>
<td>Trial Run Test 188</td>
<td></td>
</tr>
<tr>
<td>151.0</td>
<td>1.02.25.01.09.03</td>
<td>Acceptance test 188</td>
<td></td>
</tr>
<tr>
<td>152.0</td>
<td>1.02.25.01.09.04</td>
<td>Site Tests 188</td>
<td></td>
</tr>
<tr>
<td>153.0</td>
<td></td>
<td>Appendix – Selection of Power Components &amp; Wiring for Continuous Duty Cage Motor Drives 192</td>
<td></td>
</tr>
<tr>
<td>154.0</td>
<td>1.02.26</td>
<td>Illumination 193</td>
<td></td>
</tr>
</tbody>
</table>
10.0 ELECTRICAL

1.01 General

1.01.01 Standards

The design, manufacture, assembly and testing as well as performance (including safety, earthing and other essential provisions) of equipment and accessories covered under this specification shall, in general, comply with the latest issue of:

- Latest applicable Standards and Codes of Practices published by Indian Standards Institution (BIS).
- Latest IPSS (Interplant Standards for Steel Industry)
- Latest Indian Electricity Rules & statutory requirements of Central Govt. and State Govt.

In case, the tenderer is not in a position to comply fully with certain IS / IPSS specifications or in respect of certain items for which there are no IS / IPSS specifications, the tenderer may base his proposals on IEC recommendations or other reputed national or international standards subject to the approval of the Purchaser.

The components and materials used and the equipment supplied shall conform to high standards of design, engineering and workmanship and shall be suitable for efficient operation and reliable service in steel plant conditions.

All equipments supplied and all work done including system design and detailed engineering shall also comply with the statutory requirements of Govt. of India and the respective governments of state in which the plant is situated. The installation shall also confirm to Indian Electricity Act and Indian Electricity Rules.

In case of any contradiction between the data given in the Technical Specification (TS) and this General Technical specification (GTS), data given in the Technical specification (TS) shall prevail.

1.01.02 Climatic Conditions

1.01.02.01 Environmental condition

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Environmental condition</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Maximum ambient temp.</td>
<td>50 deg. C</td>
</tr>
<tr>
<td>2.0</td>
<td>Maximum Humidity</td>
<td>100 % does not occur simultaneously with maximum temperature.</td>
</tr>
<tr>
<td>3.0</td>
<td>Height</td>
<td>Less than 1000 M.</td>
</tr>
<tr>
<td>Sl.No</td>
<td>Environmental condition</td>
<td>Data</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>4.0</td>
<td>Environment</td>
<td>Dusty &amp; Corrosive</td>
</tr>
</tbody>
</table>

1.01.02.02 Ambient conditions of shop units

Generally following maximum ambient temperature shall be considered in different units of the integrated steel plant.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Area</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Coke Ovens &amp; Byproduct Plant</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Battery cellar</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Battery Top</td>
<td>+ 60 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Coal Tower, Intermediate &amp; End benches</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>4.</td>
<td>Pusher Car &amp; Loco</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>5.</td>
<td>Guide Car &amp; Charging Car</td>
<td>+ 60 Deg. C</td>
</tr>
<tr>
<td>B.</td>
<td>Blast furnace</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Cast house</td>
<td>+ 60 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Furnace proper</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Stock house</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>4.</td>
<td>Pump house</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>5.</td>
<td>Stove area</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>6.</td>
<td>GCP area</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>7.</td>
<td>Other areas</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>C.</td>
<td>Steel Melting Shop</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Converter Bay</td>
<td>+ 60 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Mixer Bay</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Other areas</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>D.</td>
<td>Continuous Casting Shop</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Casting bay</td>
<td>+ 60 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Withdrawal, straightening and gas cutting areas</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Other areas</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>E.</td>
<td>Hot rolling mills</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Generally</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Finishing bays</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Foundry</td>
<td>+ 55 Deg. C</td>
</tr>
<tr>
<td>4.</td>
<td>Auxiliary Shops</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>F.</td>
<td>Other areas</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>G.</td>
<td>Electrical rooms</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HT/LT substation &amp; MCC rooms (ventilated)</td>
<td>+ 45 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>Cable basements / tunnels (ventilated)</td>
<td>+ 45 Deg. C</td>
</tr>
<tr>
<td>H.</td>
<td>Control Rooms</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Control rooms – Air conditioned</td>
<td>+ 24 Deg. C</td>
</tr>
</tbody>
</table>

Equipment selection and de-rating shall generally be based on ambient temperature of 50 Deg.C. For specific areas and shops, the ambient temperature conditions indicated above shall be taken into consideration and equipment shall be suitably de-rated accordingly.
The equipment offered should be suitable for smooth, efficient and trouble free service in the tropical humid climate prevailing at plant site and under the ambient temperature conditions indicated above for the different shops and areas. In hot areas of higher temperature conditions, the equipment shall be adequately protected against damage from radiant heat and hot air.

The equipment shall be designed to give efficient and reliable performance under heavy steel plant conditions and shall be such that the risks of accidental short-circuits due to animals, birds or vermins are avoided.

### 1.01.03 Standard Voltage levels:

In case the standard voltage levels to be adopted in the plant are specified in the Technical specification, it shall be followed. In absence of any details indicated in the Technical Specification, the following standard voltage levels shall be adopted.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HT AC</td>
<td>11 KV / 6.6 KV , 3 phase, 50 Hz, unearthed neutral.</td>
</tr>
<tr>
<td>2.</td>
<td>LT AC</td>
<td>415V, 3 Phase, 50 Hz, 4 wire, solidly earthed</td>
</tr>
<tr>
<td>3.</td>
<td>AC control and signaling voltage</td>
<td>240V, AC ± 10% obtained using suitable control transformers with auto changeover facility.</td>
</tr>
<tr>
<td>4.</td>
<td>DC supply voltage</td>
<td>220 Volts / 110 Volts</td>
</tr>
<tr>
<td>5.</td>
<td>DC control and signaling voltage</td>
<td>220 Volts / 110 Volts</td>
</tr>
<tr>
<td>6.</td>
<td>Control voltage for HT switchgear equipment</td>
<td>110 V DC from battery in HT S/S area. 220 V DC from battery in MSDS area.</td>
</tr>
<tr>
<td>7.</td>
<td>Special socket outlets for portable lamps</td>
<td>24V, single phase, 50 Hz, AC obtained through suitable transformers</td>
</tr>
<tr>
<td>8.</td>
<td>DC Electro-magnetic brakes</td>
<td>220V, DC, obtained through individual rectifiers</td>
</tr>
<tr>
<td>9.</td>
<td>Solenoid valves</td>
<td>24V DC, unearthed</td>
</tr>
<tr>
<td>10.</td>
<td>Machine tools lighting</td>
<td>24 V AC</td>
</tr>
<tr>
<td>11.</td>
<td>Sockets for Welding purposes</td>
<td>415V, 100A, 3 pin plus earth with plug interlocked switch</td>
</tr>
<tr>
<td>12.</td>
<td>Sockets for hand tools</td>
<td>240V, 15A, 2 pin plus earth with plug interlocked switch</td>
</tr>
<tr>
<td>13.</td>
<td>Illumination system</td>
<td>240 V AC for general application. 24 V AC for confined &amp; semi confined area. (as per IPSS).</td>
</tr>
<tr>
<td>14.</td>
<td>PLC power supply</td>
<td>240 V AC, 50 Hz, obtained through UPS (for processor , RIO chassis ,</td>
</tr>
</tbody>
</table>
### 1.01.03.01 Symmetrical short circuit ratings:

The three phase symmetrical short-circuit ratings of the switchgear at the different voltage levels shall be as follows unless specifically indicated in the Technical specification:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>11 kV switchgear</td>
<td>40 kA for 3 sec.</td>
</tr>
<tr>
<td>2.</td>
<td>6.6 kV switchgear</td>
<td>40 kA for 3 sec.</td>
</tr>
<tr>
<td>3.</td>
<td>415 V switchgear</td>
<td>50 kA for 1 sec.</td>
</tr>
</tbody>
</table>

### 1.01.03.02 Permissible variations:

The system / unit / plant / equipment shall be designed so as to be suitable for the following variations in voltage and frequency unless specifically indicated in the Technical specification:

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible variations with rated performance, rated current and control effectiveness maintained</td>
<td>For LT system: +10% &amp; -15%</td>
<td>Frequency variation for both HT &amp; LT shall be +4%, -6%</td>
</tr>
<tr>
<td></td>
<td>For HT system: +6% &amp; -9%</td>
<td></td>
</tr>
<tr>
<td>Permissible variations With changes in rated Current / torque but without any undesirable effect on performance</td>
<td>+/- 10%</td>
<td>+/- 3%</td>
</tr>
<tr>
<td>Permissible variations for control and regulation equipment</td>
<td>+/- 15%</td>
<td>+6%, -6%</td>
</tr>
</tbody>
</table>
### 1.01.04 Criteria for selection of voltage levels for motors & Power devices:

- AC squirrel cage induction motors of ratings up to 200 kW and slip ring motors up to 250 kW shall be fed at LT, 415V, 3 phase, 4 wire, 50 Hz with DOL.
- AC motors of ratings in excess of 200KW up to 1000 KW and beyond 1000 KW shall be connected to 6.6 KV U/E and 11 KV U/E power supply system respectively for DOL starting. The HT voltage level shall be as specified in the Technical specification.
- AC squirrel cage induction motors of ratings up to 200kW may be fed at LT, 415V, 3 phase 4 wire 50 Hz, with VFD where speed control is required.
- For motor rating more than 200 KW up to 1000 KW shall be provided with VFD where speed control is required, the rated voltage of the motor shall be 690 V.
- Soft starters with DOL bypass shall be provided for drives ratings ranging from 90 KW to 200 KW where full torque load starting and speed variation is not required.

### 1.01.05 Design criteria & reliability conditions:

#### 1.01.05.01 Power Distribution system

The power distribution system shall meet the following guide lines:

- Suitable numbers of 415V LT Substation (LTSS) shall be provided for feeding different Motor control centers and auxiliaries power distribution boards as required for the plant.
- The MCC / PDB / MLDB shall be fed from LTSS.
- Suitable numbers of 415V Motor control centers shall be provided for feeding power supply to motors of rating 90 KW and below.
- Field located Power supply panels (MCB DB / Local Starter Panels) shall be fed from MCC.
- Electronic relays with display (for motor rating of 37 KW and above) shall be considered in place of thermal overload relays as follows:
  - Electronic over load relay protection for motors below 15 KW for crane application and for reversible drives. Electronic over load relay / MPCB protection for motors below 15 KW for other application
  - EOCCR for OC & EF, unbalance protection for motors rated 18.5 KW to 90 KW
  - Composite motor protection relay with OL, OC, EF, unbalanced & locked rotor protection with digital display for motor rated 110 KW and above.
  - EOCCR shall be used only for non intelligent feeders.
- Motor of rating above 90 kW shall be provided with independent Motor control Panel (MCP) which shall be fed directly from LTSS. Power devices like MCCB,

---

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>with rated performance and control quality maintained</td>
<td>For LT system: -15%</td>
<td>Frequency Variation for both HT &amp; LT shall be considered as +4%, -6%.</td>
</tr>
<tr>
<td>Permissible voltage dip at the HT and LT switch gear bus during starting of HT and LT motor</td>
<td>For HT system: -10%</td>
<td></td>
</tr>
</tbody>
</table>
Contactors, intelligent motor control relays / microprocessor based MPR (for non intelligent controllers) etc. shall be located in independent MCPs. Each MCP shall be located in MCC room by the side of the respective group MCC.

- VFD’s shall be provided for process fans / pumps as per technological requirement
- A dedicated MCC with two incomers (one from PCC and other from DG set or any emergency power source) and bus coupler shall be provided for catering to all emergency loads of the shop/unit.
- MCCB, contactor and overload relay rating for the low voltage general purpose induction motors shall be selected as per type-2 coordination chart of selected manufacturer. However the minimum contactor rating shall be 32A.
- All the important drives (all 6.6 KV , 11 KV & 690 V motors) should be provided with suitable CBM systems such as vibration monitoring, current signature, temperature etc. Information from CBM systems to be interfaced to HMI system as well as plant-wide CBM system.

1.01.05.02 The capacities of the transformer shall be selected as per the following guidelines:

- MD of MCC, shall be calculated as per the guidelines given in clause no. 1.01.08 of the General Technical Specifications.
- Load factor of 0.9 shall be considered for motors being fed from 415V LTSS . The load factor shall be applied on the kW rating of motors. Only working motors shall be considered.
- Load of lighting transformer shall be considered as per the kVA rating of transformer.
- Where ACDB is provided along with the LTSS, then load of ventilation system with 0.9 load factor shall be considered.
- Diversity factor of 1.1 shall be used on the summation of MDs of various MCCs, motors, lighting transformers and ACDB.
- Spare capacity of 20% shall be provided for future use.
- Each LTSS shall be fed from two identically rated transformers.
- In case of outage of any transformer, the remaining transformer shall be loaded up to 80% of their rating.
- Transformer shall be selected from standard rating of 1000/2000 KVA only
- It shall be ensured that when all the loads are in operation and the largest motor is started, the voltage drop at the motor terminals shall not be more than 15%.

1.01.05.03 The rating of outgoing feeders of LTSS shall be selected from standard circuit breakers ratings of 800A, 1000A & 1600 A only considering the load requirement and derating factors due to ambient temperature as well as for the mounting of the component in the switch board. CTs shall be selected considering the actual loads.

1.01.05.04 11kV / 6.6 kV panel mounted load break switches with earthing switches of adequate rating shall be provided before feeding the transformer . Transformer pens shall also be provided with push button station for switching ON/OFF the corresponding 11kV / 6.6 kV upstream feeding circuit breaker.

In case of transformer of rating 5 MVA and above , following arrangement shall be followed:

- LBS (isolator) shall be provided in the transformer room, when transformer is fed from remote HT switchboard.
- Lockable type PB shall be provided in transformer room when transformer is fed from HT switchboard located in the same building.
1.01.05  AC squirrel cage induction motors shall be used for drives requiring speed control.
For all electrical machines wherever strip wound coils are used detail drawing is to be provided in soft copy.
Use of DC motors, AC slip ring motors shall be avoided to the extent possible.
Manufacturing drawing for parts – stator coils, slip ring, brush, brush holder in slipring motor’s and drawings of parts of armature coil, commutator, brush and brush holder in DC machine shall be provided in soft copy.
Sizes of conductors used in motors shall be preferred sizes as per IS.
Sufficient spares of parts of all electrical machines shall be provided..

1.01.06  Cabling
Tenderer shall note the following regarding cabling: -

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Requirement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Inter shop cable routing</td>
<td>Through overhead cable gallaries / structure or walkable cable tunnel.</td>
</tr>
<tr>
<td>2.0</td>
<td>Substation building</td>
<td>RCC cable basement of minimum 3.0 metres clear height.</td>
</tr>
<tr>
<td>3.0</td>
<td>MCC room</td>
<td>RCC cable trench / false floor at bottom of MCC</td>
</tr>
</tbody>
</table>
| 4.0    | Illumination system cable laying in all units. | 1. Unarmoured FRLS cables through MS black conduits in open area.  
2. Armoured FRLS without conduit in covered area.  
3. Unarmoured FRLS cables through concealed MS black conduits in buildings like control room, office building etc. |

1.01.07  Motor starting and permissible voltage dips:
- Voltage dip on starting of the largest L.T. motor shall be limited to 15% of the nominal voltage at the motor terminals.
- Maximum allowable voltage drop in any feeder under steady state condition shall be maintained as follows :-
  - Total voltage drop during running : 6%
  - LTSS to motor : 6%
  - LTSS to MCC/PDB/MLDB if in same building : 2%
  - MCC to motor for above case : 4%
  - LTSS to MCC/PDB/MLDB if in different building : 3%
  - MCC to motor for above case : 3%

Voltage drop at the terminal of other equipment shall be as per the minimum voltage required for proper functioning of the equipment recommended by their manufacturers.
1.01.08 Maximum Demand of MCC

Maximum demand (MD) of the MCC shall be calculated considering the following:

1. Working load of the MCC shall be calculated based on the motor kW rating.
2. The load factor shall be considered as follows:
   - For continuous drives – 0.9
   - For intermittent drives like sump pumps etc. – 0.6
   - For electrically actuated valves / dampers – 0.2
   - For maintenance loads like hoists, cranes etc. - 0.4
3. Welding and utility socket loads shall not be considered for calculation of maximum demand.
4. Load factor shall be applied on the kW rating of motor.
5. Diversity factor shall be considered as one.
6. Spare feeders shall also be considered for calculation of maximum demand as per guidelines indicated in Sl. No.2
7. Load of power supply feeders shall be corresponding to the load being fed with 0.9 load factor.
8. Cyclic load shall be converted to continuous load and shall be used for MD without load factor. (e.g. 22kW motor at 40% duty factor will have continuous load as 22xsquare root of 0.4)
9. 20% spare capacity shall be included in maximum demand for future use.

1.01.09 Incomer rating selection for MCC

1. All ACB I/C shall be intelligent type having standard protocol for communication
2. Incomer of the MCC shall be ACB / MCCB having fault level of 50 kA for 1 sec. MCCB shall be provided for ratings 630A and below. Standard ratings of ACB / MCCB shall be provided.
3. Continuous current rating of the incomer shall be corresponding to MD of the MCC.
4. In case of PMCC where MCC is directly fed from transformer, Continuous current rating of Incomer shall be equal to current rating of transformer.
5. In case ACB / MCCB is rated for 40 deg.C then continuous de-rated current in enclosure and for ambient temperature shall be more than MD / transformer current rating.
6. Main bus bar rating of MCC shall be equal to incomer rating.
7. Voltage rating of the breaker shall be equal to the incomer voltage of the system with rated tolerance (as mentioned in the relevant chapter).
8. Each MCC shall be provided with manual operated, draw out two nos. of incomers and one no. of bus coupler. Incomers and bus coupler shall be ACB / MCCB. ACB / MCCB shall be provided with overload, short circuit, earth fault and under voltage releases.
9. Each incomer and bus coupler shall be provided with indicating lamps for each phase for incoming supply and digital ammeter and voltmeter for measuring current in each phase and line to line voltages of MCC bus. ON, OFF and TRIP indicating lamps shall also be provided.
10. Incomer and bus coupler shall be mechanically interlocked in such a way that at any given time only two breakers can be closed. Electrical interlocks shall be provided as follows:
When both incomer ACBs / MCCBs are ON then bus coupler ACB / MCCB can not be switched ON.
When incoming power to one of the incomer is not available then bus coupler can be switched ON manually.
When incoming power to the incomer breaker is restored then incomer can be switched on manually and bus coupler will trip automatically.
Bus coupler closing is not permitted if the incomer trips on fault.

1.01.10 Outgoing Feeder Selection for MCC

1 Motor feeders shall be provided with MCCB, contactor, electronic thermal overload relay (with indication lamp for motor rating 37 KW and above) and other auxiliary equipment like selector switch, indicating lamps, auxiliary contactors etc. as per requirement (for non intelligent MCC).
2 Overload protection device shall be electronic overload relay as indicated in specification. In case electronic overload relay is provided then MCC module shall be provided with indicating lamps.
3 Motor control panel (MCP) for motor ratings above 90 KW shall be provided with motor protection numerical relay (for non intelligent MCC) as per specification. Other components same shall be same as motor feeders of MCC.
4 Power supply feeders shall be provided with MCCB and ammeter.
5 All PDB feeding non-critical loads shall be single fed system

1.01.11 Power Factor Compensation

In case power factor correction at LT level is specified in specification then APFC shall be provided in PMCC / LTPDB. The capacitor bank shall be so designed that the overall power factor of the system shall be 0.95.

1.01.12 Cable selection

.01 Incomers of MCC / PDB / MLDB

- Cable size for incomer of MCC & PDB shall be selected on the basis of current rating corresponding to MD and voltage drop.
- Cable size for incomer of MLDB shall be selected on the basis of current rating corresponding to lighting transformer and voltage drop.
- The standard size of the cable shall be 3.5 x 240sq.mm. of type AYFY as per IS:1554 (A2XFaY for XLPE insulated cables as per IS : 7098 Part-1).
- For calculating the current rating of power cables de-rating factor of 0.65 shall be used.

.02 Motors

- Cable size for LT motors shall be selected on the basis of rated nameplate current and starting & running voltage drop as per specification.
- Cable size for HT motors shall be selected on the basis of rated nameplate current, starting & running voltage drop as per specification and short circuit capacity of the system. The cable size shall be calculated based on the breaker opening time of 0.35 seconds.
- Minimum size of cable for LT motors shall be 4x6sq.mm. of type AYRY as per IS:1554 and maximum size of cable shall be 3.5 x 185 sq.mm. of type AYFY as per
IS:1554. In case copper conductor cables are used then the maximum & minimum size of cable shall be one size lower than as indicated above for aluminium cables.

- For motors rated up to 2.2 kW and actuators of motors of valves and dampers cable size of 4x2.5sq.mm. of type YRY as per IS:1554 shall be used.
- For calculating the current rating of power cables de-rating factor of 0.65 shall be used.

.03 Illumination System

- The minimum size of the cable for feeding power to SLDB or MCBDB having 32A incomer shall be 4x25sq.mm of type AYFY/AYY as per IS:1554.
- Cable size for MCBDB to light fittings shall be 2x2.5sq.mm. or 4x2.5sq.mm as per the configuration of fittings. The cable type shall be YRY/YY as per IS:1554.
- In case of concealed wiring, single core, PVC insulated, stranded copper conductor wire of size 1.5sq.mm in MS conduit shall be used. For utility sockets, cable size shall be 4sq.mm.
- Laying of cables shall be decided as per details indicated in the specification.
- Energy efficient smart lighting fixtures and controls to be used for buildings.

.04 Automation System

- All control cables connecting I/Os from field to marshalling panel of PLC or remote I/O panel shall be of stranded copper conductor of type YRY as per IS: 1554 and of size 1.5 sq. mm. minimum for PLC I/O or as suitable.
- Communication bus shall be laid in GI pipe. The route for redundant communication bus shall be different.

.05 General

- Minimum size of the cables used in LT power circuits shall be 6sq.mm per core if with aluminium conductor or 4sq.mm per core if with copper conductor. Maximum cable size shall be 240sq.mm for incomers to MCCs, PCCs etc. The minimum cable size selected for applications in the power circuits of cranes and other moving mechanisms shall be 6sq.mm per core copper. All power cables shall be 3.5 / 4 cores.
- For power supply to moving mechanisms subject to vibrations, flexible copper cables preferably of single core should be used. In these cases, a separate core should be provided for earthing. For hoists with flexible / festoon cable system, power supply shall be through butyl rubber / EPR insulated PCP/CSP sheathed flexible cables. Cables used for circuits of tacho generators, brakes, solenoids, field windings and secondary windings of measuring transformers shall be copper conductor with cross-sectional area not less than 2.5sq.mm per core.
- For control circuits, PVC insulated and PVC sheathed multicore cables with copper conductors having a minimum cross-sectional area of 2.5sq.mm per core shall be used. The number of cores may be standardized as 3, 5, 7, 10, 14, 19, and 24.
Each core of control cable with 7 core and above shall be numbered at every 1-meter interval.

- For signals like mA and mV, special screened/shielded cables shall be used.
- 20% spare cores shall be provided with minimum 1 spare core in multi-core control and signal cables.

1.01.13 Ventilation and Air Conditioning

The various electrical rooms of the plant shall be provided with ventilation and air conditioning facilities, as indicated below. Air dryer units to be provided wherever air is being used for purging / cleaning purposes.

.01 Substation building, MCC Rooms and Cable Cellar

All HT/LT substations, switch gear rooms and MCC rooms, cable basement/cellars which do not house any electronic equipment but contain only electrical equipment, shall be pressurized up to 2-3mm water column with cooled air washer system to maintain the room temperature at 45 deg.C irrespective of ambient temperature. Suitable capacity fan and pumps (1W+1S) shall be provided for each unit.

.02 Electrical rooms with electronic equipment / Central Control rooms

The electrical rooms housing electronic equipment like PLC, computers, Servers, Level –II systems, Remote I/Os, AC and DC variable speed drives, soft starters, UPS, electronic weighing panels, telephone exchange equipment etc. shall be installed in air-conditioned environment with pressurization to maintain the following conditions:

- Room temperature : Shall not be more than 35deg.
- Relative humidity : 50 to 60%
- Pressurization : 2-3 mm WC
- Temperature gradient : 2 Deg. C/h

For central control rooms standby air conditioners shall also be provided. Separate room, as part of control room shall be provided with window AC units.

.03 Small local Control Rooms/pulpits

The small control rooms/pulpits shall be air-conditioned to maintain the following conditions:

- Room temperature : 24Deg. C
- Relative humidity : 50-60%
- Pressurization : 2-3 mm WC

.04 Cable tunnels
These shall be ventilated with fresh filtered air to maintain exit air temperature at 40deg.C.
- Cable tunnel ventilation shall be sectionalized to maximum length of 150 m.
- Temperature rise shall be limited to 3-5 deg.C above atmospheric dry bulb temperature subject to a maximum of 40deg.C at the exit of air from these premises.
- Partition door between basement and the cable tunnel shall be air tight and of fire retardant material.
- All cable tunnels shall be properly ventilated.

.05 General

- Necessary ducting with air diffuser shall be provided.
- Ventilation and air conditioning system shall be interlocked with fire detection system for safety.
- Airtight double door arrangement shall be provided for electrical rooms, control rooms and basement.

1.01.14 Variable Speed AC Drives.

1. Continuous current of AC drives shall be decided as indicated below:
   - For continuous duty drives (variable torque drives) like pumps fans etc. :- 115% of motor full load rated current.
   - For motion control drives and intermittent duty drives : 150% of motor full load current.
   - For constant torque drives and multi motor drives like moving machines, hoisting etc. :- 150% of the summation of rated motor current for multi motor drives and rated motor current for hoisting drives.
2. All AC drives shall be rated for 380 – 480V, three phase with voltage variation as specified.
3. Isolation transformer shall be provided for drive more than 75 KW and line reactor shall be provided for drive less than 75 KW in incoming (line) side .
4. For 4 quadrant operation applications active front end, low harmonics, regenerative AC drive shall be provided for main drives, process cranes and major auxiliary drives..
5. For crane applications in hot areas where ambient is more than 50 deg.C thyristor converters (ASTAT or SIMOTRAS) shall be used .
6. Current rating of AC drive as innumerated above shall be calculated after de-rating to specified ambient temperature.

1.01.15 Control Philosophy

.01 General

Adequate and appropriate automation systems shall be designed and engineered using state-of-art and field proven technology to facilitate monitoring, control and all other functions associated with operation of all the plant/shop units through user-friendly human-machine interfaces.

The Automation system shall be designed with geographical & functional distribution of hardware in a multi-level hierarchy, viz. Level-0, Level-1, level-2, level-3 etc, as
applicable, to meet specific plant requirements for monitoring, control, process visualization & optimization of all the plants/shop units.

The automation system shall be structured in general, considering the following hierarchical levels:

- **Level - 0**
  
  This level, also called field level, is functionally responsible for generation, transmission & conversion of signals for the process parameters compatible to the higher level equipment as well as signal based activation for the final control elements.

  This level is realized based on the primary sensing elements, proximity switches, converters, microprocessor based intelligent systems and final control elements. The components of this level shall be grouped and distributed geographically around the plant as per main process equipment location.

- **Level-1**
  
  This level, also called supervisory level, is functionally responsible for supervision of the individual process equipment & functions, monitoring, control, visualization and regulation of process parameters to the desired level based on the signals generated from the field level. This level is also responsible for processing of signals for generating compatible control commands to control the process parameters by activation of the final control elements.

  This level is realized based on the controllers & systems, input & output systems, data base units, data communication, visualization system (HMI stations) and interface units for connectivity to the other levels of the automation system. In addition to routine PID functions, advanced process optimization functions comprising special control algorithms, mathematical computations etc. will be able to permit distribution of control and data acquisition functions throughout the entire plant.

- **Level-2**
  
  This level is functionally responsible for the process control functions through the Level-1 automation system by process guidance & optimization and control of process parameters to the desired level of perfection based on the available signals from the supervisory level. This level is also called process control level and is responsible for generating set points / control commands to the Level-1 equipment based on the pre-loaded process specific mathematical models. This level is realized based on the process computer & its own data base units, input & output systems, data communication systems, visualization system (HMI stations) and interface units for connectivity to the other levels of the automation system. Level-2 automation system has been covered under a separate General Specification.

The Level-1 automation shall basically comprise:

- A Programmable Logic Controller (PLC) based automation system

**.02 Modes of operation**
The following modes of operation shall be provided, it shall be in line with changes suggested in respective TS.

A. Local

Local Control Station (LCS) shall be provided for all motor and actuator drives. LCS shall have required numbers of push buttons for operation of drive.

In Local Mode, operation of single drive / equipment from LCS shall be provided. This mode of operation will generally be for test and repair purposes. To enable the testing of individual equipment all the interlocks shall be bypassed in this mode. However all critical equipment / drives shall be provided with hard-wired interlocking in MCC.

However for failsafe operation, potential free contact of Push Button from LCS and a potential free contact of field safety sensor shall be hard wired to MCC for safety reasons.

Drive can not be started from any place if the selector switch is in OFF position.

B. Remote

In Remote mode, the equipment can be started from control room only. This remote mode is further divided into following three modes:

- Operator mode
- Auto mode
- Computer mode (Level-2 system)

Once the remote mode of operation is selected then from HMI with help of key board / mouse / soft keys above three modes of operation can be selected.

Operator Mode

Under this mode it shall be possible to monitor & control the plant based on set points / commands given by operator through keyboard and the control, sequential operation of various mechanisms in the required sequence shall be executed by PLC with all interlocks. In this case all the changes / operations are operator initiated.

Auto Mode
This is the normal mode of operation of the plant. In this mode, the desired values (set point) of the parameters of process control loop will be set via keyboard of the HMI and sequencing and logic functions will remain operative through the PLC as per application software.

There shall be a provision for group start of drives in individual section with the required interlocks, logic and sequencing between the individual drives.

Computer Mode

In this mode the entire plant will be controlled through level-2 system. All the required set points will be generated by level-2 computer as per the mathematical model calculations based on the inputs received from the field. In case of failure of the level – 2 system all the set points will be automatically shift to operator mode of operation.

1.01.16 Spares Philosophy

The spare philosophy for various equipment shall be as follows:

1. LTSS, MCC, PDB and MLDB shall be provided with 20% spare feeders or one of each type whichever is higher with minimum of two numbers in each section
2. LDB, MCBDB for lighting and MCB DB for utility sockets shall be provided with minimum 9 nos. of spare feeders.
3. DC MCB DB shall be provided with 8 nos. of spare feeders.
4. ACDB of UPS shall be provided with 40% spare feeders.
5. 20% spare terminals shall be provided in each module of MCC, MCP and each ACB panel.
6. 20% spare terminals shall be provided in all junction boxes, LCS and local control panels / local starters.
7. Control desk and control cabinet shall be provided with 30% spare terminals.
8. Marshalling panel of MCC and PLC shall be provided with 30% spare terminals.
9. Relay panels / relay modules shall have 20% spare relays of each type fully wired up to the terminal blocks.
10. 20% spare interposing relays fully wired up to the terminal blocks shall be provided in PLC panels.
11. 10% spare components of each type shall be provided in each control desk /control cabinet / signaling panel.
12. Spare I/O philosophy for PLC shall be as follows:
    - Min. of 20 % of I/O modules used (with at least one module of each type) for input and output shall be offered as spare for each programmable controller and the same shall be mounted and wired to the terminal block in the cubicle suitably.
    - No. of spare Channel per card shall be 20 %.
    - Provision shall be provided with empty slots for future expansion for 20% I/O modules.
    - Minimum 50 % spare memory capacity shall be available in the system for Purchaser’s use after loading of application and system software.
1.01.17 **Uninterrupted Power Supply (UPS)**

UPS shall meet the following requirements:

1. Hot standby dual redundant UPS system shall be provided. Each UPS shall be rated for full capacity and under normal condition one UPS shall be sharing the total load. In case of failure of any UPS second UPS shall take the full load.
2. Spare capacity of UPS shall be 60%.
3. Load factor or diversity factor shall not be considered while calculating the load on UPS.
4. Two separate power supply from different sources shall be provided to UPS – one for UPS and the other for Bypass.
5. Bypass supply to equipment shall be through constant voltage transformer.
6. UPS and SMF batteries shall be located in air conditioned room.

1.01.18 **Colour coding of equipment.**

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>DESCRIPTION OF EQUIPMENT</th>
<th>COLOUR</th>
<th>PAINT SHADE NO. AS PER IS 5 : 1991</th>
<th>EQUIVALENT RAL CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>MOTORS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>11 kV/6.6 kV motors</td>
<td>Traffic Grey A</td>
<td>631</td>
<td>7042</td>
</tr>
<tr>
<td>2.</td>
<td>415 V LT AC motors</td>
<td>Silver Grey</td>
<td>631</td>
<td>7030</td>
</tr>
<tr>
<td>II.</td>
<td>MOUNTED ELECTRICS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Equipment installed on or along with motors viz. Tacho generators, brake etc.</td>
<td>Same as that of motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Equipment installed on mechanism but separate from motor viz. Limit switches, pull chord switches, belt sway switches, speed switches, load cells, photo electric relays etc.</td>
<td>Traffic Grey A</td>
<td>631</td>
<td>7042</td>
</tr>
<tr>
<td>III.</td>
<td>CONTROL GEAR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Drive panels, soft starter panels, UPS panels, PLC, Relay panels, MCC, PDB, MLDB, LDB, etc. including crane control panels</td>
<td>Light grey</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>2.</td>
<td>Lighting distribution and power distribution board</td>
<td>Light grey</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>3.</td>
<td>Fire fighting panel</td>
<td>Post office red</td>
<td>538</td>
<td>3002</td>
</tr>
<tr>
<td>4.</td>
<td>Local control box, Junction box</td>
<td>Light grey</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>5.</td>
<td>Control desk</td>
<td>Light grey</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>6.</td>
<td>Pulpit equipment</td>
<td>Light grey</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>7.</td>
<td>Telecommunication panel</td>
<td>Smoke gray</td>
<td>692</td>
<td>7014</td>
</tr>
<tr>
<td>IV.</td>
<td>MISCELLANEOUS EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Junction boxes</td>
<td>Light gray</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>2.</td>
<td>Conduit/pipe pull boxes</td>
<td>Light gray</td>
<td>631</td>
<td>7035</td>
</tr>
<tr>
<td>3.</td>
<td>Light fittings</td>
<td>Light gray</td>
<td>631</td>
<td>7035</td>
</tr>
</tbody>
</table>
**ILLUMINATION**

**1.0 General**

The lighting system inside and outside plant units are designed based on the desired illumination levels recommended by IS and the practices followed in industries, architectural arrangement, building dimensions including mounting height, environmental considerations, ease of maintenance and reliability of the lighting distribution network.

**2.0** The illumination system shall be designed as per IS:3646-1992. The level of illumination, type of fittings, maintenance factor to be considered is as given below:

<table>
<thead>
<tr>
<th>Area</th>
<th>Type of Light Fittings</th>
<th>Lux level</th>
<th>MF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control rooms</td>
<td>Louvered recessed type 2x40W &amp; 4x20W fluorescent fittings</td>
<td>300</td>
<td>0.75</td>
</tr>
<tr>
<td>Electrical rooms having PDB, MCC, VFD panels, PLC</td>
<td>Industrial corrosion proof fluorescent lamp fittings for 2x36W fluorescent lamps Philips type TKC 22/236 or equivalent</td>
<td>200</td>
<td>0.7</td>
</tr>
<tr>
<td>Staircases of plant buildings</td>
<td>- do -</td>
<td>70</td>
<td>0.6</td>
</tr>
<tr>
<td>Staircases (steel) of plant</td>
<td>Industrial well-glass integral type luminaire</td>
<td>70</td>
<td>0.6</td>
</tr>
</tbody>
</table>
complex and cable tunnels / cellars suitable for 70W HPSV lamps, similar to Philips type SDL-23/70 or equivalent

<table>
<thead>
<tr>
<th>Pump house</th>
<th>- do -</th>
<th>200</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood lighting</td>
<td>Weather proof flood light fittings for 1x400W HPSV lamps Philips type H/SVF12 or equivalent</td>
<td>70</td>
<td>0.5</td>
</tr>
<tr>
<td>Pipeline tunnel</td>
<td>Industrial fittings for 24V, 2x50W halogen lamps “Sigma” make deck lights or eqvt.</td>
<td>700</td>
<td>0.5</td>
</tr>
<tr>
<td>Casting Bay</td>
<td>High bay HPSV industrial incandescent (1000 W) equivalent to HDK /SDK of PHILLIPS make</td>
<td>200</td>
<td>0.5</td>
</tr>
<tr>
<td>Conveyor Houses / conveyor gantries / junction houses</td>
<td>Fluorescent / incandescent industrial type fitting equivalent to TPW / NXC of PHILLIPS make</td>
<td>70 to 100</td>
<td></td>
</tr>
<tr>
<td>Aviation obstruction</td>
<td>Aviation obstruction light fittings, flame retardant type consisting of multi ultra high intensity 60 mscp LED module, without flashing module, steady in red colour, having omni directional capability and shall be suitable to deliver maximum light output in the zone between 70° above and 10° below the horizontal with a maximum of condition at 20° above the module.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Standard wattage of lamps shall be

1. FTL
   36 W high luminous lamps.
2. HPMV
   250 and 400 W
3. HPSV
   70, 150, 250 and 400 W
4. Incandescent
   60, 100 W (Use of Incandescent lamps shall be avoided)

b) Compact fluorescent lamps are to be used for offices and corridors.

c) All switches and sockets used in office buildings shall be of flush type

d) For street lighting, necessary control gear shall be provided for reduced voltage running during off peak traffic for energy conservation.

Illumination: Electronic ballast having third harmonic distortion less than 6 % and total harmonic distortion less than 12 % with high luminous tube lights are to used. Time switches, reduced voltage controllers, group solar lighting sections for remote areas shall be provide wherever feasible. Lighting Fixtures and Accessories shall be energy efficient

### 3.0 Area Lighting :-

<table>
<thead>
<tr>
<th>Classification</th>
<th>Type of road</th>
<th>Av. Lux level</th>
<th>Type of illumination</th>
<th>of</th>
<th>MF</th>
</tr>
</thead>
</table>

### Group - A1 Important traffic road carrying fast traffic
- Cut off / semi cut off: 30
- MF: 0.6

### Group - A2 Main road carrying mixed traffic
- Cut off / semi cut off: 15
- MF: 0.6

### Group - B1 Secondary road with considerable traffic
- Cut off / semi cut off or non cut off: 8
- MF: 0.6

### Group - B2 Secondary road with light traffic
- Cut off / semi cut off or non cut off: 4
- MF: 0.6

**MF : Maintenance factor**

The light fittings shall be complete with all accessories like electronic ballast, reflector etc. External area lighting including street/road lighting / tower lights shall be fed from MLDB through separate SLDB located at suitable places. Automatic switching ON/OFF of these circuits shall be done through timers. Flood light towers shall be fed through 415/240V, 3 phase, 4 wire circuit with individual fittings distributed at 240V, single phase, with control and protection located at bottom of each tower. Rewirable fuse in a sheet steel box shall be provided near each fitting to facilitate removal of lamp in off position.

In high bays walkway shall be provided for maintaining light fittings. At other places suitable ladder/platform/approach shall be provided for maintaining/replacement of light fittings.

### B. Power distribution

1. **The distribution of lighting power supply for the individual areas shall be done at 415V, 3 phase, 4 wire bus system through Main Lighting Distribution Boards (MLDB) for the area. The MLDB shall be fed through a lighting transformer.** The outgoing feeders of the MLDB shall feed the required numbers of Sub Lighting Distribution Boards (SLDB) for lighting. Each SLDB shall receive power at 415V AC, 3 phase, 4 wire and distribute it into 240V, 1 phase circuits for connection to the lighting fixtures and 240V receptacles. The SLDB shall be located in the rooms, bays etc. covering the respective zone. The SLDB shall be located in the electrical rooms in the respective area.

2. **Emergency lighting**

In case of indoor illumination, separate lighting circuit shall be provided as emergency lighting circuit. Emergency lighting circuit shall be through emergency MCC/PDBs so that in case of failure of power in lighting DBs circuit, these lights can continue to glow. 20% lights shall be connected to this circuit. Balance lights shall be connected through lighting circuit.

Portable Emergency lighting including built-in battery, battery charger & lamps shall be provided in strategic areas like control rooms, staircases, entry of cable tunnels/basements, escape routes, etc. for safety.

3. **Maintenance lighting**

For maintenance lighting, power supply shall be fed from 240/26.5V small capacity step-down transformers to the 24V socket outlets.

4. **Outdoor lighting**
Flood lights for area lighting shall be mounted on towers/poles or building structures. Tower height shall be kept to an average of 22m.
Street/road lighting and boundary wall lighting shall be provided with HPSV/fluorescent lamp fittings mounted on poles of 9m to 11m height.
Neon aviation obstruction lights shall be provided on chimneys and other such tall installations as per regulation. M/S Binay or equivalent make aviation obstruction lights (LED type) shall be provided. For street lighting necessary control gear shall be provided for reduced voltage running during off peak traffic for energy conservation.

5.0 Power factor improvement
Power factor of all the light fittings shall be improved so that it is not less than 0.90. Power factor shall be improved by providing capacitor banks with discharge resistor in the light distribution or by providing capacitors with individual fittings.

C. SPECIFICATIONS :-
A. EQUIPMENTS AND COMPONENTS
1 Lighting Transformer

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Type</td>
<td>Dry Type</td>
</tr>
<tr>
<td>2.0</td>
<td>Power Rating</td>
<td>As per load calculation</td>
</tr>
<tr>
<td>3.0</td>
<td>Primary Voltage</td>
<td>415 V</td>
</tr>
<tr>
<td>4.0</td>
<td>Secondary Voltage</td>
<td>415 V</td>
</tr>
<tr>
<td>5.0</td>
<td>Connection</td>
<td>Star - Star</td>
</tr>
</tbody>
</table>

2.0 Main Lighting Distribution Board (MLDB)

A. General

| 1.0    | Type               | - Metal clad .                   |
|        |                    | - Non drawout type.              |
| 2.0    | Construction        | - Modular construction .         |
|        |                    | - Fully compartmentalized with metal / insulating material partition. |
| 3.0    | Enclosure class     | IP52                             |
| 4.0    | Type of execution  | Single front.                    |
| 5.0    | Mounting            | - Floor mounting.                |
|        |                    | - Free standing with ISMC 75.    |
| 6.0    | Installation        | Indoor.                          |

B. Constructional Features :-

| 1.0    | Sheet steel         | - 2 mm for load bearing members. |
|        | Material            | - 1.6 mm for non load bearing members. |
|        | CRCA                |                                   |
| 2.0    | Cable entry         | - Incomer :- Bottom cable entry. |
|        |                     | - Outgoing :- Bottom cable entry. |
| 3.0    | Design              | - Separate bus alley and cable alley on opposite side of the outgoing modules . |
- All the components shall be accessible from front.
- Each module to have covering at the bottom.

| 4.0 Interlocking & protection | - Module door interlocked with main power isolating devices.  
- Power circuit isolation device to have pad locking in the OFF position with door closed. |
|-------------------------------|-------------------------------------------------|
| 5.0 Operating height          | - Minimum :- 300mm  
- Maximum :- 1800 mm. |
| 6.0 Gland plate               | Undrilled removable bottom gland plates (3 mm thick) |
| 7.0 Miscellaneous            | - Neoprene rubber gasket shall be provided for all the doors, removable covers & between adjacent covers.  
- Lifting hooks for the panel.  
- Doors shall have concealed hinges. |
| 8.0 Labelling                 | Clear legible identification labels (anodized aluminium with white letters engraved on black background) with letter sizes of :-  
- 25-50 mm for MLDB panel  
- 5 mm for components and module name plates.  
- Danger board on front and rear sides in English, Hindi and local language. |
| 9.0 Earthing                 | - Two separate earthing terminals will be provided.  
- Bolted joints with tooth spring washers for good earth continuity.  
- Earth bus to run in all cable alley of the panel. |
| 10.0 Shipping length         | To be limited to 2.4 M. |
| 11.0 Limiting dimensions     | - Width of MLDB :- 2400 mm  
- Depth of MLDB :- 500 mm  
- Width of Cable alley :- 300 mm  
- Width of Bus alley :- 300 mm  
- Height of module :- 400 mm (min) |

### C. Busbars

(i) Main horizontal & vertical busbars

<table>
<thead>
<tr>
<th>1.0 Arrangement</th>
<th>Three phase &amp; neutral.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 Material</td>
<td>High conductivity electrolytic aluminium alloy confirming to grade E91E as per IS-5082 –1981.</td>
</tr>
</tbody>
</table>
| 3.0 Phase Busbar Rating | - Shall be able to carry continuously the connected load (considering all derating factors) plus a 25% margin.  
- Max. current density shall be  
  - 1.0 A/sq.mm for Aluminium  
  - 1.5 A/sq.mm for Copper. |
| 4.0 Neutral Busbar Rating | 50 % of phase busbar rating |
| 5.0 Short circuit rating | 50 KA for 1 sec. |
| 6.0 Busbar configuration | Red-yellow-blue from front to back or top to bottom or left to right as viewed from front. |
| 7.0 Busbar insulation | Heat shrinkable PVC  
- R,Y,B coloured sleeves for phases  
- Black for neutral. |
| 8.0 Busbar supporting insulators | Non-hygroscopic  
- Flame retarded |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>9.0</td>
<td>Max. temp. rise of bus</td>
<td>Not to exceed 35 deg. C. above ambient of 50 deg.C.</td>
</tr>
<tr>
<td>10.0</td>
<td>Air clearance for bare busbar</td>
<td>Phase to phase :- 25.4 mm (minimum) Phase to earth :- 19.0 mm (minimum)</td>
</tr>
<tr>
<td>11.0</td>
<td>Joints and tap off points</td>
<td>- Busbar joints and tap off points shall be shrouded and bolted (with cadmium coated bolts with plain and spring washers and locknuts). - Bimetallic connectors for connection between dissimilar metals. - Antioxide grease for all bus connections.</td>
</tr>
<tr>
<td>12.0</td>
<td>Neutral bus isolation</td>
<td>Through disconnecting link.</td>
</tr>
<tr>
<td>13.0</td>
<td>Vertical busbar</td>
<td>Rear side</td>
</tr>
</tbody>
</table>

(iii) Earth bus

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Material</td>
<td>GI.</td>
</tr>
<tr>
<td>2.0</td>
<td>Size</td>
<td>Minimum 50 x 6 mm with extension at both ends.</td>
</tr>
</tbody>
</table>

(iii) Control bus

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Material</td>
<td>Copper.</td>
</tr>
<tr>
<td>2.0</td>
<td>Size</td>
<td>Minimum 25 x 3 mm.</td>
</tr>
</tbody>
</table>

D. Insulation level

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Rated insulation voltage</td>
<td>1100 V</td>
</tr>
<tr>
<td>2.0</td>
<td>Impulse withstand voltage</td>
<td>4 KV as per IS-13947 (Part I) 1993</td>
</tr>
<tr>
<td>3.0</td>
<td>One minute power frequency withstand voltage</td>
<td>2.5 KV for power circuit &amp; 500 V for control circuit</td>
</tr>
</tbody>
</table>

E. Pollution Degree

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Pollution Degree</td>
<td>Pollution Degree 3 as per IS-13947 (Part-1) : 1993 ; unless otherwise stated</td>
</tr>
</tbody>
</table>

F. Feeder arrangement

Incomers

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Isolating Equipment</td>
<td>3 pole MCCB (for rating upto 630 A) (with E/F protection).</td>
</tr>
<tr>
<td>2.0</td>
<td>Quantity</td>
<td>Two incomer</td>
</tr>
<tr>
<td>3.0</td>
<td>Autochangeover</td>
<td>- Through contactor logic with suitable timer. - Normally only one Incomer shall be ON.</td>
</tr>
<tr>
<td>4.0</td>
<td>Indication Lamps</td>
<td>LED type indicating lamps for :- - MCCB ON/OFF/TRIP. - Power ON R / Y / B.</td>
</tr>
<tr>
<td>5.0</td>
<td>Meters and selector switches</td>
<td>- 144 sq.mm size voltmeter with 7 position selector switches - 144 sq.mm size ammeter with 4 position selector switches</td>
</tr>
<tr>
<td>6.0</td>
<td>Current transformer</td>
<td>3 numbers for metering.</td>
</tr>
</tbody>
</table>

Outgoing feeder arrangements

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Circuit breaker</td>
<td>Three pole MCCB.</td>
</tr>
<tr>
<td>2.0</td>
<td>Indications</td>
<td>ON/OFF/TRIP indication lamp.</td>
</tr>
<tr>
<td>3.0</td>
<td>Protection</td>
<td>All the equipment inside the boards shall be covered in front with a 3 mm thick bakelite sheet. Only the operating knobs of the equipment shall be projected outside the bakelite sheet for safe operation.</td>
</tr>
</tbody>
</table>
### G. Panel wiring

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0</strong></td>
<td>Power / current transformer circuit</td>
<td>1.1Kv grade single core, black colour PVC insulated, stranded copper conductor of minimum size 2.5 sq.mm.</td>
</tr>
<tr>
<td><strong>2.0</strong></td>
<td>Ferrules</td>
<td>- Numbered plastic/ceramic ferrules. &lt;br&gt;- Self locking type.</td>
</tr>
<tr>
<td><strong>3.0</strong></td>
<td>Marking</td>
<td>- Wiring will be properly marked as per relevant IS.</td>
</tr>
<tr>
<td><strong>4.0</strong></td>
<td>Terminals</td>
<td>- Power &amp; control terminals shall be segregated by insulating material like hylam / bakelite sheet. &lt;br&gt;- Power terminals will be stud type. &lt;br&gt;- Control terminals will be ELMEX type suitable for connecting two cores of 2.5 sq.mm wires. &lt;br&gt;- Minimum 20% spare terminals will be provided. &lt;br&gt;- The minimum rating of control terminal shall be 10 Amps.</td>
</tr>
<tr>
<td><strong>5.0</strong></td>
<td>Cable glands</td>
<td>Double compression cable glands for receiving external power and control cables</td>
</tr>
</tbody>
</table>

### 3.0 SUB LIGHTING DISTRIBUTION BOARD (SLDB)

<p>| | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0</strong></td>
<td>Type</td>
<td>- Metal clad &lt;br&gt;- Shall be suitable for 415/240V, 3 phase and neutral.</td>
</tr>
<tr>
<td><strong>2.0</strong></td>
<td>Construction</td>
<td>- Totally enclosed. &lt;br&gt;- Dust &amp; vermin proof. &lt;br&gt;- Welded back and sides.</td>
</tr>
<tr>
<td><strong>3.0</strong></td>
<td>Enclosure class</td>
<td>IP54. &lt;br&gt;IP 55 (with canopy) for outdoor installation.</td>
</tr>
<tr>
<td><strong>4.0</strong></td>
<td>Type of execution</td>
<td>Single front.</td>
</tr>
<tr>
<td><strong>5.0</strong></td>
<td>Mounting</td>
<td>Wall mounting.</td>
</tr>
<tr>
<td><strong>6.0</strong></td>
<td>Installation</td>
<td>Indoor / Outdoor (with canopy).</td>
</tr>
</tbody>
</table>

#### B. Constructional Features :-

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0</strong></td>
<td>Sheet steel CRCA</td>
<td>Thickness 2 mm.</td>
</tr>
<tr>
<td><strong>2.0</strong></td>
<td>Cable entry</td>
<td>- Incomer :- Bottom cable entry. &lt;br&gt;- Outgoing :- Top / Bottom cable entry.</td>
</tr>
<tr>
<td><strong>3.0</strong></td>
<td>Design</td>
<td>- One Incomer and outgoings. &lt;br&gt;- All the components shall be accessible from front. &lt;br&gt;- Access to the operating handle of the incoming isolating switch shall be from the front of the cubicle without opening the front door. &lt;br&gt;- Operating knobs of outgoing MCBs shall be accessible only after opening the front door of the cubicle. &lt;br&gt;- Protective insulated cover plate (3 mm thick bakelite sheet) shall be provided inside the cubicle to shroud all the live parts.</td>
</tr>
<tr>
<td><strong>4.0</strong></td>
<td>Gland plate</td>
<td>Undrilled detachable gland plates (3 mm thick) shall be provided at the top and bottom with suitable gaskets for cable entry.</td>
</tr>
<tr>
<td><strong>5.0</strong></td>
<td>Miscellaneous</td>
<td>- Neoprene rubber gasket shall be provided for all the doors, removable covers &amp; between adjacent covers. &lt;br&gt;- Suitable locking devices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| 6.0 | Labelling | - Clear legible identification labels (anodized aluminium with white letters engraved on black background) with letter sizes of:  
 | | - 5 mm for components and module name plates.  
 | | - Danger board on front and rear sides in English, Hindi and local language. |
| 7.0 | Earthing | - Two separate earthing terminals will be provided. |
| 8.0 | Limiting dimensions | - Width of SLDB: 800 mm  
 | | - Depth of SLDB: 300 mm  
 | | - Height of SLDB: 400 mm (min) |
| **C. Busbars** |   |   |
| 1.0 | Arrangement | Three phase & neutral. |
| 2.0 | Material | High conductivity electrolytic aluminium alloy confirming to grade E91E as per IS-5082-1981. |
| 3.0 | Phase Busbar Rating | - Shall be able to carry continuously the connected load (considering all derating factors) plus a 25% margin.  
 | | - Max. current density shall be  
 | | - 1.0 A/sq.mm for Aluminium  
 | | - 1.5 A/sq.mm for Copper. |
| 4.0 | Neutral Busbar Rating | 50% of phase busbar rating |
| 5.0 | Short circuit rating | 50 KA for 1 sec. |
| 6.0 | Busbar configuration | Red-yellow-blue, black for neutral. |
| 7.0 | Busbar insulation | Heat shrinkable PVC  
 | | - R,Y,B coloured sleeves for phases  
 | | - Black for neutral. |
| 8.0 | Busbar supporting insulators | - Non-hygroscopic  
 | | - Flame retarded  
 | | - Track resistant  
 | | - High strength  
 | | - Sheet moulded compound or equivalent polyester fibre glass moulded type. |
| 9.0 | Air clearance for bare busbar | Phase to phase: 25.4 mm (minimum)  
 | | Phase to earth: 19.0 mm (minimum) |
| **F. Feeder arrangement** |   |   |
| **Incomers** |   |   |
| 1.0 | Isolating Equipment | 3 pole ELCB  
 | | ELCB shall be of AC 23 duty category conforming to IS: 13947-1993 having fully shrouded contacts. |
| 2.0 | Quantity | One |
| 3.0 | Indication Lamps | LED type indicating lamps for:  
 | | - Power ON R / Y / B. |
| **Outgoing feeder arrangements** |   |   |
| 1.0 | Circuit breaker | DP MCB |
| **G. Panel wiring** |   |   |
| 1.0 | Power / current transformer circuit | 1.1Kv grade single core, black colour PVC insulated, stranded copper conductor of minimum size 2.5 sq.mm. |
| 2.0 | Ferrules | - Numbered plastic/ceramic ferrules.  
 | | - Self locking type. |
| 3.0 | Marking | - Wiring will be properly marked as per relevant IS. |
4.0 Terminals
- Power & control terminals shall be segregated by insulating material like hylam / bakelite sheet.
- Terminals shall be ELMEX type suitable for connecting two cores of 2.5 sq.mm wires.
- Minimum 20% spare terminals will be provided.
- The minimum rating of control terminal shall be 10 Amps.

5.0 Cable glands
- Double compression cable glands for receiving cables.

### 4.0 Control Room Switchboard

<p>| | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Location</td>
<td>Control room for controlling the lighting fixtures</td>
</tr>
<tr>
<td>2.0</td>
<td>Type</td>
<td>Flush mounted type</td>
</tr>
<tr>
<td>3.0</td>
<td>Construction</td>
<td>Fabricated from 14 SWG MS sheet with 6mm thick bakelite cover. Shall have conduct knockouts on the sides.</td>
</tr>
<tr>
<td>4.0</td>
<td>Switch mechanism</td>
<td>Quick make and quick break mechanism</td>
</tr>
<tr>
<td>5.0</td>
<td>Power source</td>
<td>The switchboards shall be fed from SLDB of respective area.</td>
</tr>
</tbody>
</table>

### 5.0 Transformer for 24V AC Sockets -

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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Type</td>
<td>Dry type. Step-down transformer. Air-cooled</td>
</tr>
<tr>
<td>2.0</td>
<td>Rating</td>
<td>Minimum 2500VA</td>
</tr>
<tr>
<td>3.0</td>
<td>Primary / secondary voltage</td>
<td>240V /26.5 V AC, single-phase</td>
</tr>
<tr>
<td>4.0</td>
<td>Construction</td>
<td>The transformer shall be enclosed in industrial wall mounting stainless steel (2 mm thick) box having separate chambers for the transformer, incoming and outgoing MCB’s.</td>
</tr>
<tr>
<td>5.0</td>
<td>Cable entry</td>
<td>Suitable knock-outs shall be provided at the top and bottom for cable entry through GI pipes.</td>
</tr>
<tr>
<td>6.0</td>
<td>No. of winding</td>
<td>Two winding</td>
</tr>
<tr>
<td>7.0</td>
<td>Protection</td>
<td>SPN MCB’s on primary and secondary side incorporating overload and short circuit releases.</td>
</tr>
<tr>
<td>8.0</td>
<td>Utility</td>
<td>Power supply to 24V repair network</td>
</tr>
<tr>
<td>9.0</td>
<td>Location</td>
<td>On structural platforms</td>
</tr>
</tbody>
</table>

### 6.0 24 V AC SWITCH SOCKET OUTLET

<p>| | | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Type</td>
<td>2 pole, 3 pin with third pin earthed industrial type receptacles</td>
</tr>
<tr>
<td>2.0</td>
<td>Rating</td>
<td>24 V AC 5A</td>
</tr>
<tr>
<td>3.0</td>
<td>Construction</td>
<td>Metal clad gasketed construction, weatherproof</td>
</tr>
<tr>
<td>4.0</td>
<td>Cable entry</td>
<td>Suitable for cable entry through 20mm dia. conduit.</td>
</tr>
<tr>
<td>5.0</td>
<td>Mounting</td>
<td>Wall / column mounting</td>
</tr>
</tbody>
</table>

### 7.0 240V SWITCH SOCKET OUTLET

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<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Type</td>
<td>1 pole, 3 pin with third pin earthed industrial type receptacles. non-reversible, metal-clad, dust proof, industrial type suitable for horizontal insertion.</td>
</tr>
<tr>
<td>2.0</td>
<td>Rating</td>
<td>240 V AC 15A</td>
</tr>
<tr>
<td>3.0</td>
<td>Construction</td>
<td>Metal clad gasketed construction, weatherproof</td>
</tr>
</tbody>
</table>
All socket outlets will be supplied with heavy-duty type plug and cap with chain.

| 4.0 | Isolation Switch | rotary type switch mounted flush in the socket outlet box. The isolating switches will be manually operated industrial type of category AC 22. |
| 5.0 | Protection      | Operating handle of the rotary switch will be fixed in such a manner that it will not be possible either to insert or withdraw the plug without switching off the supply. |
| 6.0 | Cable entry     | Suitable for cable entry through 20mm dia. conduit. |
| 7.0 | Mounting        | Wall / column mounting |
| 8.0 | Inscription     | Inscription plate will be provided indicating the voltage and current rating of the switch socket outlet. |
| 9.0 | Miscellaneous   | In hazardous area, flame proof switch socket outlet will be provided. |

8.0 Miniature Circuit Breakers

| 1.0 | Type                  | Heat resistant plastic moulded type |
| 2.0 | Ref. Standard         | IS: 8828 –1978 |
| 3.0 | Protections           | MCBs shall be provided with quick break trip-free mechanism and direct acting thermal overload and short circuit trip elements. |
| 4.0 | Short circuit capacity| Not less than 9000A at 0.8pf |
| 5.0 | Mounting              | DIN Channel mounting. Single phase MCBs mounted adjacent to each other and connected to different phases will be provided with adequate insulated phase barriers. |
| 6.0 | Current Rating        | The MCBs shall be selected from standard current ratings. (Asper SLD) MCB shall confirm to curve C. Motor duty MCBs will be provided, if specified. |

9.0 240 V SINGLE/ DOUBLE POLE SWITCHES

| 1.0 | Application            | The switches are intended for controlling lighting circuits |
| 2.0 | Type                   | Weather and dustproof and industrial type |
| 3.0 | Design                 | The rotary or toggle switches provided will be of sturdy design |
| 4.0 | Standard               | As per IS : 6875 (Part-3) - 1980 |
| 5.0 | Housing                | The unit will be housed in cast iron or cast aluminium box having gasketted, screwed front cover plate, fixing lugs and suitable provision for terminating conduit/cable at the top, bottom or sides as specified. |
| 6.0 | Mounting               | DIN Channel mounting. Single phase MCBs mounted adjacent to each other and connected to different phases will be provided with adequate insulated phase barriers. |
| 7.0 | Terminal suitability   | Terminals suitable for aluminium conductor cables. |

B. Cabling and Wiring

01 All wiring from SLDB to lighting fixtures and receptacles shall be carried out with 1100V / 650V grade PVC insulated and PVC sheathed unarmoured cable in MS / GI pipes. For each outgoing phase conductor from the MCB of SLDB, one no. neutral conductor shall be taken
from the same SLDB and shall run along with the phase conductor throughout the length of the cable run upto the luminaires.

02 All lighting cables for the entire complex shall be PVC insulated with copper conductors.

C. Lighting Fixtures and Accessories

01 All the luminaires will be designed, manufactured and tested in accordance with the Indian Standards in so far as they are applicable. Lighting Fixtures and Accessories shall be energy efficient

02 All the luminaires will be industrial type. Specification for the various types of sodium vapour and fluorescent fittings mentioned in the schedule of quantities will be followed. All the lighting fixtures will be complete with all parts along with lamps/tubes, control gears and accessories for installation and efficient performance whether specifically mentioned in the specification or in the schedule of items or not.

03 Individual light fittings will be provided with suitable gland arrangements for 3x2.5 sq.mm armoured copper cable entry unless otherwise specified. Terminals of all fittings will be suitable for taking 3x2.5 sq.mm, copper conductor PVC insulated and PVC sheathed cable.

04 All fittings will be supplied with all interconnections made and fully wired upto the terminal block.

05 All live parts will be provided with suitable sleeves to prevent accidental contacts. The earthing terminal in the fitting will effectively earth the body of the entire luminaire.

06 Dust and vapour tight fittings will have the enclosures suitably designed to withstand the heating effect.

07 The fixing arrangement of various components and lamps will be in such a way that the maintenance and replacement jobs can be easily carried out.

08 All flameproof equipment will be provided with flameproof plugs.

09 Flame proof fittings and control gearboxes will be provided as per relevant IS in hazardous area.

D. ILLUMINATION FITTINGS

1.0 OUTDOOR LIGHTING FITTINGS.

All road lighting fittings will be mounted on steel tubular poles with single/ double or triple outreach brackets having sodium vapour lamps. The fittings will be cut-off / semi cut-off distribution and integral type.

For lighting of open areas self-supporting steel towers shall be provided with flood light fittings and sodium vapour lamps.

2.0 FLUORESCENT FITTINGS

2.01 DECORATIVE FLUORESCENT LIGHT FITTING

Decorative type fluorescent tube light fitting complete with stove enamelled mounting rail, polyester filled ballast, spring loaded rotor lamp holders, starter holder and starter, power factor correction condenser to improve the power factor to 0.95 and acrylic diffuser. Provision will be made for mounting the fitting end to end in continuous row and/or for mounting individually using high impact black polystyrene end plate. All the fluorescent tube lights fixtures shall have electronic ballast having third harmonic distortion less than 6% and total harmonic distortion less than 12%.

2.02 INDUSTRIAL TYPE FLUORESCENT LIGHT FITTING
The fitting will have channel and reflector made of CRCA sheet steel with white cover plate. Channel and reflector will be finished with light Grey stove enamelled outside and white stove enamelled inside. The fitting will be complete with all electrical accessories like polyester filled ballast, starter, spring loaded rotor lamp holders, starter holder, power factor improvement capacitor to improve the power factor upto 0.95 etc. All the fluorescent tube lights fixtures shall have electronic ballast having third harmonic distortion less than 6% and total harmonic distortion less than 12 %

All types of fluorescent fittings will be suitable for mounting on wall/ceiling/conduit suspension.

2.02.1 WELL GLASS FITTINGS
Well glass lighting fitting will be fitted with sodium vapour or mercury vapour lamps. These fittings will be suitable for hanging by means of hangers, brackets, hooks etc. as required. All fittings will be integral type.

2.02.2 FLOOD LIGHT FITTING
- Sodium vapour flood light fittings are required for area lighting as specified in schedule of quantities.
- The Flood light fitting will be weatherproof and suitable for outdoor duty. The housing/enclosure will be of die cast Aluminium alloy and finished with hammertone Grey. The enclosure of the luminaries will be provided with a flat toughened glass in the front. Adequate gasketting will be provided with synthetic rubber for making the luminaries completely weatherproof. The fitting will be provided with facility to position the luminaries for effective lighting at the target area. The fitting will also be provided with graduated protractor to aid accurate aim and ensure a con-trolled light distribution.
- High quality polished Aluminium will be used in the reflector to ensure powerful light beams. The reflector will be anodised to enhance the longevity and contoured in multiple segments for optimum optical performance. The fitting will be provided with GES porcelain lamp holder. The control gear housing (separate control gear-non-integral type) will be housed with copper wound ballast, perfected improvement capacitor and terminal block. An electronic igniter will be provided in the luminaries.
- All the control gear components will be pre-wired in all respects and terminated to the terminal block for incoming cables. The fitting will be provided with earthing terminal and wiring will be done by multi-strand copper conductor. All the fasteners will be electroplated and passivated. The fitting will be suitable for twin/Single 400 watts HPSV lamps.

2.02.3 STREET LIGHT FITTING
- Street light fittings will be suitable for outdoor duty in weatherproof, single piece die cast Aluminium enclosure, finished with epoxy paint outside and stove enamelled inside. The fitting will be provided with GES porcelain lamp holder, and anodised Aluminium reflector with facility for obtaining cut off as well as semi-cut off light distribution. These will also be provided with high transparency clear acrylic cover with neoprene rubber gasket to make them absolutely dust and weather proof. Control gear compartment will be provided with detachable CRCA steel, pre-wired with ballast, capacitor, igniter and terminal blocks for incoming supply. Fittings will be provided with earthing terminals and wiring will be done with multi-strand copper conductor.
- All the fasteners will be electroplated/passivated and mounting arrangement will be suitable for direct mounting on poles having maximum 65 mm. OD with provision for holding the pipe in extended portion of control gear by means of clamps

2.02.4 FLAME PROOF FITTINGS
Flame proof type fittings will be well glass type luminaries suitable for use with HPLN 250W (High pressure Mercury Vapour) lamp with separate control gear complete with copper ballast, power factor improvement capacitor, terminal block enabling loop-in-loop out connection. Both fittings & control gear will be of cast Aluminium alloy LM6 or cast iron stove enamel, Grey hammertone finish outside and white inside.

The control gear box and enclosure for fittings will have certification from CMRS, Dhanbad and will be suitable for gas groups IIA & IIB as per IS 2148-1981. The fittings will be designed as per IS 2206 (Part-I) -1987. The material for cable gland will be brass/stainless steel/aluminium alloy LM6 and will be double compression type suitable for indoor/outdoor use. These are must for every flameproof fittings and accessories.

2.02.5 CONTROL GEAR, LAMP & ACCESSORIES

- **Lamps**

  Sodium vapour lamps will be suitable for universal burning position. The characteristics of the lamps will be in line with the relevant Indian Standards. The outer bulbs will be elliptical heat resistant type, evacuated to minimise heat losses and coated with light diffusion film for pleasing colour discharge. The lamp will be provided with corrosion resistant, nickel-plated screw base.

- **Ballast’s**

  All ballast’s will be of proven design and capable of delivering long trouble free service. The ballast’s will be made up of low loss silicon with steel lamination and will be wound with polyester-based super enamelled copper wire. The ballast will be polyester filled and able to dissipate the heat efficiently so as to keep the temperature rise well within the limits specified in the IS.6616-1972. The ballast will be provided with tapping at 200,220 and 240 volts and will be suitable for HPSV lamps.

- **Capacitors**

  Capacitors will have element wound from layers of high purity Aluminium foils laid over the two faces of capacitor paper. The Aluminium cylindrical case containing the elements will be dried under high vacuum and impregnated before being sealed. The solder type lug terminals will be mounted over porcelain insulators at the sealed end and the capacitor will conform to IS: 1569. The value of capacitance will be chosen as to raise the power factor of burning lamps to above 90%.

- **Igniters and Starters.**

  Igniters for HPSV lamps will be of proven design and capable of delivering long trouble free operations. The igniter and starters will be suitable for tropical condition and conform to IS: 2215-1968.

- **Lamp and Starter Holders**

  Lamp and starter holders will have good spring contacts and of well tried out design. The spring contact will be such as to prevent disconnection due to vibration during cleaning. They will also have facility for easy removal.

3.0 Street Lighting Poles

Lighting poles will be fabricated from GI of specified section with joints swaged together when hot and bevelled on outside edges. A weatherproof sheet steel junction box will be provided at the bottom of the pole and contain fuse, neutral link, bolted type terminals, grounding stud etc. The bolted type terminals will be suitable for receiving 4 x 16 mm² AYFY cables with loop-in-loop out arrangement GI conduits will be embedded in the muff for incoming and outgoing cables.
The street light poles of 9M height will be conforming to: 410-SP-29
The street light poles of 7M height will be conforming to : 410-SP-3
All erection consumables like bricks, sand, cement stone chips etc. for foundation of poles will be supplied & erected

4.0 High Mast Lighting Tower

4.01 Mast Proper

The mast will be 30 meter’s high and designed in such a manner that it is capable of withstanding external forces exerted by wind pressure as per IS: 875 (Part 3)-1992 along with load of the lantern carriage assembly.

4.02 Mast Construction

The mast will be fabricated from special steel plates conforming to BS 4360 cut and folded to form number of polygonal sections, giving a continuous tapered profile for stability and aesthetics. Silicon content in steel should not exceed 03% for good quality galvanisation. Bottom section will be provided with plate welded to it for anchoring the mast to a reinforced concrete foundation block. To increase the strength, gussets will be provided.

The bottom section will be accommodate winch, electric drive etc. and for the safety of the same a vandal resistant and weather proof door will be provided with locking arrangement.

The fabricated and welded mast sections as detailed above will be hot dip galvanised with a minimum thickness of coating 90 microns conforming to IS 4759-1996, IS: 2629-1990 & IS: 2633-1992, both internally and externally.

After the delivery of the mast at site, these will be jointed by slip stressed fit method with necessary stressing equipment. No site welding or bolted joints will be accepted. Earthing terminal will be provided on the mast base and feeder pillar-box as per relevant ISS.

The mast will be provided with suitable aviation obstruction lamp.

4.03 Head Frame

The head frame designed to be a capping unit of the mast will be of welded steel construction, galvanized internally and externally after assembly.

The head frame assembly will accommodate specially designed LM 6 die-cast pulleys to accommodate the wire ropes and cable. Pulley construction will ensure that wire rope does not jump out of the grooves.

The suspension arrangement for lantern carriage will be with three ropes of stainless steel running on three on three pulleys for superior stability. There will be a separate pulley for running the electric supply cable.

The pulleys will run on stainless steel shaft/spindles and will be self lubricating type.

The whole head frame assembly will be covered and protected by steel canopy, hot dip galvanized internally and externally and secured to frame by stainless steel hardware.

4.04 Lantern Carriage

It will be of mild steel construction and hot dip galvanized internally and externally. The lantern carriage will be so designed and fabricated to hold designed number of flood light fittings and their control gearboxes, radically symmetrical. All junction boxes, Controlgear, fittings etc. mounted on the lantern carriage will be on non-corrodable material with class of protection IP 55.
At the top docking position, combined guides and stops will ensure concentricity between the lantern carriage and the masthead. The stops will also help to ensure proper levelling and positioning of the lantern carriage at its top position. All the lower docking position, the lantern carriage will rest firmly at a maintainable height from the ground level with the help of stoppers for ease of maintenance.

During lowering/raising operation the design will ensure that there is no damage caused to the mast surface and any other parts installed.

4.05 Winch Assembly

The winch will be self sustaining and self lubricating type specially designed without the need of breaks, springs or clutches, and will consist of two drums fabricated from steel with machined grooves and mounted inside the mast at a convenient height from the base.

The wire rope will be wound on the drum with one end attached to the lantern carriage while the other end is clamped to the winch drum. The design will ensure no inter winding of the fitting ropes.

At least four turns of rope will remain on the drums when the lantern carriage is fully lowered.

4.06 Support Ropes

The support ropes will be of stainless steel and will be capable of safely handling the lantern carriage load.

4.07 Supply cables.

Power supply cables will be class B insulated with required number of cores provided with multi-pin heavy duty locking type male/female connectors at the end. Pulley assembly will accommodate extra cable for emergency supply.

Test load will be of 5-meter length 5-core 2.5-mm² copper conductor cable with multi-pin heavy duty locking type male/female connectors at the ends. Under no circumstances the test lead will travel through the mast.

4.08 Foundation

The design and construction of foundation for high mast lighting tower will be included in the scope of the contractor. The contractor will consider the following indicative data as design parameter for high mast. However the actual data will be indicated during tender scrutiny.

a) Soil bearing capacity at 1-Metre depth  :- As per data supplied by Purchaser (BSP)

b) Wind speed  :- As per data supplied by Purchaser (BSP)

c) The Contractor will submit the design drawings for approval of MECON for high mast based on soil bearing capacity and wind speed. The Contractor will be responsible for safe & efficient erection of the mast.

4.09 Electric Drive & Fittings

The drive will be 3 phase, 415 volt, 50 Hz, class B insulated, flameproof type induction motor/geared motor with suitable torque limiter.

The motor will be mounted on MS hot dip galvanised plate inside the mast with a possibility of adjusting its position. The drive will be capable of taking the load of whole lantern carriage with luminaries, control gearboxes, aviation obstruction light mounted on it.

Manual handle will be supplied along with power tool for operating the winch manually in case of power failure. Reversible type starters for motor, contactors for lighting circuit, MCB isolator switch etc. will be provided in a flame proof & weatherproof enclosure.
4.10 Light Fittings

The light fittings will be of flood light type with twin 400-watt HPSV lamps. The quantity, mounting position/angle and optical characteristics will be decided on the basis of the following illumination requirement.

Minimum 30 lux illumination will be achieved at a horizontal distance of 30 meters from the bottom of the mast all around. Illumination level of 10 lux will be sufficient at plant boundary wall, parking area, Administrative Building, etc. Minimum of 3-5 lux is required to be achieved at a horizontal distance of 125 Metre from the bottom of the mast towards all area. Minimum 20 lux will be achieved in the areas adjoining at the perimeter of 40 meter (approx.) radius considering the mast base at the centre.

All lighting performances will be checked holding the lux meter in horizontal plane at ground level.