TENDER DOCUMENT

TENDER NO.: DLI/C&E/WI-675/316

FOR

Tender for Supply, Fabrication and Painting (Two Coats Primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the Project of “Augmentation of Fuel & Flux Crushing Facilities (Package No. – 064)” for Bhilai Steel Plant at Bhilai, Chhattisgarh”

VOLUME – I

NOTICE INVITING TENDER

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7, Institutional Area,
Lodhi Road, New Delhi-110003
Tel No. 011-24361666 Fax No. 011-24363426
Email: core@engineeringprojects.com
<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 Tenderer (Suppliers)</td>
</tr>
<tr>
<td>4.</td>
<td>Addendum to Instructions to Tenderers (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>Proforma for Bank Guarantee in Lieu of Earnest Money Deposit</td>
</tr>
<tr>
<td>8.</td>
<td>Procedure for e-tendering / e-procurement</td>
</tr>
</tbody>
</table>
ENGINEERING PROJECTS (INDIA) LTD.
(A Govt. of India Enterprise)

NOTICE INVITING e-TENDER (NIT)

DLI/C&E/WI-675/316

Date: 23.07.2019

Tender for Supply, Fabrication & Painting (Two Coats of Primer) “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the project of “Augmentation of Fuel and Flux Crushing Facilities (Package No. 064) of Bhilai Steel Plant (SAIL), Bhilai, Chhattisgarh”.

Engineering Projects (India) Ltd. invites the online item-rate offer for the above work through e-Tendering for Bhilai Steel Plant (SAIL) in Chhattisgarh from eligible vendors for the following work:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of work</th>
<th>Period of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Supply, Fabrication and Painting (two coats primer) of &quot;Horizontal Gravity Take-up Unit for Conveyor Y7-12 &amp; Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 &amp; RSC-L118” for the Project of “Augmentation of Fuel &amp; Flux Crushing Facilities (Pkg-064) for Bhilai Steel Plant at Bhilai, Chhattisgarh”.</td>
<td>2 (Two) months from the date of issue of LOI or 45 days from the date of handing over of last approved drawings, whichever is later.</td>
</tr>
</tbody>
</table>

The brief scope of work included in this tender shall include (but not limited to) manufacturing, shop fabrication, assembly, testing & inspection at manufacturer’s works, painting (two coats primer), packing, dispatch, transportation, delivery to site of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” at Bhilai Steel Plant (SAIL), Bhilai, Chhattisgarh. The detailed scope of work is given in the tender document.

Time schedule of tender activities:

i) Last Date & Time of Online Submission of Tenders: On or before 13.08.2019 upto 10:30 AM

ii) Date & Time of Online Opening Cover-1 (Techno-Commercial Bid): 13.08.2019 at 11:00 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. Joint ventures are not allowed to bid in the tender.

i) The Bidder should have experience of executing following similar work during last five years ending last day of the month previous to the one in which applications is invited.

   a) One similar work of min. value of ₹ 13.84 Lakh or
   b) Two similar work of min. value of ₹ 10.38 Lakh each or
   c) Three similar work of min. value of ₹ 6.92 Lakh each

Similar work means supply, fabrication and painting work of “Technological Structures/ Take-up units/ Wheel Assembly for Conveyors” in steel plant/ power plant/other industrial project.
ii) Bidders should submit documentary evidence like completion certificate/certified invoices from client and copy of work order in support of the execution of “similar works”.

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

iv) Bidder should have valid GST Registration No. Copy of the GST Registration is to be enclosed unless they are exempted from GST.

v) Should have average annual turnover of minimum ₹ 8.65 Lakh during last three financial years ending on 31.03.2018 and copies of audited balance sheets of FY 2015-16, 2016-17 & 2017-18 are to be submitted. Certificate from Chartered Accountant is to be enclosed for this purpose.

vi) Should not have incurred loss in more than 2 year in last five financial years ending on 31.03.2018. Certificate from Chartered Accountant is to be enclosed for this purpose.

vii) Should submit “Solvency Certificate” issued by a nationalized/scheduled bank for a minimum value of ₹ 6.92 Lakh issued within 6 months from the original/first date of submission of tender as per NIT.

Documentary evidence such as attested copy of work order, completion certificates/performance certificates of previous works executed by them indicating value of each order with date of completion, audited balance sheets shall be submitted by the Bidder failing which the offer shall be rejected.

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

2.0 Bidders have to submit confirmation letter whether they are registered under NSIC/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 Cover-1 and a request letter for claiming exemption from submission of Tender fee and EMD.

3.0 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>
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</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Vol – I</td>
<td>Notice Inviting Tender (NIT)</td>
</tr>
<tr>
<td>ii)</td>
<td></td>
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</tr>
<tr>
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</tr>
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<td></td>
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</tr>
<tr>
<td>ix)</td>
<td>Vol – II</td>
<td>Price Bid Format</td>
</tr>
<tr>
<td>x)</td>
<td>Vol – III</td>
<td>Technical Specifications</td>
</tr>
<tr>
<td>xi)</td>
<td>Vol – IV</td>
<td>Drawings</td>
</tr>
</tbody>
</table>
4.0 In order to participate, the bidder should have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities.

5.0 Interested bidders have to necessarily register themselves on the portal https://www.mstcecommerce.com/eprochome/epil through M/s MSTC, 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, 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, New Delhi directly, as and when required, for which contact details are mentioned above. EPI 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.

6.0 Bidders can download the bid document from the portal without paying document fees in advance, any time from 18:00 Hrs on 23.07.2019; 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. Tenders submitted without Tender Fees or inadequate Tender Fees shall be rejected.

7.0 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 Cover 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 cover (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 cover 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 ₹ 34,600.00 (Rupees Thirty Four Thousand Six Hundred 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 favouring ”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, favouring ”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 bid shall be valid for 90 days from date of opening of Price Bid. **Bidders submitting EMD through BG, need to attach SFMS form from the BG issuing Bank.**

**Tender fee, EMD (in original), Relevant Documents, NSIC/MSME certificate as per Clause No. 2 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.**

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

9.0 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.

10.0 EPI shall have right to verify any or all documents submitted by the bidder from the issuing authority for its correctness. If found false/ forged the offer will be summarily rejected and entire amount of EMD will be forfeited.

11.0 In case of non-approval of PARTY’s association with EPI for this work by BSP/MECON due to any reason, the tender submitted by them shall be rejected and the PARTY shall have no claim/liability on EPI.

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 MSTC 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 PQ documents/BG from the concerned department/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, 2331
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

18.0  For site related Queries/Visit:

Shri Praveen Kumar, Site Incharge
ENGINEERING PROJECTS (INDIA) LTD.
B- 32, Phase –II, Surya Vihar,
Bhilai, Chhattisgarh – 490020
Mobile No.: 09425296110

For more information on EPI, visit our website at: www.epi.gov.in
For more information on the e-tender, visit website of M/s MSTC at: https://www.mstcecommerce.com/eprochome/epil
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 Envelope-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 and / 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 / Authorised 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 Supply, Fabrication and Painting (two coats primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the project of “Augmentation of Fuel and Flux Crushing Facilities (Package No. 064) of Bhilai Steel Plant (SAIL), Bhilai, Chhattisgarh”.

NIT No.: DLI/C&E/WI-675/316

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<tr>
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<th>Description</th>
<th>Values/Description to be applicable for relevant clause(s)</th>
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<tbody>
<tr>
<td>i.</td>
<td>Name of work</td>
<td>Supply, Fabrication and Painting (two coats primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 &amp; Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 &amp; RSC-L118”</td>
</tr>
<tr>
<td>ii.</td>
<td>Owner/Client / Employer</td>
<td>Bhilai Steel Plant (SAIL), Bhilai</td>
</tr>
<tr>
<td>iii.</td>
<td>Type of Tender</td>
<td>Item Rate</td>
</tr>
<tr>
<td>iv.</td>
<td>Earnest Money Deposit</td>
<td>₹ 34,600.00 (Rupees Thirty Four Thousand Six Hundred Only)</td>
</tr>
<tr>
<td>v.</td>
<td>Estimated Cost</td>
<td>-</td>
</tr>
<tr>
<td>vi.</td>
<td>Time of completion of work</td>
<td>2 (Two) months from the date of issue of LOI or 45 days from the date of handing over of last approved drawings, whichever is later</td>
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<tr>
<td>vii.</td>
<td>Mobilization Advance</td>
<td>Not applicable</td>
</tr>
<tr>
<td>viii.</td>
<td>Interest Rate on Mobilization Advance</td>
<td>Not applicable</td>
</tr>
<tr>
<td>ix.</td>
<td>Number of Installments for recovery of Mobilization Advance</td>
<td>Not applicable</td>
</tr>
<tr>
<td>x.</td>
<td>Validity of Tender</td>
<td>90 (Ninety) days from the opening of price bid of the tender by EPI</td>
</tr>
<tr>
<td>xi.</td>
<td>Security Deposit cum Performance Guarantee</td>
<td>5% of contract value in the form of Bank Guarantee within 10 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 from 7 days of issue of Letter of Intent (LOI)</td>
</tr>
<tr>
<td>xiii.</td>
<td>Defect Liability Period</td>
<td>As per clause no. 19 of APC</td>
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<tr>
<td>xiv.</td>
<td>Arbitration</td>
<td>Arbitration shall be as per provision of clause no. 31 of APC</td>
</tr>
<tr>
<td>xv.</td>
<td>Jurisdiction</td>
<td>Courts at <strong>DELHI/NEW DELHI</strong></td>
</tr>
</tbody>
</table>

**SIGNATURE OF BIDDER**

**NAME (CAPITAL LETTERS)** : ________________________________

**OCCUPATION** : ________________________________

**ADDRESS** : ________________________________

____________________

**SEAL OF BIDDER**
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 General Manager (Contracts)
   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 Resolution 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 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 the tender which are not acceptable, Engineering Projects (India) Limited without prejudice to 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:

Being an e-Tender, Tender is to be submitted as per “Procedure for E-Tendering/E-Procurement”.

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

Being an e-Tender, Tender is to be submitted as per “Procedure for E-Tendering/E-Procurement”.

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

Being an e-Tender, Tender is to be submitted as per “Procedure for E-Tendering/E-Procurement”.

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 covers:

1**st** Cover (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 cover.

In this cover the tenderer should also upload the complete tender documents digitally signed as their acceptance. Deviations if any, to be submitted in this cover.

Bidders have to submit confirmation letter whether they are registered under NSIC/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 Cover-1 and a request letter for claiming exemption from submission of Tender fee and EMD.

2**nd** Cover (Price Bid)

The form of Price Bid duly filled in with the item rates both in words and figures shall be uploaded on the portal in this cover. No terms and conditions or deviations if any or any other thing shall be uploaded in this cover.

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/their 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 air respectively 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 upto 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 non-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 alongwith 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 alongwith 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.
ADDITIONAL PURCHASE CONDITIONS (APC)

1.0 The following Additional Purchase Conditions shall be read in conjunction with General Purchase Conditions. If there are any provisions in these Additional Purchase Conditions, which are at variance with the provisions of General Purchase Conditions, the provisions in these Additional Purchase Conditions shall take precedence.

Clause No. 11, 20, 21 and 22 of General Purchase Conditions (GPC) is not applicable to this Tender.

2.0 SCOPE OF WORK INCLUDED IN THE CONTRACT

The brief scope of work included in this tender shall include (but not limited to) supply, fabrication & painting (Two coats of Primer as per GS-09 of Vol-III), inspection at manufacturer's works, packing, dispatch, transportation, delivery to site of ‘Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118’ for the project of “Augmentation of Fuel & Flux Crushing Facilities (Pkg-064) for Bhilai Steel Plant at Bhilai, Chhattisgarh” as per BOQ, technical specification and approved drawings.

Following is also included in the scope of work:

i) Representative of successful bidder should be available at site during unloading of Take-up & Wheel Assembly Units to ensure completeness as per drawing.

3.0 USE OF STEEL:

The contractor shall have to use such items of steel as are manufactured by SAIL only. If some of the material are not available with SAIL necessary NOC is to be issued by EPI/BSP for procurement from other reputed and integrated steel manufacture like JINDAL, ESSAR, ISPAT, TISCO, RINL etc.

4.0 QUALIFICATION OF TENDERERS

To be eligible for this tender the bidders should fulfill the requirements for eligibility as mentioned in the Notice Inviting Tender (NIT). The Bidders are required to fulfill all the eligibility criteria as stipulated in NIT and elsewhere in the Tender documents. The price bid of bidders who fulfill 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.

5.0 DISQUALIFICATION

In addition to clause no. 14 of Instructions To Tenderers (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
incompletion, 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.

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.

6.0 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.

7.0 PAYMENT TERMS

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

Following breakup of payment shall be followed:

i) 95% payment shall be released progressively on delivery of material at site.

ii) 5% payment shall be released after 6 months from the date of receipt of last consignment.

8.0 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.

9.0 While raising invoice for such goods, the invoice should contain the following:

a) Tax payer Identification Number under GST Act.

10.0 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 sub-contractor. 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.

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

12.0 COMPLETION PERIOD

Completion of the total work as mentioned in the NIT & tender documents shall be 2 (Two) months from the date of issue of LOI or 45 days from the date of handing over of last approved drawings, whichever is later.

13.0 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.

14.0 GUARANTEE

The bidder shall guarantee that the materials and workmanship of the items supplied by him, under these specifications shall be new and first class in every respect. 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.

15.0 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 their own cost.
16.0 LICENCES

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

17.0 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 themself 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.

18.0 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.

19.0 DEFECTS LIABILITY PERIOD

The Contractor shall be responsible for the rectification of defects in the works for a period of 12 (twelve) months from the date of completion of last lot of supply. 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.

20.0 The bidder shall give performance tests of the entire installation(s) as per specifications and drawings before the work is finally accepted and nothing extra whatsoever shall be payable to the bidder for these performance tests.

21.0 BOQ

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.

22.0 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.

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

24.0 Care shall be taken in handling of material to avoid damage. Any damages made to the equipment during transit shall be made good by the bidder at their own cost.

25.0 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.

26.0 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.

27.0 SECURED ADVANCE AGAINST NON-PERISHABLE MATERIALS:

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

28.0 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 department as 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.

**29.0 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.

**30.0 CENVAT/ITC ON GST**

30.1 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.

30.2 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.

**31.0 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:

31.1 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.

31.2 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.

31.3 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.

31.4 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.

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

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

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

31.8 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 thereunder 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:-

A. 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
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.
PROFORMA FOR BANK GURANTEE 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................. 201...

For and on behalf of the Bank

NOTE: on a Non-Judicial stamp paper of Rs. 100/- (Rupees One hundred only)
Procedure for e-tendering / e-procurement

Bidder’s guide for EPIL portal:

1. Use browser to go to 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.

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:
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**
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.

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, 2331 Fax No. – 011-24363426  
E-mail - core@engineeringprojects.com

For any assistance during bid submission, system settings etc. bidders may contact at MSTC:

Phone Number: 033-22901004, 011-23212357, 011-23215163, 011-23217850  
Email: mstcnro@mstcindia.co.in  
Please mention “Helpdesk” as subject while sending emails  
Availability: 10 AM to 5:30 PM on all working days.

**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 ₹34,600/- (Rupees Thirty Four Thousand Six Hundred 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, 2331 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.
TENDER DOCUMENT

TENDER NO.: DLI/C&E/WI-675/316

FOR

Tender for Supply, Fabrication and Painting (Two Coats Primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the Project of “Augmentation of Fuel & Flux Crushing Facilities (Package No. – 064)” for Bhilai Steel Plant at Bhilai, Chhattisgarh”

VOLUME – II

PRICE BID FORMAT
**PRICE BID (SUPPLY)**

**Project:** Augmentation of Fuel & Flux Crushing Facilities (Package No. 064) of Bhilai Steel Plant, Bhilai (SAIL)

Supply, Fabrication & Painting (Two Coats of Primer) "Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118"

NIT No.: DLI/C&E/WI-675/316

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>Item Description</th>
<th>Unit</th>
<th>Qty.</th>
<th>Unit Rate (`)</th>
<th>Amount (`)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply, fabrication, painting, packing &amp; forwarding, transportation to site as per terms and conditions of tender documents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Horizontal Gravity Take-up Unit for Conveyor Y7-12 (Rope Sheave, Trolley Wheel, HGTU Trolley, Trolley Support Frame &amp; Guide Post and Counter Weight)</td>
<td>Set</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>b</td>
<td>Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 (Drive Shaft &amp; Non-Drive Shaft with Wheel and Rail Clamping Arrangement)</td>
<td>Set</td>
<td>1</td>
<td></td>
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<tr>
<td>c</td>
<td>Wheel Assembly for Reversible Shuttle Conveyor RSC-L118 (Drive Shaft &amp; Non-Drive Shaft with Wheel and Rail Clamping Arrangement)</td>
<td>Set</td>
<td>1</td>
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</tbody>
</table>

**Total Amount of Base Price (`)**

- GST (if applicable) @
- Inland Freight upto site (if applicable) @
- GST on Inland Freight upto site (if applicable) @

**TOTAL QUOTED PRICE (F.O.R. Bhilai inside BSP at PKG-064 store) (`)**

(TOTAL AMOUNT ____________________________)

Signature with stamp

Note:

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 details of taxes & duties shall be duly filled without blank space.

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

iii) 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.

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

TENDER NO.: DLI/C&E/WI-675/316

FOR

Tender for Supply, Fabrication and Painting (Two Coats Primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the Project of “Augmentation of Fuel & Flux Crushing Facilities (Package No. – 064)” for Bhilai Steel Plant at Bhilai, Chhattisgarh”

VOLUME – III

TECHNICAL SPECIFICATIONS
STEEL STRUCTURES
&
AUXILIARY FACILITIES
(CHAPTER-04)
GENERAL TECHNICAL SPECIFICATION
FOR
SUPPLY, FABRICATION, ERECTION
SHEETING & PAINTING OF
STEEL STRUCTURES
(GS – 04)

MECON LIMITED
RANCHI - 834002

No. MEC/S/1901/11/38/0/00/00/F1889/R2
JULY, 2007
# CONTENTS

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Content sheet</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Amendment sheet</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>General Description of Work</td>
<td>3,4</td>
</tr>
<tr>
<td>4</td>
<td>Scope of Work</td>
<td>4 to 6</td>
</tr>
<tr>
<td>5</td>
<td>Design of Building Structures</td>
<td>6 to 19</td>
</tr>
<tr>
<td>6</td>
<td>Design of Conveyor galleries &amp; Junction Houses</td>
<td>20 to 25</td>
</tr>
<tr>
<td>7</td>
<td>Pipe Line Supporting Structures</td>
<td>25,26</td>
</tr>
<tr>
<td>8</td>
<td>Steel Chimney</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Standardisation and Uniformity</td>
<td>29</td>
</tr>
<tr>
<td>10</td>
<td>Fabrication of Steel Structures</td>
<td>30 to 42</td>
</tr>
<tr>
<td>11</td>
<td>Erection of Structures</td>
<td>42 to 50</td>
</tr>
<tr>
<td>12</td>
<td>Welding Specifications</td>
<td>50 to 56</td>
</tr>
<tr>
<td>13</td>
<td>Painting of Building Steel Structures</td>
<td>56 to 60</td>
</tr>
<tr>
<td>14</td>
<td>General Requirements</td>
<td>60 to 62</td>
</tr>
<tr>
<td>15</td>
<td>Inspection of Structures</td>
<td>62 to 64</td>
</tr>
<tr>
<td>16</td>
<td>Quality System and Third Party Inspection</td>
<td>64 to 71</td>
</tr>
<tr>
<td>17</td>
<td>Permissible Deviations in Assembly of Welded Joints</td>
<td>71,72</td>
</tr>
<tr>
<td>18</td>
<td>Permissible Deviations in Erection and Fabrication</td>
<td>72 to 83</td>
</tr>
</tbody>
</table>
## AMENDMENT SHEET

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Structural
Page 2 of 83
GENERAL DESCRIPTION OF WORK

SECTION : 1

1.1 The general specifications for structural works furnished herein are intended as guidelines for execution of the works satisfying the Owner’s requirements as also complying with all technical norms in totality. This specification is to cover the design, preparation of design drawings and fabrication drawings, supply of all labour as well as materials and construction of all structural work on a turnkey basis for the Project / Works as described in the general conditions of contract.

1.2 Description of various items of work under this specification and nature of work in detail are given hereinafter. The complete work under this scope is referred to as STRUCTURAL WORKS. The detailed scope of works covered under Structural works is given in Section -2.

1.3 The work to be performed under this specification consists of design, engineering, supply, fabrication, erection and cladding, as well as providing all labour, materials, consumables, equipment, temporary works, temporary labour and staff colony, constructional plant, fuel supply, transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of the plant, all in strict accordance with the specifications, including revisions and amendments thereto as may be required during the execution of the work.

1.4 Supply of all materials including structural steel, roof cladding & side-cladding sheets, fasteners, paints, consumables like gas, electrodes etc. and all other materials as deemed necessary for proper completion of the work, are included in the scope of the Contractor.

1.5 The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Owner/Consultant.
For all buildings and structures, necessary layout and details are to be developed by the Contractor keeping in view the statutory & functional requirements of the plant and facilities and providing enough space and access for operation, use and maintenance. Certain minimum requirements are indicated in this specification for guidance purpose only. However, the Contractor's offer shall cover the complete requirements as per the best prevailing practices and to the complete satisfaction of the Owner.

1.6 Contractor shall inspect the site, examine and obtain all information required and satisfy himself regarding matters and things such as access to site, communications, transport, right of way, the type and number of equipment and facilities required for the work, availability of local labour, materials and their rates, local working conditions, weather, tidal / flood levels, subsoil conditions, natural drainage, etc. Ignorance of the site conditions shall not be accepted by the Owner as basis for any claim for compensation or extension of time. The submission of a bid by the Contractor will be construed as evidence that such an examination was made and any later claims / disputes in regard to price quoted shall not be entertained or considered by the Owner on account of ignorance of prevailing site conditions.

1.7. Contractor shall comply with all the applicable statutory rules pertaining to Factory act, Fire safety rule of Loss prevention association, Water act for Pollution control, Explosives act etc. Provisions of Safety, health and welfare according to Factories act shall also be complied with. Statutory clearances and norms of State Pollution Control Board shall be followed. Statutory body /Act requirements shall be fulfilled by the Contractor and in case any modifications /additions to the building /Structures are to be made as per the above, shall be carried out by the Contractor at no extra cost to the Owner.

SECTION - 2

SCOPE OF WORK
2.0. The scope of work shall cover, but shall not be exclusively limited to, the following:

- collection of all site related data & conducting site investigations,

- design, preparation of all design drawings, fabrication drawings,

- obtaining Owner's/Consultant's approval on general arrangements and design of structures

- dismantling, retrieval, sorting and storing of any existing structures as directed by the owner, if dismantling is a part of the total work

- supply of all materials viz, raw steel, sheeting for roof and side cladding, and paints

- supply of fasteners like bolts, nuts, washers etc

- supply of consumables like electrodes for welding, gases for gas cutting etc

- supply of plant & machinery, tools tackles, instruments for fabrication and erection

- providing facilities for testing of materials and conducting NDT

- providing facilities for transport and handling

- deploying requisite skilled and unskilled manpower

- making arrangements for all services like approach to site, electricity, water etc

- fabrication of structures, their transport and proper storing at site

- erection of structures, claddings, gutters, down pipes etc

- application of paints at shop after fabrication and at site after erection

- providing all reasonable facilities for inspection by Owner/Consultant

- conducting NDT as stipulated by the Owner and making test results available to Owner / Consultant for evaluation
- compliance with primary acceptance tests / inspection, liquidation of defects; compliance with final acceptance tests / inspection, liquidation of defects;

- carrying out field-engineering decisions as desired by the Owner

- preparation of “As Built” drawings for all the structures and hand over to the Owner the completed structural work to the Owner’s full satisfaction.

- supply of all loading data for RCC foundation, layout drawing, HD bolt insert details and all other necessary information for requirement of Foundation/ RCC work, where future expansion is envisaged, the successful contractor shall furnish load data separately for present and future construction.

- any other work deemed incidental for the completion of the overall work but not included in the above detailed scope.

SECTION – 3  DESIGN OF BUILDING STRUCTURES

3.0 General

This specification shall apply to steel work in building and general structural steel work. For technological structures, additional stipulations shall be considered as per technical requirements.

3.1 Design considerations

3.1.0 General

3.1.01 Structures shall be designed such that they are economical and safe and meet the functional and service requirement of the technological process for which
they are designed. The architectural planning of the building shall be based on technological requirements.

3.1.02 The structures shall be designed conforming to the relevant safety regulations, Factory Acts, Electricity Rules and stipulations of Statutory bodies as applicable to the project.

3.1.03 Natural ventilation shall be provided ensuring that it does not permit rain water entry into the building. Scope of natural lighting shall be used to the maximum possible extent.

3.1.04 Mild steel gutters and down-pipes with gutter outlets having grating cover shall be provided to carry rain water from roofs of buildings to the drainage system at ground level. All gutters shall be designed as walkable with 600 mm sole width.

3.1.05 Adequate facilities in the form of monorails, hoists, platforms etc. shall be provided to facilitate repair and maintenance of overhead cranes, equipment, etc. Access to these platforms shall be provided by stairs / ladders from the nearest accessible floor or platform.

3.1.06 Access to all floors, gangways and landings shall be by staircases. Access to platforms and landing of secondary importance or where such access is used only rarely, shall be by vertical ladders with safety hoops.

3.1.07 Roofs with access shall be provided with safety handrails along the periphery of the roof.

3.1.08 Edges of floors, gangways, stairs and landings shall be provided with safety hand railings.

3.1.09 At gable ends of buildings, platforms shall be provided connecting the walkways at crane gantry level.

3.1.10 Floors, gangways and landings shall be covered as follows:

a) Gangways and landings shall have chequered plate with a minimum thickness of 6mm o/p suitably stiffened to meet design load requirements.

b) Floors and operating platforms other than the above shall have chequered plate flooring or hot dip galvanised open gratings, or RCC slab resting on steel structural framework, to suit the technological requirements.
3.1.11 Protective metal heat shields shall be provided for steel structures exposed to continuous heat radiation of temperature exceeding 150 °C and also where hot metal splashing on structures is likely to occur.

3.1.12 All buildings and their foundations shall be designed so that it shall be possible to extend them in the longitudinal direction at a later date without further strengthening of gable structures. Provision for transverse extension, if any, shall also be made at the initial stage.

3.1.13 Sheetling on sides and gables shall generally terminate 3.0 m above ground floor level unless required to be otherwise. Sides below this level shall be generally screened by brick walls allowing sufficient air inlet to achieve natural ventilation, unless otherwise required from technological / ventilation requirements.

3.1.14 Connection by permanent bolts to structural elements subject to vibration shall be provided with lock nuts.

3.1.15 For Analysis/design of steel structural frame work STAAD PRO soft ware shall be used. CD of input files shall be submitted to purchaser/consultant along with the hard copy of the document.

3.2 Elements of Structures

3.2.01 Columns

a) At the location of passage/opening through columns web shall be suitably strengthened by vierendeel panel or modified lattice system.

b) Shear force at the column base shall be resisted either by shear keys shop-welded to the underside of column base plates or by welding base plate to inserts provided in foundation.

c) The level of underside of column base shall be so chosen such that the complete anchor table lies below the finished floor level, thus keeping the shop floor free from projections of anchor tables.
3.2.02 Crane Girders

a) Crane girders shall generally be of simply supported design, unless continuous crane girders are specifically required.

b) Top flange plate shall be welded to web plate with full penetration butt weld with fully automatic submerged arc welding. Bottom flange plate shall be welded to web plate by continuous fillet welds with automatic/semi-automatic welding.

c) All intermediate stiffeners shall be fitted against top flange and welded to it by fillet welds/partial penetration butt welds. These stiffeners shall terminate short of bottom flange with at least 25 mm gap. The stiffeners shall be fillet welded to web plate and corners shall be cut suitably to clear thermally affected area of web to top flange connection.

d) End bearing stiffener plates of crane girder shall be capable of transmitting the maximum reactions to the columns. The bearing surface of the bearing plate shall be planed/machined to ensure full contact.

e) Tension flange of crane girders shall be stabilised by horizontal latticed bracings, where required in order to limit the slenderness ratio of the flange to 150.

f) Generally for girders having span 12m and above, vertical auxiliary girder and horizontal girder at crane girder bottom flange level shall be provided.

g) All crane girders shall be checked for fatigue as per IS: 1024 (latest).

h) At crane girder level, walkway shall be provided on both sides. Walkway at column location shall have minimum clear width of 500mm. Approach by staircase to this level shall be near the maintenance bay.

i) All crane girders and their supporting structures shall be designed for loading from loaded crane in worst position of crane and crane to create most unfavorable loading condition of the girders. For increase of load due to impact and crane load combination including lateral surge shall be taken as per provision of IS 875 (Part – 2) -1987.

j) Suitable approach to be provided for tightening of bolts of Crane Rail. Approach for Crane Rail fixing shall be properly planned for all types of sections of Crane Girders.

3.2.03 Surge Girder walkways and auxiliary beams.
a) Continuous maintenance walkways with safety hand-railing shall be provided along each column row adjacent to each crane gantry girder. These walkways shall be of non-slip plate construction connected to crane girder top flange by continuous fillet welds. Staircase at every 120m shall be provided from floor for access to this walkways so that stairs are available within 60m from any location.

b) Connections between surge girder and the main columns shall be designed to resist load due to lateral braking of crane trolley.

c) On the periphery of the building, full length handrails shall be provided along the edge of the maintenance walkway at crane girder level.

d) Handrail and its clearance from crane end carriage shall conform to provisions of relevant safety regulations.

3.2.04 Crane Stops

a) Crane stops shall be provided at the ends of each crane girder system, or as required to limit the movement of crane as per technological requirements.

b) Crane stops shall be bolted to crane gantry girder.

c) Only tested rail materials shall be used. Manufacturer’s test certificate, including chemical analysis shall be supplied.

d) Rails shall be free from twists, pitting, laminations and any other internal and external defects. The rail shall be straight and the deviation from the straightness shall not exceed + 1.5mm. If necessary the rail shall be cold straightened.

e) Unless otherwise specified, the crane rail joint shall be butt-jointed (either by Thermit or fusion welding) or by fishplates.

f) For Butt-welding the contractor shall take prior approval of the Purchaser regarding method of edge preparation, welding procedure and sequence of welding to be done. Edge preparation shall be done by oxyacetylene flame and shall be neatly finished by chipping and grinding.

g) All position low hydrogen electrodes conforming to IS 814-1991 shall be used for welding. The rail end shall be pre-heated to 250 deg. C before welding. The electrode shall be pre-heated as per manufacture’s instructions. The welded joint shall be allowed to cool slowly. It is recommended that the initial and intermediate layers of deposit may be by using ferron V, Superchord or equivalent. Top 3mm layer shall be deposited with Duroid 2A or equivalent, to obtain good wearing surface.
h) The joints shall be free from kinks, twists etc, and shall be grinded properly after welding to ensure smooth running of the crane.

i) Method of securing the crane rail to the crane gantry, alignment and expansion joints, if any, shall be subject to Purchaser’s approval. The crane rail clips shall be preferably forged or pressed from steel plates.

3.2.05 Roof Structures

a) The main supporting element for roof shall be roof trusses provided at uniform spacing to suit shop layout. Roof shall be provided with adequately sized roof monitor for natural ventilation, wherever required.

b) Roof shall have suitable slope to meet technological as well as rainwater drainage requirements. Hand railings at eaves level and gable ends of the roof of the building shall be provided.

c) System of bracings shall be provided in the roof top chord and bottom chord levels along with longitudinal ties to ensure stability and rigidity of the roof structures. Vertical bracings between trusses shall also be provided wherever required.

d) Galvanised wind tie (45x6 mm flat) shall be provided at the free edge of roof sheeting.

e) Suitable arrangement of anchors shall be provided at the ridge of roof sheeting for holding lanyards of safety belts.

3.2.06 Roof lighting walkways

a) Full length roof lighting walkways, generally 600 mm wide, shall be provided in each bay as required to match the number of rows of roof lights provided in the shop as per technological requirement.

b) These walkways shall span between roof truss members and will be decked with chequered plate floor. Walkways shall be provided with handrails on both sides.
3.2.07 Roof drainage system

a) Roof drainage system shall be designed for maximum precipitation for 5 minutes based on local meteorological data. A factor of safety of 1.3 shall be kept in the design.

b) All valley and eaves gutters shall be of pressed plate construction with a minimum sole width of 600 mm so as to function as walkways.

c) Eaves gutter shall be provided for eaves height ranging between 10 m to 25 m above apron/ground level.

d) The gutters shall be laid to slope towards down-pipes with welded outlets and having grills fitted flush with gutter sole. Slope of gutters and collector pipes shall not be flatter than the following limits:

   i) Longitudinal slope of gutter 1 : 500
   ii) Longitudinal slope of collector pipe 1 : 300

e) Poking holes with cover shall be provided in the down-pipes at suitable intervals as well as at accessible levels, to clean the down-pipes.

f) Collector pipes shall be provided with covered manholes at 6 m intervals.

g) Eaves gutter shall be provided with safety handrails.

h) When rain water falls from higher to lower roof, double layer of sheets shall be provided for the portion of roof sheeting on which rain water falls, provided the drop of roof is in the range of 3 m to 6 m. In case the drop is more than 6 m, independent gutter shall be provided.

i) Down pipes shall be spaced preferably at 24 m centres. The down-pipes shall be connected to the gutter with suitably designed hoppers with gratings at sole level of gutter, made of 8 mm dia rounds at 50 mm centers.

j) Joints of gutter and collector pipes shall be by welding in order to be leak-proof.
3.2.08 Wall Structures

a) Wall runners with necessary sag rod arrangements shall be provided to support wall and gable sheeting, including internal partition wall, wherever required.

b) Hanging wall posts shall generally terminate at 3.5 m above ground floor level unless required to be otherwise (Refer Clause 3.1.13).

c) Gables of buildings shall have wall post spaced at intervals to suit bay width.

d) Walls shall be provided with louvres and translucent sheeting at appropriate levels, to provide natural ventilation and lighting.

3.2.09 Floor Frameworks

a) Floor beams supporting vibrating equipment shall be designed to avoid resonant frequencies. (Refer clause 3.3.01 (c))

b) Beams along-with framework, shall be provided with both horizontal and vertical bracing (wherever permissible) to achieve overall rigidity.

3.2.10 Vertical bracings

a) Vertical bracings shall be provided on all column rows for each expansion block.

b) Vertical bracings shall extend from ground level to roof level and shall be designed to transmit longitudinal forces i.e wind forces, crane tractive forces, seismic forces etc. to the foundation.

c) Below crane girder level, for two-legged columns, the bracings shall be of twin system in the plane of each column leg, suitably tied or laced together.

3.2.11 Access staircase, walkways, platforms and ladders.
a) Wherever possible, access shall be provided by means of stairs.

b) All walkways and stairs leading to working platforms shall have minimum 1000 mm width of walkways/flight of stair.

c) All other walkways and stairs leading to areas for maintenance purpose, or due to restriction of space, shall have a minimum width of 800 mm of walkway/flight of stair, unless required otherwise.

d) Staircases shall be generally designed with slope of approximate 37.5° with the horizontal. (in no case the slope shall exceed 40 ° with the horizontal). Intermediate landings shall be provided wherever required such that vertical rise of each flight does not exceed 3000 mm. Risers in one flight shall be equally spaced.

e) Walkway floors and stair treads shall be designed with chequered plate (or non-slip type plates). Ribbed floor/treads may be provided wherever the possibility of accumulation of dust exists, taking care that such provisions do not create a nuisance to the operating personnel on the shop floor.

f) Rise of treads in staircases shall not exceed 200 mm.

g) A minimum headroom of 2200 mm shall be provided over operating platforms, visitor's galleries, or other areas with possibility of public gathering. In all other platforms, walkways and stairs, a minimum headroom of 2000 mm shall be provided. Only in special cases, local headroom of 1800 mm may be allowed (i.e at intersection with structural members etc.).

h) Cat ladders shall be provided for access, wherever provision of staircase is impractical due to limitations of space, or the access is required very infrequently.

i) Wherever the height of cat ladder exceeds 4.0 m, safety cage shall be provided. Intermediate landing shall be provided to cat ladders such that vertical height of single rise does not exceed 8.0 m.

j) Cat ladders shall be designed with following provisions:

   i) Width of rung = 500 mm
   ii) Minimum rise of rung = 250 mm
      Maximum rise of rung = 300 mm
   iii) Minimum clearance from rung of ladder to back of cage (in case of caged ladders) = 700 mm
iv) Minimum clearance from the centre of cage all round = 350 mm

v) Slope of cat-ladders:

I. For normal cat-ladders, slope shall be within the range of 75°-90° with the horizontal.

II. For ship-type ladders (i.e. cat-ladders with short side handrails) the slope shall be within the range of 65°-75° with the horizontal.

k) All walkways, platforms and stairs shall be provided with safety handrails. All handrails shall be constructed with steel tubes/angles for posts, top and middle rail and plates/sheets for toe plates. In case of stairs, the toe guards need not be provided.

l) The vertical height of hand-railings on walkways and stairs shall be minimum 1000 mm above floor level.

m) Hand-railing along edge of roof and gutters shall have a minimum height of 600 mm over top edge of gutters/sheets. In such hand-railings toe guards need not be provided. (only top handrail and mid-rail shall be provided).

n) Access to roof of the building shall be provided by means of staircases at midway length of the building. Pair of staircases shall be provided with one at the near end and the other at far end length of building. Approach to monitor roof/high bay roof from the roof of the bay approachable by staircases at midway length of the building shall be by means of staircase (if height of roof > 3m) or cat-ladder. Approach shall be provided on the roof of the building along the cross-section of the building.

3.3 Design

3.3.01 Design of structures

a) Design of steel structures shall be done in accordance with IS:800-1984 or any equivalent international code of practice that may be applicable.

b) Structures subjected to fluctuating/reversal of stress (eg. Crane girders) shall be designed in accordance with IS:1024-1979.

c) Resonance in structures: Structures supporting vibratory/reciprocating equipments shall be designed so as to obviate occurrence of resonance. The ratio of applied frequency to natural frequency shall not lie within the range 0.7
3.3.02 Description of design loads

Loads considered in design shall allow fully for all aspects of:

i) Dead weight of structures, wall, floors, equipment, wiring, machinery, pipe-work, cabling and any item of a permanent nature.

ii) Superimposed loads for roofs and floors plus any temporary machinery not allowed within the general superimposed loads.

iii) Crane loading.

iv) Temperature loads from process requirements because of the position of the structure relative to the heat source or from support of mains, pipes etc. subject to heat.

v) Maximum range of temperature variation for climatic conditions = ± 45°C

vi) Dust load.

vii) Dynamic loads from screens and other such reciprocating machinery.

viii) Maintenance hoists on Runway beams.

ix) Wind Loads

x) Seismic loads

xi) From future extensions.

xii) Any special erection requirements.

xiii) Erection loads on floor and structures

3.3.03 Loading codes
a) All live loads shall be considered in accordance with IS:875(Part-2)-1987. 
(Also refer clause 3.3.04)

b) Wind loads shall be in accordance with IS:875(Part-3)-1987 and any other 
consideration specific to the site.

c) Seismic loads shall be in accordance with IS:1893-2002.

d) Crane loading to be considered in design shall be as follows:

I. As per relevant clause of IS:800-1983.

II. IS:875(Part-2)-1987 for conditions not covered in IS:800-1983.3. unless more 
severe loads have to be considered for technological/operational conditions.

e) Crane stopper shall be designed in accordance with clause 6.1.4 of IS:875 

f) In absence of any suitable provision for design loads, any other recognised 
code of practice may be followed subject to prior approval of the Owner.

3.3.04 Additional Design Loads

Besides technological loads, all platforms, walkways, stairs etc. shall be designed 
for the following live loads:

i) Walkways and Platforms : 2 KN/m²

ii) Visitor's galleries : 4 KN/m²

iii) Maintenance platforms : 4 KN/m²
   including crane level walkway.

iv) Staircase and treads : 4 KN/m²

v) Monorail walkways : 4 KN/m²

vi) Handrails : 0.75 KN/m run
   (Horizontal)

vii) Ladder : 0.9 KN
   at middle of rung

viii) Dust loads (for buildings and structures located in dusty zone) : 0.5 KN/m²

ix) All structures supporting : Overloading vibrating equipment by 25% on 
(motors, fans etc.) Static load unless specified otherwise of Equipment.
3.3.05 Combination of loads

Various design loads considered shall be combined in accordance with clause 8.0 of IS:875(Part-5)-1987 to give the most severe loading condition for design of structures.

3.3.06 Stress Enhancements

Permissible limits of stress may be increased wherever permissible, in accordance with IS:800-1983.

3.3.07 Limiting deflection

a) The deflection shall be limited in various elements of structures in accordance with IS:800- 1984 (clause 3.13).

b) In addition, the following limitations in deflection shall be observed in design:

**Vertical Deflection**

i) Monorail track beams, main floor beams, equipment supporting beams & beams supporting brick walls : Span / 400

ii) Main roof trusses, roof girders, main floor beams in operating platforms : Span / 400

iii) Secondary floor beams : Span / 325

**Horizontal Deflection**

i) Crane girders due to surge force: Span / 2000 (from one crane only).

ii) Main columns at crane rail level: H / 2500 in transverse direction due to action of crane surge (for surge force consider one crane for single bay and one crane each on adjacent aisles for multi-bay buildings)

iii) Open gantry for condition as in: H/4000 (ii) above.
Where \( H \) = Height of Column from bottom of base plate to crane rail level.

c) All deflections shall be calculated without dynamic factor.

### 3.3.08 Camber

Wherever excessive deformation is likely to cause operational problem or is aesthetically not agreeable, camber shall be provided to neutralise the effect of deformation due to dead load plus 50% of imposed loads.

### 3.3.09 Expansion joints

a) Longitudinal and transverse expansion joints shall be provided in buildings and structures in accordance with IS:800-1984 (clause 3.14).

b) Expansion joints shall be formed by providing double rows of columns, with overhanging gantry girders, secondary roof and wall framing being detailed to allow the maximum calculated movement for the specified temperature variation.

### 3.3.10 Miscellaneous design requirements

a) The minimum thickness of structural steel elements shall be in accordance with IS:800-1984 (clause 3.8). Minimum size angle shall be ISA50x50x6.

b) The diameter of structural bolts shall not be less than 16 mm except for those securing roof and wall sheets, windows, doors and stitching of thin coverings. For bolted joints, at least two bolts per joint shall be provided.

c) The size of fillet welds shall not be less than 5 mm.

d) Main structural elements shall be welded continuously. Intermittent welding shall be used only on secondary members which are not exposed to weather or other corrosive influence.

e) Field connection and splices shall be made as follows:

i) by welding
ii) by permanent bolts (for secondary members such as purlins, wall runners etc.)

iii) by High Strength Friction Grip bolts (HSFG)

3.4 DESIGN OF CONVEYOR GALLERIES AND JUNCTION HOUSES

3.4.0 Design Considerations

3.4.01 The general parameters for conveyor galleries shall conform to the provision of IPSS:2-03-001-81 (Interplant Standards : Steel Industry - Design parameters for galleries and tunnels for belt conveyors in steel plant), and provisions of IS : 11592-1985 unless specified otherwise in Technical Specifications. The structures shall be designed so as to meet functional requirements and shall provide space for operation, maintenance and removal of machinery and give the workers good and safe environment.

3.4.02 Gallery floors shall be of pre-cast R.C.C slabs / Chequered plates (as required ) supported on steel beams.

3.4.03 Steps shall be provided (rise not exceeding 130 mm) along the walkways if the gallery slope exceeds 12°. In case the slope of gallery is between 6° to 12°, suitable ribs shall be provided on floor (without any sharp edges) at 250 to 300 mm intervals.

3.4.04 Provisions shall be made for emergency exit from galleries to ground level and also for cross-over above conveyor at 100 m intervals (maximum). The width of cross over shall not be less than 600 mm.

3.4.05 Roof and side walls of conveyor galleries shall be covered with GCS/ Aluminium sheets. with a provision of gap of 300 mm below roof and 150 mm from top of floor level on the side wall for ventilation.

3.4.06 Adequate provision for natural light inside conveyor gallery shall be made through side walls by providing translucent sheets (FRP sheets as per IS: 12866-1989). Every sixth sheet on side wall shall be FRP sheet and shall be staggered on opposite wall.
3.4.07 Roof slopes of conveyor galleries shall be 1:5 (1 vertical, 5 Horizontal).

3.4.08 The level of underside of the base plate of gallery supporting trestles shall be 300 mm above the average ground level of the surrounding area.

3.4.09 Protective hand railing shall be provided along gallery walkways, open platform, stairways, landings, edges of walkways when the gallery is not enclosed, and around erection openings, if any, to ensure safety of operating personnel.

3.4.10 Conveyor galleries longer than 150 m shall be provided with expansion joints with twin trestles/supports. Each expansion block shall have fixed support/rigid trestle with adequate arrangement (provision of top chord and bottom chord bracing to gallery girder etc.) for transferring the transverse and longitudinal forces to the foundation.

3.4.11 Gallery girders near junction house shall be preferably supported on trestle located as close to the junction house as possible, with part of gallery girder between junction house and trestle cantilevered from the trestle. Supporting gallery girders on junction house shall be generally avoided.

3.4.12 The underside of the belt conveyor shall be fully covered with 3 mm sheet in case of conveyor is located within the boundaries of the plant. Wherever such covering is not provided (as in case of the mines area or cross country), the covering must be provided where the gallery crosses roads, railway lines or areas of public gatherings.

3.4.13 Conveyor gallery over hot metal track:

When underside of gallery is at less than 12m height from track level, heat shield shall be provided below gallery as well as on sides for a width of track 8 m (i.e. 4 m on either side of center line of the track).

3.4.14 When conveyor gallery crosses above or below H.T cables, a minimum clear distance of 1.0 m between the structural elements/cladding and HT cables shall be maintained.

3.4.15 When the conveyor bridge passes over plant roads, clearance between the road surface and the lowest points of the bridges shall not be less than 4.5 m or the height needed for the passage of the largest individual components of the plant equipment, whichever is the larger.

3.4.16 The junction house shall be designed to suit the technological requirements. Number of floors, height of building etc. shall be decided accordingly.
3.4.17  In general the junction house shall be designed as framed structures on shorter span side and vertically braced on longer side to achieve stability.

3.4.18  Floor of junction houses shall be of RCC slab supported on steel beams, unless required otherwise from technological consideration. The RCC slab will be connected to steel beams through suitable lugs.

3.4.19  Roof and side covering of junction houses shall be with GCS/Aluminium sheets / troughed colour coated sheets as specified. Roof slope shall be 1 : 5 (1 Vertical : 5 Horizontal).

3.4.20  Suitable access staircase and safety hand railing shall be provided to all floors of junction houses.

3.4.21  When hydro-washing of floor of junction house is envisaged, the floor beam supporting RCC slab shall be laid to a suitable slope to achieve the same, wherever the same is not practicable to achieve through screed concrete. (Minimum slope of floor shall be 1.5%).

3.4.22  Wall sheeting shall generally start from the lowest working floor and extend up to roof level with louvres at each floor level to ensure adequate natural ventilation.

3.4.23  Monorails for maintenance hoists shall be provided for maintenance and repair of various equipments located on the floors.

Components of structures

3.4.24  Gallery Trusses and Roof
   a) Gallery truss shall be of latticed type construction and shall support roof (for covered galleries) as well as floor deck supporting conveyor system.

   b) The trusses shall be adequately braced at top and bottom chord level to transfer the horizontal wind forces to end portals.

3.4.25  Stringer Beam

These beams shall be suitably spaced to support the conveyor stringer post and shall deliver load to gallery trusses. Walkways on either side of the conveyor shall also be supported on these stringer beams.
3.4.26 Supporting Trestles

Intermediate trestles shall be two legged and shall deliver loads from gallery trusses to the foundations. In addition, four legged trestles shall be provided which will act as fixed support to transmit all longitudinal forces between expansion block, in addition to other forces.

3.4.27 Junction Houses

a) Floors - Floor beam layout shall be arranged to suit equipment layout as well as equipment anchoring system.

b) Columns - In addition to loads from floor and roof, columns shall be designed to transmit horizontal load due to belt tension/snapping of belts to the foundation.

3.4.28 Belt Tensioning Device

Suitable structures shall be provided to accommodate belt-tensioning device which may be located either under the conveyor gallery or in the junction house itself.

3.4.29 Wall Structures

a) Wall runners with necessary sag rods shall be provided to support wall sheeting in conveyor galleries and junction houses.

b) Wall sheeting and louvres - refer clause 3.2.08

3.4.30 Access stairs, walkways, platforms, ladders, hand railing etc. - These shall be provided in accordance with clause 3.2.11 of this specification.

3.5 Design of Structures.

3.5.0 a) Design of steel structures shall be done in accordance with IS:800-1984.

b) In absence of specified dynamic factor to be considered for the load from the belt conveyor, a dynamic factor of not less than 1.3 shall be considered for the design of floor beams and gallery girders.
c) Gallery trusses and stringers as well as floor beams of junction house shall be checked for obviating occurrence of resonance and shall be designed in accordance with clause 3.3.01(c).

d) For wind load consideration the following may be considered:
   - Basic wind speed (vb) at 10 M ht = 39 m/s.
   - Risk co-efficient (K1) = 1.0
   - Terrain ht and structure size factor (K2) shall be calculated with category 2.
   - Topography co-efficient (K3) = 1.0

e) Seismic load – structure shall be designed as per IS 1893 (Part 1) 2002. Site is located in zone II.

3.5.1 Description of loads and loading codes

3.5.01 Unless specified otherwise hereinafter, all the live loads shall be considered in accordance with IS:875 (Part-2)-1987.

3.5.02 Wind loads shall be considered in accordance with IS:875 (Part-3)-1987.

3.5.03 Seismic loads shall be considered in accordance with IS:1893-1984.

3.5.04 Live loads from conveyor on the gallery floor shall be as per conveyor suppliers load data.

3.5.05 While designing the fixed support/rigid trestles in an expansion block of conveyor gallery the following loads (in addition to wind load) shall be considered.

   a) Forces due to difference in frictional resistance of top and return idle rollers of conveyor.

   b) Forces due to inertia of rollers at the time of starting of conveyor belt.

   c) Break down load caused by snapping of belt (in case of multiple conveyors, snapping of one belt at a time) shall be considered.

   d) Special loads if any

3.5.06 Gallery girders and floor shall be designed for the following live loads, inclusive of spillage loads on floors.

   a) Walkway/Supporting beams for floor - 4.0 KN/m²

   b) Under the conveyor belt - 0.75 KN/m²
c) Gallery girder, for floor load of - 3.0 KN/m²

3.5.07 Dust load on roof of junction house and conveyor galleries shall be considered as follows:

a) For building and structures located at a distance of 300 m from the dust producing units - 0.5 KN/m²

b) At a distance of 300 m to 800 m from the dust producing unit - 0.25 KN/m²

3.5.08 As per technological requirements, provision of supporting the following, and load arising thereof shall be considered in the design of conveyor gallery.

a) Ventilation duct.

b) Electrical cables/cable racks.

c) Fire Fighting equipment.

3.5.09 Junction house floors shall be designed for the following loads:

a) Live load on floor - 4.0 KN/m²

b) Tension from conveyor belt

c) Load due to equipment located on floor.

d) Load due to jamming of chutes.

e) Erection loads anywhere on the floor.

3.5.10 Combination of loads

The various loads specified shall be combined in accordance with clause 8.0 of IS:875 (Part-5)-1987 to give the most severe loading condition for design of structures.
3.5.11 Stress enhancements

Permissible limits of stress may be increased, wherever permissible, in accordance with IS:800-1984.

3.5.12 Limiting deflection

a) The deflection shall be limited in various elements of structures in accordance with clause 3.13 IS:800-1984.

b) In addition following limitation in deflection shall be observed in design:

i) Gallery Trusses - Span / 400

ii) Top of End portal of gallery truss - H / 325 where H = Height of portal above beams

iii) Traverse deflection of top of supporting Trestle - H/1000 where H = Height of trestle above foundation.

3.6 PIPELINE SUPPORTING STRUCTURE

3.6.0 Design considerations

3.6.01 Bridges shall be provided to support pipelines of smaller diameters for which maximum permissible span is less than the distance between supporting trestles.

3.6.02 Trestles which are designed to transmit longitudinal loads (along the length of pipeline) to the foundation, shall be four legged construction. Other trestles which transmit only the vertical load to the foundation shall be two-legged construction.
3.6.03 Access stair and platforms shall be provided for maintenance of equipment installed in the pipeline (eg. valves etc.). Maintenance walkways with hand-railing shall also be provided along the pipeline, wherever required. Provision of access stairs, walkways platforms, hand-railing etc. shall conform to clause 3.2.11 of this specification.

3.7 Design of Structures

3.7.0 Design of steel structures shall be done in accordance with IS:800-1984.

3.7.01 Unless otherwise specified hereinafter, all live loads shall be considered in accordance with IS:875 (Part-2) 1987.

3.7.02 Wind load shall be considered in accordance with IS:875 (Part-3)-1987.

3.7.03 Seismic loads shall be considered in accordance with IS:1893-2002.

3.7.04 In addition, pipeline, bridge and supporting trestle shall be designed for the following loads:

   a) Weight of liquid or condensate, as is appropriate for pipeline.

   b) Weight of valves, compensators, fittings etc. in addition of self-weight of pipe.

   c) Load due to thermal expansion of pipeline

3.7.05 Maintenance platforms shall be designed for a service load of 4 kN/sq.m

3.7.06 Combination of loads

The various loads specified shall be combined in accordance with clause 8.0 of IS:875 (Part-5)-1987 to give the most severe loading condition for design of structures.

3.7.07 Stress enhancements

Permissible limits of stress may be increased, wherever permissible, in accordance with IS:800-1984.

3.7.08 Limiting deflection
a) Deflection of gallery bridge structure shall be limited to Span/400.

b) Traverse deformation of trestle shall be limited to H/1000 where H = Height of trestle above foundation level.

c) The deflection of other elements of structures shall be limited in accordance with clause 3.13 of IS:800-1984.

3.8 STEEL CHIMNEY

3.8.0 General
This specification shall apply to design of self supporting steel chimneys.

3.8.1 Design Consideration

a) Lining shall be provided in chimney shell as per technological requirements. In the case of lined chimneys, checking for stress and resonance due to wind shall be done for both the conditions i.e lined and unlined.

b) Annular platforms with minimum clear width of 1200mm shall be provided at locations of environment monitoring equipment, in addition to the stipulations of IS:6533 (Part-2)-1989. Landing/resting platforms to ladders shall be provided at intervals not exceeding 10.00 M where annular platforms are provided at intervals of height greater than 10.00 M.

c) Approach to platforms shall be with ladders with safety cages. (Refer Clause 3.2.11(j) of this specification.

d) Chimneys shall be provided with adequate number of Painter's trolleys for inspection and maintenance unless categorically agreed to otherwise with Owner. In case where Painter's trolley is not provided, suitable alternative facility shall be provided for inspection and maintenance.

e) Chimneys shall be fitted with helical strakes of three rail system, and shall be strong enough to withstand the additional wind load from the strakes.

3.8.2 Design

a) Steel chimneys shall be designed in accordance with IS:6533(Part-2)-1989.
b) Elements like platforms, hand-rails, ladders, anchor bolts etc. shall be designed in accordance with IS:800-1984.
c) For wind and seismic refer clause 3.3.01 (d) and (e).

3.8.3 Limiting Deflection

The maximum deflection at the top due to the action of wind, without considering the dynamic factor shall not be greater than $h/200$, where $h$ is the unsupported height of the chimney.

3.9 STANDARISATION AND UNIFORMITY

3.9.0 General

Every endeavour shall be made to achieve standardisation and uniformity amongst the steel structures of different units of the plant.

3.9.1 The following items shall be kept in view in design of structures:

a) Uniform layout module shall be adopted to the extent possible consistent with economy. It is suggested to adopt a basic module of 3 m for building width and 6 m for column spacing along building length.

b) Uniform slopes of roofs matching with existing buildings unless specifically required otherwise for any particular unit.

c) Provision of expansion joints by using twin columns.

d) Uniform adoption of clearance between structures and moving parts of equipment.

e) Provision of adequate natural ventilation by using louvres (canopy like structures) at appropriate location and roof monitors/natural ventilation systems at roof.
4.0 FABRICATION OF STEEL STRUCTURES

4.1 Drawings

4.1.1 The Contractor shall prepare design drawings indicating general arrangement, members, sections and details of important joints, fabrication drawings, erection drawings, bill of materials, drawing office despatch lists / shipping documents, schedule of bolts and nuts and as built drawings. All drawing work shall be in metric system and all writing work shall be in English. Drawings shall be prepared using Autocad software.

4.1.2 The fabrication drawings shall show full length layout with all connecting members and connections marked thereon. The fabrication drawings shall include all the necessary blown-up details required for the correct fabrication of the structures to meet the design requirements. These drawings shall be made in conformity with the best modern practices and with due regard to speed and economy in fabrication and erection. Each erection piece shall be clearly identified by an erection mark in these drawings.

4.1.3 The preparation / detailing of fabrication drawing shall be complete in all respects. In the case of bolted connections, the bolt dia., the hole dia.,
the actual location of holes and the coordinating scheme with connecting/matching elements shall be clearly indicated. As far as possible, uniformity in the bolt dia shall be maintained. Where HSFG bolts are used, method of surface preparation shall be indicated. In case of welded constructions, the size and length of welds along the relevant weld lines should be distinctly marked. The length specified shall be the effective length excluding end crates. For all butt welds, details of appropriate edge preparation shall be indicated.

4.1.4 Detailing of structural steel members subjected to dynamic loading shall be so as to keep the stress concentration to a minimum. Cross welding shall be avoided as far as practicable.

4.1.5 For bolted connections subjected to dynamic loading, lock nuts or spring washers shall be used in addition to plain washers.

4.1.6 Erection drawings shall consist of line diagrams showing every detailed member in position with the respective erection mark. Erection marks shall appear on the left end of the members as detailed. All steel members shall be erected with marks in the same relative position as shown in plan or elevation. All loose members shall either be given part marks or wired on to the main erection mark for despatch.

4.1.7 The erection clearances for cleat-connected ends of members connecting steel to steel shall preferably not be greater than 10 mm. at each end. The erection clearance at ends of beams shall not be more than 20mm. at each end but where for particular reasons greater clearance is necessary, suitably designed seats shall be provided.

4.1.8 The fabrication drawings shall be prepared in such a manner that structures are despatched with maximum transportable lengths and work involved at site is minimum. Steelwork shall be shop-fitted and shop-assembled as far as practicable.

4.1.9 All edge preparations for welding shall conform to IS:9595.

4.1.10 The contractor shall ensure correctness & completeness of fabrication drawings.

4.2 Material of Construction
4.2.1 All steel and other materials used for steelwork and in association with steelwork shall conform to appropriate Indian standards. Only tested materials shall be used unless written authority is obtained for the use of untested materials for certain secondary structural members.

Unless otherwise specified in the drawings

a) All rolled sections and plates up to & including 20 mm thickness shall conform to Grade "A" as per IS : 2062.

b) Plates of thickness above 20 mm and Plated structures subjected to dynamic loading shall conform to Grade "B" as per IS: 2062.

c) For High Tensile steel requirements, material conforming to IS:8500 or SAIL- MA (HYA or HYB) shall be used.

4.2.2 Steel sheets shall conform to IS : 1079.

4.2.3 Steel tubes for structural purpose shall conform to IS : 1161 (of Grade Yst 240)

4.2.4 Corrugated Galvanised Sheets shall conform to IS:277 with appropriate Zinc coating for the selected thickness of sheet on roof and sides.

4.2.5 Aluminium industrial toughed sheets conforming to IS : 1254 shall be used as follows:

i) In roof - 0.91mm thick 
ii) In side walls - 0.71mm thick

4.2.6 Translucent sheets shall be fibreglass reinforced polyester sheets of matching profile as per IS:12866.

4.2.7 Colour coated sheets shall be as per appropriate standard. All roof, monitor roof galvanised / zinc aluminium colour coated sheets of total coated thickness (TCT) of 0.65 mm with base metal yield strength of 240 MPa or alternately sheets having TCT of 0.5mm with base metal yield strength of 550 MPa.

All side sheets, monitor sides colour coated sheets of total thickness (TCT) of 0.6mm with base metal yield strength of 240 MPa or alternately sheets having TCT of 0.5mm with base metal yield strength of 550 MPa.

Ridging/ Flushing : colour coated sheets TCT of 0.8mm with base metal yield strength of 240 MPa or alternately sheets having TCT of 0.5mm with base metal yield strength of 550 MPa. For all above, minimum zinc deposition shall be 150 gms per sq.m.
4.2.8 Gutters shall be of copper bearing steel conforming to Grade "A" as per IS :2062

4.2.9 Crane Rails shall conform to IS : 3443.

4.2.10 All black bolts, nuts and locknuts shall conform to IS : 1363 and IS : 1364 (for precision and semi precision hexagonal bolts) of property class 6.4 unless otherwise specified. Washers shall conform to IS : 6610

4.2.11 All tapered washer shall be as per IS:5372 for channels, and IS:5374 for Joists. Spring washers shall conform to IS:3063.

4.2.12 All HSFG bolts shall conform to IS : 3757. Assembly of joints using HSFG bolts shall conform to IS : 4000. Nuts and washers for HSFG bolts shall be as per IS:6623 & IS:6649 respectively.

4.2.13 Covered electrodes for arc welding shall conform to IS: 814. Coding of electrodes shall be as follows:

a) ER421 ‘C’ X for mild steel of Grade 'A' and Grade 'B' as per IS : 2062
b) EB 542 ‘C’ H3X for Mild steel of Grade 'B' as per IS 2062 for dynamically loaded structures (arising out of crane, vibratory screen, equipments etc.) ‘C’ is the value of the current as recommended by the electrode manufacturer.

4.2.14 Certified mill test reports of materials used in the work shall be made available for inspection by the Owner / Consultant upon request.

4.2.15 All materials shall be straight and if necessary before being worked shall be straightened and / or flattened by pressure including de-coiling of plates unless required to be of curvilinear form and shall be free from twists.

4.2.16 The MS / GI gratings shall be electro-forged and shall be of approved brand and manufacturer unless otherwise agreed to by the Owner. The type of grating selected shall be based on the loading in the area in which the grating is provided and shall be subject to approval of Owner.

4.3 Material preparation
4.3.1 Cut edges shall be finished smooth by grinding or machining wherever necessary. Sufficient allowance (3 mm to 5 mm) should be kept in the items in case machining is necessary.

4.3.2 Cutting may be effected by gas cutting, shearing, cropping or sawing. In gas cutting of high tensile steel, special care is to be taken to leave sufficient metal to be removed by machining so that all metal that has been hardened by flame is removed.

4.3.3 Sufficient shrinkage allowance (@ 1mm/M) shall be kept wherever heavy welding is involved.

4.3.4 Straightening and bending shall be done in cold condition as far as practicable.

4.3.5 If required, straightening and bending may be done by application of heat between 900°C and 1100°C. Cooling down of the heated item shall be done slowly.

4.4 Drilling and punching of holes

4.4.1 Drilling and punching of holes for bolts shall be done as per clause no.11.4.4 of IS:800:1984, unless otherwise specified by the Owner.

4.4.2 Drifting of holes for bolts during assembly shall not cause enlargement of holes beyond permissible limit or damage the metal.

4.4.3 Holes for bolted connection should match well to permit easy entry of bolts. Gross mismatch of holes shall be avoided.

4.4.4 Permissible deviation in holes for mild steel bolts of normal accuracy and high strength bolts are given in the ANNEXURE-A.

4.5 Assembly for fabrication
4.5.1 Fabrication of all structural steelwork shall be in accordance with IS:800-1984 and in conformity with various clauses of this specification, unless otherwise specified in the drawings.

4.5.2 Fabrication of structures shall preferably be taken up as per the sequence of erection.

4.5.3 All erection units shall bear erection mark no. and reference drg no. at a prominent location on the structures for easy identification at site.

4.5.4 Fabricated structures shall conform to tolerance as specified in this standard and in IS:7215-1974. In case of contradiction, tolerances specified in this standard shall prevail.

4.5.5 All the components of structures shall be free from twist, bend, damage etc,

4.5.6 Assembly of structures shall be carried out by using suitable jigs and fixtures in order to obviate distortion during welding.

4.5.7 Cutting of items specially for truss, bracing, bunker, hopper, galleries surge girder, portal etc, shall be done only after checking of sizes as per Layout.

4.5.8 Surface, wherever machining is specified, shall be either planed or milled or ground to ensure maximum contact.

4.5.9 If end-milling or machining is planned after the assembly is over, sufficient allowance (5 mm to 15 mm) shall be kept in the items where milling/machining is to be done.

4.5.10 If pre-bending of the plate is required to avoid welding distortion, it shall be done in cold condition.

4.5.11 Sufficient trial assembly of fabricated components (despatch elements) shall be carried out in the fabrication works to control the accuracy of workmanship.

4.5.12 Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads of nuts and bolts satisfactory bearing.

4.5.13 The threaded portion of each bolt shall project through the nut at least by one thread.
4.5.14 Tolerance of assembled components of structures are given in TABLE -

4.5.15 Permissible deviations from designed (true) geometrical form of the despatch elements shall be in accordance with IS:7215-1974.

4.6 **Method of Construction**

4.6.1 The method of construction shall be either by welding or by bolting limiting the site work to the minimum possible.

4.6.2 Bolt diameter shall not be less than 16mm. except for bolts securing roof and wall sheeting, windows, doors and stitching of thin coverings. For bolted joints, min. two bolts shall be used.

4.6.3 The size of fillet welds shall not be less than 5mm for load-bearing joints.

4.6.4 Main structural elements shall be welded continuously. Intermittent welds shall be used only on secondary members, which are not exposed to weather or other corrosive influence.

4.6.5 Connections and splices shall be made by welding, or by bolting with appropriate property class. Black bolts shall be used in connections and attachments of secondary members such as purlins, wall girts, etc. Bolts shall be prevented from loosening by means of lock nuts, single coil spring washers or similar devices.

4.6.6 Method of splicing shall be similar to the method of construction adopted for structures. All splices shall be full-strength splice unless exception is specified.

4.6.7 Roof and wall sheets shall be fixed to purlins and wall girts by stainless steel top speed screws/galvanized J- hook bolts, each complete with neoprene and stainless steel /galvanized washers. The connections shall ensure water-tightness into the buildings. The spacing of these screws/bolts shall be sufficient to prevent uplift of sheets by suction. The roof and wall sheets shall be stitched together at their edges by using studs, rivets or screws. The end and side overlaps of sheeting shall be sufficient to prevent ingress of rainwater. End lap shall not be less than 75mm and side lap shall not be less than one and half corrugation for
GCS sheets. For troughted aluminium sheets manufacturer’s recommendations shall be followed.

4.7 **Structural steel connection**

4.7.1 The Contractor shall be responsible for the design and the detailing of all connections. The design of connections shall provide for adequate strength for the transfer of force in the structural elements indicated on the design drawings. For purposes of detailing of connections, the allowable stresses in material, bolts and welds shall be as per IS:800 and IS:816 or as specified in the design drawings.

4.7.2 For all full strength butt welding of plates and sections thicker than or equal to 10 mm, edge preparation shall be done and got approved by the Owner / Consultant.

4.7.3 Two numbers of washers shall be used for all bolted connections, one washer bearing against the head and other bearing against the nut.

4.7.4 The magnitude of forces shown on design drawings shall be used at face values with no reductions for connections.

4.7.5 If extra joints are to be provided in column, crane girder etc, prior approval on the same shall be obtained from the Owner / Consultant. However, as general guidance, the following is suggested:
   - Splice joint on column and crane girder shall be of full strength butt weld, and, wherever possible, shall be located at the section of minimum or substantially lesser stress.
   - Splice joints of web and flange should be sufficiently staggered in position.

4.7.6 All penetration for piping, conduit, cable trays, etc., through grating or plate flooring shall be cut and suitably banded in the field, except when such penetrations are dimensioned in the drawings in which case they shall be shop cut and banded.
4.8 **Fabrication**

4.8.1 Fabrication of all structural steelwork shall be in accordance with IS:800 or their equivalent foreign national standard of the country of origin of supply unless otherwise specified, and in conformity with various clauses of the Technical Specification.

4.8.2 Wherever practicable and wherever perfect matching of parts is required at site, members shall be shop assembled before despatch to minimise site work. Parts not completely assembled in the shop shall be secured, to the extent possible, to prevent damage during despatch.

4.8.3 All pieces shall be properly identified and bundled for transportation to work site. Care shall be exercised in the delivery, handling and storage of material to ensure that material is not damaged in any manner. Materials shall be kept free of dirt, grease and foreign matter and shall be protected from corrosion. All materials shall be stored properly on skids above the ground which shall be kept clean and properly drained. Girders and beams shall be placed upright and stored. Long members such as columns and chord members shall be supported on skids spaced near enough to prevent damage due to deflection.

4.8.4 Bolts shall be furnished according to bolt lists showing the location of their use and additional bolts shall be supplied to cover wastage.

4.8.5 All fabricated pieces shall bear erection mark numbers painted/punched according to appropriate erection and shop drawings at a prominent location on the structure for easy identification.

4.8.6 All workmanship shall be in accordance with the best practice in modern structural shops. Greatest accuracy shall be achieved in the manufacture of every part of the work and all identical parts shall be strictly interchangeable.

4.8.7 Shearing or flame cutting may be used at the Contractor's option provided that a mechanically controlled cutting torch is used for flame cutting and that the resulting edges are clean and straight.

4.8.8 Unless clean square and true to shape all flame cut edges shall be planed/cleaned by chipping or grinding. Where machine flame cutting is permitted for high tensile steel, special care shall be taken to leave sufficient margin and all flame hardened material shall be removed by machining/edge grinding.
4.8.9 Wherever shearing is used for cutting to size, sheared members shall be free from distortions at sheared edge.

4.8.10 The ends of all girder stiffeners shall be in contact with the compression flange and shall be planed or ground to fit tightly against flange plates unless otherwise stated on the drawings. Care shall be taken to ensure full bearing of the stiffeners at the supports by machining the contact surfaces of both bearing stiffeners and bearing plates. The ends shall not be drawn or caulked.

4.8.11 Column splices and butt joints of struts and compression members depending on contact for stress transmission shall be accurately machined and close butted over the whole section with a clearance not exceeding 0.1 mm locally at any place.

4.8.12 In column cap and bases, the ends of shafts, should be accurately machined so that the parts connected butt over the entire surface of contact. Care should be taken so that these connecting members are fixed with such accuracy that they are not reduced in thickness by machining by more than 1.0 mm. On secondary members, where sufficient gussets and welds are provided to transmit the entire loading, the column ends may not be machined subject to the approval of the Owner / Consultant.

4.8.13 Holes for permanent black bolts shall not be more than 1.5 mm larger than the nominal diameter of the black bolts unless specified otherwise. All holes for turned and fitted bolts shall be sub punched or drilled and reamed at site under assembly of connected parts to a tolerance of +0.3 mm unless specified otherwise. Holes in purlins, side-sheeting runners, packing plates and lacing bars may be punched full size. Holes in light framing with the exception of joint holes, may be punched full size. All punching and sub-punching shall be clean and accurate and all drilling free from burrs. In block/batch drilling, parts shall be separated after drilling and the burrs removed. No hole shall be made by gas cutting process.

4.8.14 The component parts shall be so assembled that they are neither twisted nor otherwise damaged and specified cambers, if any, shall be provided. No drifting of hole shall be permitted except to draw the parts together. Drifts used shall not be larger than the nominal diameter of the bolt. Drifting done during assembling shall not distort the metal or enlarge the holes. Sufficient trial assembly shall be carried out in the fabrication works to prove the accuracy of workmanship of the and the number of such trials required shall be at inspector’s discretion.
4.8.15 Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing. The threaded portion of each bolt shall project through the nut by at least one thread.

4.8.16 In all cases where the full bearing area of the bolt is to be developed, the bolt shall be provided with a washer of sufficient thickness, under the nut so as to avoid any threaded portion of the bolt being within the thickness of the parts bolted together. Column bases and caps, shall be in one solid piece, and except when cut from plates with true surfaces, shall be accurately machined over the bearing surfaces, and shall be in effective contact over the whole area of the machine end of the stanchion.

4.8.17 Each piece shall be distinctly marked before delivery, in accordance with an approved marking diagram and shall bear such other marks as well to facilitate erection. For easy identification at site a small distinguishing mark for each building shall be painted at each end of every member before despatch from fabrication shop. The fabricated steel work shall be despatched in sequence as per agreed programme and for such portion as may be found convenient for erection or as ordered by the Owner / Consultant.

4.8.18 The Contractor shall provide suitable packing wherever necessary to guard against damage during handling and transportation to site. All fabricated parts shall be adequately braced to prevent damage during transit.

4.8.19 The tolerances for fabrication of steel structures shall generally conform to IS:7215 and to suit the technological requirements as specified by the equipment supplier.

4.8.20 Any fabrication work which is considered not to be in keeping with the Technical Specification forming the Contract, or in absence of Technical Specification with recognized good practice, shall be rectified /replaced /corrected at the Contractor’s expense as directed by the Owner / Consultant. Site fabrication work shall also conform to all specifications, stipulations, terms and conditions applicable for shop-welded structures as mentioned above.

4.8.21 Fabrication of steel structures shall not be allowed inside the plant premises.

4.9 **Wastage & Accountability**
4.9.1 For the purpose of accounting of materials where the same is supplied by the Owner, free or on cost recoverable basis, the following wastage including rolling margin, invisible wastage and cut pieces of less than one metre length and plates with lesser dimension less than 300 mm shall be allowed.

a) Structural Steel : i) Sections - 5% on the quantity by weight computed, based on Fabrication drgs.

   ii) Plates - 7.5% on the quantity by weight computed, based on Fabrication drawings.

b) Other materials : 5% on the quantity by weight computed, based on manufacturing drawings.

For all cut pieces (plates & sections) invisible wastage (cutting and burning losses) of maximum 0.5% will be admissible.

4.9.2 Owner reserves the right to take back such sections or quantity of steel issued in excess of quantity as per fabrication drawings plus permissible wastage where raw steel is issued free of cost by Owner. The contractor shall return to the Owner all such steel supplied in good and acceptable condition. In case of failure of the Contractor to return such surplus steel on demand by the Owner, Owner reserves the right to recover the cost of such steel at a penal rate of twice the SAIL- Stockyard rate of that particular section of steel as on the date of accountability.

4.9.3 If the Contractor fails to return scrap / wastage generated as per the percentage mentioned at 4.9.1. recovery on account of such scrap / wastage shall be made by the owner at prevailing rate of steel+ 20 pc per tonne.

The charging of penal rate shall be without prejudice to any other remedies or action, available to the Owner, against the Contractor.

4.10 Despatch Instructions

4.10.1 Each despatchable structure shall bear mark no. along with reference drawing number at two prominent locations (e.g. on flange and bottom of base plate of a column).

4.10.2 "As built" drawing shall be prepared after fabrication is completed to indicate additions / alterations made during the process of fabrication.
4.10.3 Control assembly of important structures shall be done in the shop floor before despatch to avoid mismatching. For all such important structures, match marking shall be given at the control assembly stage in the shop floor and such match markings shall be made clearly visible while assembling the structures at site.

4.10.4 Centre lines of column flanges and both sides of web shall be punched, preferably at top and bottom to facilitate alignment after erection.

5. **ERECTION OF STEEL STRUCTURES**

5.1 **Scope**

The scope of work under erection includes in addition to provision of erection and transport equipments, tools and tackles, consumables, materials, labour and supervision, the following:

a) Storing and stacking at site of erection of all fabricated structural components/units/assemblies till the time of erection.

b) Transportation at site of structures.

c) Receiving at site of structures including site handling/movement, unloading, storing and stacking at site of erection of technological structures such as bunkers and the related structures.

d) All minor rectification/modification such as:

i) Removal of bends, kinks, twists, etc. for parts damaged during transportation and handling;

ii) Cutting chipping, filing, grinding, etc., if required, for preparation and finishing of site connections;
iii) Reaming for use of next higher size bolt for holes which do not register or which are damaged.
iv) Welding of connections in place of bolting for which holes are either not drilled at all or wrongly drilled during fabrication.

e) Other rectification work such as
i) Re-fabrication of parts, damaged beyond repair during transportation and handling or incorrectly fabricated.
ii) Fabrication of parts omitted during fabrication by oversight or subsequently found necessary.
iii) Plug-welding and re-drilling of holes which do not register and which cannot be reamed for use of next higher size bolt.
iv) Drilling of holes which are either not drilled at all or are drilled at incorrect position during fabrication.

f) Fabrication of minor items/missing items or such important items as directed by the Owner Consultant.

g) Assembly at site of steel structural components wherever required including temporary supports and staging.

h) Making arrangements for and providing all facilities for conducting ultrasonic X-ray or gamma ray tests on welds; getting the tests conducted by reputed testing laboratories, making available test films/ graphs, reports and interpretation.

i) Rectifying at site, damaged portions of shop primer by cleaning and touch-up paint.

j) Erection of structures including making connections by bolts/high strength friction grip bolts / welding.

k) Alignment of all structures true to line, level plumb and dimensions within specified limits of tolerances as per IS :12843 “Tolerance for Erection of Steel Structures”.

l) Application of second coat of primer paint and two coats of finishing paint at site after erection.

m) Grouting of all column bases after proper alignment of columns and only after obtaining clearance from Owner / Consultant.

n) Supply of labour in sufficient numbers, where necessary, as directed by the Owner / Consultant.

o) Conducting preliminary acceptance and final acceptance tests.
p) Preparation of as built drawings, preparing of sketches/drawings to suit field engineering decisions, availability of material, convenience of fabrication, transportation and erection and changes during fabrication and erection.

All such works are subject to approval by the Owner / Consultant.

5.2 Erection Drawings

5.2.1 The erection drawings prepared by the Contractor and any approved arrangement drawings, specifications or instructions accompanying them shall be followed in erection of structures and miscellaneous connected items throughout the project.

5.3 Storing and Handling

5.5.1 The fabricated materials on receipt at site shall be carefully unloaded, examined for defects, checked, stored out for each building and stacked securely on skids above level ground which shall be kept clean and properly drained. Girders and beams shall be placed upright and stored. Long members, such as columns and chord members, shall be supported on skids spaced near enough to prevent damage from deflection.

5.5.2 The fabricated materials shall be verified with respect to markings on the marking plan or shipping list which shall be supplied by the Contractor.

5.5.3 Any material found damaged or defective shall be stacked separately and the damaged or defective portions shall be painted in distinct colour for identification. Such materials shall be dealt with as ordered by the Owner / Consultant.

5.5.4 The handling and storing of the component parts of a structure shall involve the use of methods and appliances not likely to produce injury by twisting, bending or otherwise deforming the structures. No member slightly bent or twisted shall be put in place until the defects are corrected. Members seriously damaged in handling shall be rejected.

5.4 Defects in material & fabrication
5.4.1 All materials shall be straight unless required to be of curvilinear form and shall be free from twist. All cold straightening shall be done by pressure only.

5.4.2 During assembly and during erection of the units to position, the Contractor shall compare the structures with the drawings to ensure that there are no fabrication omissions or errors. Should any omission or defect be found the same shall be brought to the notice of the Owner / Consultant who will issue necessary instructions for the rectification.

5.5 **Setting out**

5.5.1 The Contractor shall prepare geodetic survey scheme of all embedded parts and holding down bolts and submit the same to Owner / Consultant. The Contractor shall inform the Owner / Consultant about any discrepancy with approved design drawings well in advance of erection and if necessary shall make necessary adjustments at site or during fabrication of structures.

5.5.2 The Contractor shall assume, full responsibility for the free and correct setting out of all steel work and erection correctly in accordance with position, alignment, dimensions and levels shown on the approved drawings and plumbing vertical members. Particular care shall be taken to ensure free expansion and contraction wherever provided. Notwithstanding any assistance rendered to the Contractor by the Owner / Consultant, if at any time during the progress of the work, any error should appear or arise therein, on being required to do so, the Contractor at his own cost shall remove and amend the work to the satisfaction of the Owner / Consultant.

5.6 **Assembly and Erection**

5.6.1 Before starting erection, the Contractor shall submit to the Owner / Consultant for his approval the method he proposes to follow and the number of types of equipments and temporary, works he proposes to use for the erection.

5.6.2 The approval of drawings by the Owner / Consultant will not relieve the Contractor from the basic approach to design as regards the loads which the erection equipment and temporary work shall be called upon to carry and support. Adequate allowance and provision shall be made for lateral forces and wind loads.
5.6.3 If in the opinion of the Owner / Consultant, the tools, tackles plant and equipment instruments, apparatus, etc. arranged by the Contractor are not sufficient or are inadequate for the fulfilment of the contractual obligations of the Contractor within the stipulated period, the Owner / Consultant will have the right to order the Contractor and the Contractor shall comply with the order to bring/arrange such additional tools, tackles, plant and equipment instruments, apparatus, etc. to the site and employ the same to complete the work in time. All charges in connection thereof shall be borne by the Contractor.

5.6.4 Proper consideration shall be given to the following items during erection.

i) Frame of building to be true and plumb.
ii) Temporary guying and bracing shall be used to align the framing during erection, if required.
iii) Temporary bracing may be required to sustain forces due to erection loads and equipments. Erected parts of the structures shall be made stable during all stages of erection. The stability of structures subjected to the action of wind, dead weight and erection forces shall be attained by observing specified sequence of erection of vertical and horizontal structural members and by installing permanent and temporary bracings.
iv) Erection members shall be held securely in place by bolts to take care of dead load, wind load and erection load.
v) Free expansion and contraction wherever provided
vi) No final bolting or welding of joints shall be done until the structure has been properly aligned and consent obtained from Owner / Consultant.
vii) Erection tools and machinery shall be of suitable capacity for handling the materials furnished and must be in safe operating conditions at all times to avoid danger to materials and personnel.
viii) In positioning beams, columns or other steel members the use of steel sledges shall not be permitted.
ix) The Contractor shall report all failures of the fabricated Steel to fit together properly to the Owner / Consultant and shall obtain approval prior to taking corrective measures.
ii) Steel members shall not be allowed to fall or be subject to shock or impact due to other members being swung into position or for any other cause.
iii) All exposed bolt holes not required shall be plugged

5.6.5 Erection shall be carried out according to the best modern practices and as laid down in the IS : 800-1984 and other relevant standards referred
to therein and according to this erection Specification together with approved erection drawings and Technical Specification.

5.6.6 The Contractor shall design, manufacture, erect and provide false work; staging, temporary supports, etc. required for safe and accurate erection of structural steelwork and shall be fully responsible for the adequacy of the same.

5.6.7 The Contractor shall, if so required by the Owner Consultant, get his drawings, erection schemes and designs for such false work, staging, etc. approved by the Owner / Consultant, but such approval by the Owner / Consultant shall not relieve the Contractor of any of his responsibilities for the safety of such works. As far as possible, assemblies of structures shall be made on the ground itself.

5.6.8 The Contractor shall provide adequate supervision at all stages of the work and examine each portion of the work for accuracy before commencing the erection of the next structural member. The Contractor shall also provide facilities such as adequate temporary access ladders, tools and tackles, instruments, etc. satisfactory to Owner Consultant for his inspection at any stage during erection.

5.6.9 Instrumental checking for correctness of initial setting out of structures, and adjustment of alignment shall be carried out in sequence at different stages as determined by design as against checking and adjustment of alignment in one stage after completion of entire erection. The final levelling and alignment shall be carried out immediately after completion of each section of a building or when called for by the Owner / Consultant.

5.6.10 All structural members shall be erected with erection marks in the same relative position as shown' in the appropriate erection and shop drawings.

5.7 **Field connections**

5.7.1 The holes of erection joints required to be machine bolted shall be filled with temporary bolts and plugs after mounting the structures. The number of bolts and plugs shall be determined by design but it shall not be less than 50% of the total number of holes. In joints where the number of holes is equal to 5 or less, not less than 3 holes shall be filled. The number of plugs shall be about 20% of the holes filled.
5.7.2 The number of washers on permanent bolts shall not be more than two (and not less than one) for nut and one for the bolt head. Wooden rams or mallet shall be used in forcing members into position, in order to protect the metal from injury and shocks. Chipping of edges of plates shall be done without breaking parent metal. Chipped edges shall be finished with a file and all short corner and hammered rough faces shall be rounded off. Chipping with the use of sledge hammer shall only be permitted in exceptional cases and shall be done without resulting in fractured edges.

5.7.3 Where bolting is specified on the drawings, the bolts shall be tightened to the specified limit. The threaded portion of each bolt shall project through the nut by at least one thread. Tapered washers shall be provided for all heads and nuts having bearing on bevelled surfaces. Use of special bolts, such as high strength friction grip bolts, shall be according to the relevant Indian or other recognized standards and shall be subject to the prior approval of the Owner / Consultant before use.

5.7.4 Spring washers or lock nuts shall be provided as specified in the design/shop drawings. All machine fitted bolts shall be perfectly tight and the ends shall be checked to prevent nuts from becoming loose. No unfilled holes shall be left in any part of the structures. All field assembly and welding shall be executed in accordance with the requirements for shop fabrication. Where the steel has been delivered painted, the paint shall be removed before field welding, for a distance of at least 50mm on either side of the joints.

5.7.5 Erection bolts shall be retained in position permanently even after site welding

5.8 **Assembly by high strength friction grip bolts**

5.8.1 The mating surfaces shall be absolutely free from grease, lubricant, dust, rust, etc. and shall be thoroughly cleaned before assembly. The preparation of the mating surfaces shall be done as specified in the design drawings.

5.8.2 Nuts shall be tightened up to the specified torque with the help of torque wrench or by half turn method with the help of pneumatic wrench lever. Torque value has to be specified in design / fabrication drawings itself. The direction of tightening of the nuts shall be from the middle towards the periphery of the joint. The bolt head, nuts and edges of the mating surfaces shall be sealed with a coat of paint to obviate entry of
moisture. As far as possible, the diameter of bolts and nature of mating surface preparation shall be kept uniform to have specified unique torque.

5.9 **Bedding and grouting**

5.9.1 Base plates shall be set to elevations shown in the drawings, supported and aligned using steel wedges and shims or any other approved method. The supply of wedges, shims and any other material for alignment shall be the responsibility of the Contractor as part of his work. Plates shall be levelled, properly positioned and the anchor bolts properly tightened. The bedding/grouting shall not be carried out until a sufficient number of columns have been properly aligned, levelled and plumbed, and sufficient girders, beams, trusses and bracings are in position to the satisfaction of the Owner / Consultant.

5.9.2 Grouting shall be done before casting of elevated RCC floors, if any, and before equipments contributing to the loading on columns are placed in position. No moving equipment shall be tested and no trial run of any equipment conducted, before grouting has been done and cured to the satisfaction of the Owner / Consultant.

5.9.3 Grouting shall be minimum M25 grade or one grade higher than the grade of base concrete with 10 mm and below graded coarse aggregate. Ready-mix, non-shrink, free-flow grout from recognised manufacturer as approved by the Owner / Consultant shall be used with pressure grouting technique to ensure proper filling-up of all void spaces underneath the base plate. Manufacturer’s recommendations / instructions shall be followed for proper application of grout material.

5.9.4 The Contractor shall inform the Owner / Consultant when the base plates are ready for grouting for their verification. The Contractor shall be responsible for final vertical and horizontal alignment of all the base plates.

5.10 **Painting after erection**

The painting shall be as per painting specifications and instructions given in TS and, in GS for painting works.

5.11 **ACCEPTANCE OF WORK**
5.11.1 Acceptance of erected steel structures shall be either after completion of erection of the whole building or in blocks.

Intermediate acceptance certificates will be given in the following cases

i) Any steelwork or part thereof, embedded in concrete.
ii) Steel structures which are to be covered in the process of carrying out further work.

5.11.2 The following documents shall be prepared and produced by the Contractor at the time of acceptance of erected steel structures:

i) Documents showing approved deviations made during execution of erection work.
ii) Documents showing acceptance of embedded structural steelwork.
iii) Certificates / documents on control checking and test of materials (if any) and welds.
iv) Data and results of Geodetic measurements while checking the erection of structures.
v) Copies of "As Built Drawings" showing thereon all additions and alterations.

6.0 WELDING SPECIFICATIONS

6.1 General

6.1.1 The welding and welded work shall conform to IS:816 and other relevant codes unless otherwise specified. Electrodes shall conform to IS:814 and shall be approved by the Owner / consultant.

6.1.2 Welding shall be done by Electrical Arc Process. Automatic welding shall be employed for important structures as specified in the drawings. Generally, submersed arc, Automatic & Semi-automatic welding shall be
employed. Only where it is not practicable, Manual Arc welding may be resorted to. In case of Manual Arc Welding, recommendations of electrode manufacturer are to be strictly followed.

6.1.3 Welding shall not be done under such weather conditions which might adversely affect the efficiency of the welding and where necessary, effective protection and other safeguards shall be provided.

6.1.4 Only qualified welders suitable for the job shall be employed. The Owner / Consultant at his discretion can order periodic tests in accordance with IS:817 of the welders and / or of the welds produced by them at no extra cost. Welding shall be done using requisite jigs and fixtures to avoid distortions or damage to members during / after welding. Welds on exposed work shall be finished uniformly smooth to present a neat appearance.

6.1.5 The layouts and sequence of operations shall be arranged so as to eliminate distortion and shrinkage stress to the satisfaction of the Inspector. Welding work shall be under constant supervision of competent welding supervisor and shall be done in a properly organized manner with the approved quality welding sets and with automatic welding machines. Detailed welding procedure shall be submitted to the Owner / Consultant and approval of the same shall be obtained before fabrication is commenced.

6.2 **Welding Procedure**

6.2.1 Welding procedure to be prepared by the Contractor shall include the following:

i) Type and size of electrodes.
ii) Current and arc voltage.(for automatic welding)
iii) Length of run per electrode, or (for automatic welding) speed of travel.
iv) Number and arrangement of runs in multi-run welds.
v) Position of welding.
vii) Preparation and set-up of parts.
vii) Welding sequence.
viii) Pre or, post-heating.
ix) Specification and thickness of steel
x) Welding process ( manual arc / submerged arc welding )
xi) Thickness of components meeting at a joint
xii) Pre and post heating requirement
xiii) Weather condition – restrictions thereof
xiv) Use of jigs and fixtures  
xv) Type of non-destructive testing to be carried out  
xvi) Inspection procedure to be followed  
xvii) Sequence and process to be followed in different multiple-pass  butt welding for different plate thicknesses.

The welding procedure shall be subject to Owner's / Consultant's approval.

6.2.2 The welding procedure shall be arranged to suit the details of the joints as indicated in the drawings and the positions in which the welding is to be carried out. The welds shall meet the requirements of quality specified.

6.2.3 All electrodes for use in the work to which the specification relates shall be kept under dry conditions. Electrodes which are damaged by moisture shall not be used unless it is certified by the manufacturer that when it is properly dried there shall be no detrimental effect. Any electrode which has part of its flux coating broken away or is otherwise damaged shall be discarded.

6.2.4 Low hydrogen electrodes and flux for submerged arc welding shall be dried at 250-300 deg. C for one hour in drying oven before use.

6.2.5 All metal arc welding shall be as per IS : 9595

6.2.6 Submerged arc welding of mild steel and low alloy steel shall be as per IS : 4353

6.2.8 For multi-run weld deposit the succeeding run shall be done only after the preceding run is cleaned of all slag and flux deposits.

6.2.7 The Contractor shall prepare the edges with an automatically controlled flame cutting torch followed by grinding correctly to the shape, size and dimensions of the groove, prescribed in the design and shop drawings. In case of U-groove joint, the edges shall be prepared with an automatic flame cutting torch in two passes following a bevel cut with a gouging pass, or by machining.

6.2.8 The welding surfaces shall be smooth, uniform and free from fins, tears, notches or any other defect, which may adversely affect welding.
Welding surfaces or the surrounding surfaces within 50 mm of weld shall be free from loose scale, slag, rust, grease, paint, moisture or any other foreign material. Pre-bending of plates for three plate welded sections shall be done where found necessary.

6.2.9 Manipulators may be used where necessary and shall be designed to facilitate welding and to ensure that all welds are easily accessible to the operators. Where full strength butt welds are specified run-on and run-off pieces shall be used. The welding shall be such that the face of weld deposit shall at all places be proud of the surfaces of the parent metal by 1 to 1.5 mm. Where a flush surface is required, the surplus weld metal shall be ground and dressed off.

6.2.10 After completing each run of weld, all slag shall be thoroughly removed, and the surface cleaned before starting the next run of weld. The weld metal, as deposited (including tack welds if to be incorporated) shall be free from cracks, slag, inclusions, gross porosity, cavities and other deposition faults. The weld metal shall be properly fused with the parent metal without serious undercutting or overlapping at the toes of the weld. The surfaces of the weld shall have a uniform and consistent contour and uniform appearance.

6.2.11 All weld runs found defective shall be cut by using either chipping hammer, gouging torch, or suitable grinding wheel in such a manner that adjacent material is not injured in any way. Peeling of the welds involving deformation of the weld surface either during de- slagging or thereafter shall not be allowed.

6.2.12 Arc-strikes on parent surfaces of structures shall be strictly avoided.

6.3 Control in Welding

6.3.1 The extent of quality control in respect of welds for structural elements for both statically and dynamically loaded structures shall be as follows and shall be conducted by the contractor at his own cost:

a) **Visual Examination** - All welds shall be 100% visually inspected to check the following:

   i) Presence of undercuts
ii) Visually identifiable surface cracks in both welds and base metals.

iii) Unfilled craters

iv) Improper weld profile and size

v) Excessive reinforcement in weld

vi) Surface porosity

Before inspection, the surface of weld metal shall be cleaned of all slag, spatter beads, scales etc. by using wire brush or chisel.

b) **Dye Penetration Test (DPT)** - This shall be carried out for all important fillet welds and groove welds for both statically and dynamically loaded structures to check the following

i) Surface cracks

ii) Surface porosities

Dye Penetration Test shall be carried out in accordance with American National Standard ASTME 166.

c) **Ultrasonic- testing:** Ultrasonic test shall be conducted for all groove welds and heat affected zone in dynamically loaded structures and for other important load bearing butt welds in statically loaded structures as desired by Owner, to detect the following

i) Cracks

ii) Lack of fusion

iii) Slag inclusions

iv) Gas porosity

Ultrasonic testing shall be carried out in accordance with American National Standard ANSI/AWS DI.1-96. Before ultrasonic test is carried out, any surface irregularity like undercuts, sharp ridges etc. shall be rectified. Material surface to be used for scanning by probes must allow free movement of probes. For this purpose, surface shall be prepared to make it suitable for carrying out ultrasonic examination.

d) **Radiographic Testing** (X-ray and & Gamma-Ray Examination)

This test shall be limited to 2% of length of welds for welds made by manual or semi-automatic welding and 1% of length of weld if made by automatic welding machines. The location and extent of
weld to be tested by this method will be decided by Owner to detect the following defects:

i) gas porosity  
ii) slag inclusions  
iii) lack of penetration  
iv) lack of fusion  
v) cracks

Radiographic testing shall be conducted in accordance with American National Standard ANSI/AWSDI.1-96. Any surface irregularity like undercuts, craters pits etc. shall be removed before conducting radiographic test. The length of weld to be tested shall not be more than 0.75 x focal distance. The width of the radiographic film shall be width of the welded joint plus 20 mm on either side of the weld.

6.3.2 The Contractor shall provide testing equipment for conducting non-destructive tests for confirming the integrity of welding wherever necessary as directed by the Owner / consultant.

6.4 **Acceptable Limits of Defects of Weld**

Limits of Acceptability of welding defects shall be as follows:

a) Visual inspection & Dye Penetration Test  

The limits of acceptability of defects detected during visual inspection and Dye Penetration Test shall be in accordance with American National Standard ANSI/AWS D1.1-96.

b) Ultrasonic Testing - The limits of acceptability of defects detected during ultrasonic testing shall be in accordance with American National Standard ANSI/AWS D1.1-96.

c) Radiographic testing - The limits of acceptability of defects detected during Radiographic testing shall be in accordance with American National Standard ANSI/AWS D1.1-96

General guidelines for permissible deviations in welding have been given in Section 11.0 of this document.
6.5  Rectification of Defects in Welds

In case of detection of defects in welds, the rectification of the same shall be done as follows

i) All craters in the weld and breaks in the weld run shall be thoroughly filled with weld.

ii) Undercuts, beyond acceptable limits, shall be repaired with dressing so as to provide smooth transition of weld to parent metal.

iii) Welds with cracks and also welds with incomplete penetration, porosity, slag inclusion etc. exceeding permissible limits shall be rectified by removing the length of weld at the location of such defects plus 10 mm from both ends of defective weld, and shall be re-welded. Defective weld shall be removed by chipping hammer gouging torch or grinding wheel. Care shall be taken not to damage the adjacent material.

7.0  PAINTING OF BUILDING STEEL STRUCTURES

All steel structural work shall be painted as follows unless otherwise stated in the drawing / Technical Specification. Relevant section of the GS shall be referred for further guidelines on painting.

7.1  Surface Preparation

The steel surface which is to be painted wall be cleaned of dirt and grease, and the heavier layers of rust shall be removed by chipping prior to actual surface preparation to a specified grade.

Following are the type and standards of surface preparation to be followed based on the requirement of a particular painting system or as specified in the design drawings.

**Manual / Power tool cleaning**  Manual/Power tool cleaning shall be done as per Grade St-2 or St-3 of Swedish Standard institution SIS 05 5900 or cl. 7.2.1.1 & 7.2.1.2 of IS : 1477 (Part - I).
Grade St-2 :- Thorough scraping and wire brushing, machine brushing, grinding, etc. This grade of preparation shall remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or clean brush. After preparation, the surface should have a faint metallic sheen. The appearance shall correspond to the prints designated St-2.

Grade St-3 :- Very thorough scraping and wire brushing, machine brushing, grinding etc. The surface preparation is same as for St-2 but to be done much more thoroughly. After preparing the surface, it should have a pronounced metallic sheen and correspond to the prints designated St-3.

Blast Cleaning – Blast cleaning shall be done by shot blasting as per Grade SA-2 or SA-2 1/2 as specified in the drawings.

If no grade of surface preparation is specified, St-2 grade of preparation as per Swedish Standard shall be followed.

7.2 Paints and painting

Guidelines stipulated here shall be considered along with those specified in GS separately for painting.

7.2.1 Manufacture of paints, mixing of paints, etc - shall be generally according to the relevant IS codes of practice and as per guidelines in the General Specification in the relevant chapter.

7.2.2 In the event of conflict between this General Specification for painting and the paint manufacturer's specification, this conflict shall be immediately brought to the notice of the Owner / Consultant. Generally in cases of such conflicts, manufacturer's Specification/recommendation shall prevail.

7.2.3 Generally compatibility between primer intermediate and finishing paint shall be certified by the paint manufacturer supplying the paints. Before the Contractor buys the paint in bulk, it is recommended to obtain sample of paint and establish “Control Areas of Painting”. On Control Area, surface preparation and painting shall be carried out in the presence of the manufacturer of paint.

7.2.4 Control areas shall serve as specimen of painted surfaces, for observing and recording quality and performance of paint.
7.2.5 In case of any doubts, the Contractor shall send samples of paint to recognized testing laboratories to establish quality of paint with respect to:

i) Viscosity
ii) Adhesion/bond of paint to steel surfaces
iii) Adhesion/simulated salt spray test
iv) Chemical analysis/percentage of solid by weight
v) Normal wear resistance as encountered during handling and erection
vi) Resistance against exposure to acid fumes, and such other tests as considered necessary by the Owner / Consultant.

Whole system of paint shall be obtained from the same manufacturer.

7.2.6 Guarantee period on paints and painting shall commence from the date of completion of finishing coat of paint on entire structures. The guarantee period shall be indicated depending on the type of surface preparation and system of painting. To fulfil this obligations, the Contractor may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.

7.2.7 The painting material as delivered to the Contractor/Applier, must be in the manufacturer's original containers bearing thereon manufacturer's name, brand and description. Paint/painting material in the containers without labels or with illegible labels shall be rejected, removed from the area and shall not be used. Thinners wherever used shall be those recommended by the paint manufacturer and shall be obtained in the containers with manufacturer's name and brand name of the thinner legibly printed, failing which the thinner is liable to be rejected and shall not be used.

7.2.8 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 or as directed by the Owner / Consultant, and touched up with corresponding primer. Touching up paint shall be matched and blended to conspicuous marks. If more than 50% of the painting surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats followed by finishing coats shall be applied as per painting Specification.

7.2.9 All field welded areas on shop painted items shall be mechanically cleaned including the weld area proper, adjacent areas contaminated by
weld splatter or fumes & areas where existing primer / intermediate / finish paint is burnt. Subsequently, new primer and finishing coats of paint shall be applied as per painting Specification.

7.2.10 Application of paint shall be by spraying or brushing as per IS : 486 and IS . 487 and in uniform layers of 50% overlapping strokes by skilled painters. Painting shall not be done when the temperature is less than 5 degree C or more than 45 degree C and relative humidity is more than 85%; unless manufacturer's recommendations permit. Also painting shall not be done in foggy weather. During application, paint agitation must be provided where such agitation is recommended by the manufacturer.

7.2.11 Paint shall be applied at painting manufacturer's recommended rates. The number of coats shall be such that minimum dry film thickness specified is achieved. The dry film thickness (DFT) of painted surfaces shall be checked with ELCOMETER or measuring gauges to ensure specified DFT.

7.2.12 The inside surfaces of gutter which come in contact with rain water shall be provided with 2 finishing coats of water resistant, bitumastic paint of minimum DFT 75 microns, in addition to the primer coats of red oxide zinc phosphate in phenolic alkyde medium or 2 primer coats of epoxy based red oxide zinc chromate/epoxy based zinc phosphate of minimum DFT 25 microns per coat, as given in Specification and drawings. Other structures shall be painted as per painting system mentioned.

7.2.13 All structures shall receive one coat of primer paint at shop after fabrication before despatch after surface preparation has been done as per requirements. Unless otherwise specified all structures after erection shall be given one coat of primer and two coats of finishing paint of approved colour and quality. The under coat shall have different tint to distinguish the same from the finishing coat. Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of required thickness.

7.2.14 Machine-finished surface shall be coated with white lead and tallow before shipment or before being put out into the open air. Part of steel structures to be embedded in concrete, shall be given a protective coat of Portland cement slurry immediately after fabrication after this part is thoroughly cleaned from grease, rust, mill scales etc. No paint shall be applied on such parts.
7.2.15 Zinc-rich primer paints, which have been exposed several months before finishing coat is applied, shall be washed down thoroughly to remove soluble zinc salt deposits. In similar circumstances, the surface of paint based on epoxy resin should be abraded or lightly blast cleaned to ensure adhesion of next coat.

7.2.16 Paints selection shall be based on Preferred make list of BSP. Type of paint (heat resistant/high corrosion resistant) required to be applied for a structure shall be approved by BSP and prior permission shall be taken before application of paint.

8.0 GENERAL REQUIREMENTS

8.1 Programme

The Contractor shall prepare a programme showing the date of supply of steel to his work, and the fabrication and erection of each section of the structure or structures. The erection dates shall be the dates for completion of all the follow-up work in addition to main erection keeping overall completion of project in view. The programme shall include quantum of different activities of work planned month wise to complete the work.

8.2 Drawings

8.2.1 The Contractor shall prepare steel structural arrangement drawings and design drawings along with analysis and design calculation of major elements and take their approval by Owner / Consultant within the time schedule as per contract. Necessary number of prints of drawings and documents; as per contract shall be submitted for approval. The Contractor shall prepare the fabrication drawings and bill of materials shall form part of the fabrication drawings which will be included in the body of the drawing or prepared separately.
8.2.2 Even if the drawings are Approved / Commented by the Owner / Consultant, the Contractor shall not be relieved of the responsibilities for the accuracy of the detailed dimensions shown in the drawings and the safety of all structural connections.

8.2.3 Notes on specifications shown on design drawings shall be considered as superseding or overriding the specifications with which they conflict. On all drawings, dimensions shown in figures shall be acted on. Erection drawings in requisite number of sets shall be submitted to the Owner / Consultant showing thereon all authorized additions and alterations in the process of erection. These drawings shall show the "As-Built Installations".

8.2.4 Supply and distribution of fabrication drawings and other documents like bolt list etc. for the contractors own use or for the use of his subcontractors shall be the responsibility of the Contractor.

8.2.5 The Contractor shall assume full responsibility for the correct setting out of all steel works and erecting correctly in accordance with alignment and levels shown on the approved drawings and plumbing of vertical members. Notwithstanding any assistance rendered to the Contractor by the Owner / Consultant, if at any time during the progress of the work, any error should appear or arise therein, on being required to do so, the Contractor at his own cost shall remove and amend the work to the satisfaction of the Owner/Consultant.

8.2.6 The Contractor shall provide his own measuring instruments for setting out, levelling and aligning work at his own expense.

8.3 **Co-ordination with other Contractors**

The structures shall have to be erected suitably detailed with erection of equipment or construction of civil works. The Contractor shall ensure spirit of co-operation with other contractors and strict adherence to the schedule so that erection schedules of the other parties are not affected.

8.4 **Staging**

Any staging necessary for the pre assembly work of structures shall be provided by the Contractor.
8.5 **Rules and regulations of safety, electricity boards, factory etc.**

The Contractor shall at all times comply with such rules and regulations as stipulated in relevant factory acts, electricity rules, safety regulations, etc.

8.6 **Deviations**

Should the contractor wish to deviate from any specifications or approved drawings and/or technical specifications, he shall obtain the Owner/Consultant's written authority before proceeding with the deviations.

9. **INSPECTION OF STRUCTURES**

The Owner / Owner’s Inspector shall have free access at all times to those parts of Contractor's or his Sub-Contractor's works which are concerned with the fabrication of steel works and shall be afforded all reasonable facilities at all stages of preparation, fabrication and trial assemblies for satisfying himself that the fabrication is being undertaken in accordance with the provisions of relevant specification.

9.2 All gauges and templates, tools, apparatus, labour and assistance for checking shall be supplied by the contractor free of charge. The Owner / Inspector may at his discretion, check the test results obtained at the Contractor's works, by independent test at the Government Test House or elsewhere, and should the material so tested be found to be unsatisfactory, the cost of such test shall be borne by the Contractor.

9.3 Contractor shall make all necessary arrangements for stage inspection by Owner/Inspector during the fabrication at shop and incorporate all on-the-spot instructions / changes conveyed in writing to the Contractor.
9.4 Material improperly detailed or wrongly fabricated shall be reported to the
Owner/Inspector and shall be made good as directed. Minor misfits
which can be remedied by moderate use of drift pins, and moderate
amount of reaming and slight chipping may be corrected in that manner,
if in the opinion of the Owner/Inspector the strength or appearance of
the structure shall not be adversely affected. In the event the Owner/
Inspector directs otherwise, the items shall be rejected and a completely
new piece shall be fabricated. The cost of correcting errors shall be to
the account of the Contractor.

9.5 The Owner / Owner's Inspector shall have the power:

a) To declare, before any structure is submitted for inspection, that the same
is not in accordance with the contract, owing to the adoption of any
unsatisfactory method of fabrication and the same will be rejected.

b) To reject any structure as not being in accordance with specifications &
drawings.

c) To insist that no structure or parts of the structure once rejected is
resubmitted for inspection/test, except in cases where the Owner /
Inspector authorised representative considers the defects as rectifiable.

9.5.1 If, on rejection of structure by the Owner/Inspector the Contractor fails
to make satisfactory progress within the stipulated period, the Owner /
Inspector shall be at liberty to cancel the contract and fabricate or
authorise the fabrication of the structures at any other place he
chooses, at the risk and cost of the Contractor, without prejudice to any
action being taken in addition to terms of General Conditions of
Contract.

9.5.2 The Owner / Inspector's decision regarding rejection shall be final and
binding on the Contractor.

9.5.3 The specifications prescribe various tests at specified intervals for
ascertaining the quality of the work done. If the tests prove
unsatisfactory, Owner/Inspector shall have liberty to order the
Contractor to re-do the work, done in that period and/or to order such
alterations and strengthening that may be necessary at the cost of the
Contractor and the contractor shall be bound to carryout such orders
failing which the rectification/redoing shall be done by the Owner
through other agencies and the cost recovered from the Contractor.
9.5.4 Notwithstanding any inspection at the workshop the Owner/Inspector shall have the liberty to reject, without being liable for compensation any fabricated members or materials brought to site that do not conform to specifications / drawings.

9.5.5 All rejected materials shall be removed from the site of fabrication by the Contractor at his own cost and within the time stipulated by the Owner/Inspector.

10.0 QUALITY SYSTEM AND THIRD PARTY INSPECTION.

10.1 GENERAL

Inspection shall be carried out at the works of the Contractor during fabrication and on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved fabrication drawings and indicated standards.

10.1.1 This specification is in addition to the provisions laid down in Owner's General Condition of Contract (GCC) and special instructions to Contractor, if any.

10.2 QUALITY SYSTEM REQUIREMENTS.

The Contractor must recognise the importance of quality and follow the defined quality programme in all manufacturing and quality control activities of the product. The Contractor shall define and implement the tasks and controls that shall provide needed assurance in case manufacturing of product is sub-contracted either partly or fully and / or for the procured components of the product. All bought-out components, if any, shall be procured from approved list of vendors issued by the Project Authority.

Owner reserves the right to verify the quality programme and entire product characteristics to assure the intended and specified quality of the product.

10.3 QUALITY ASSURANCE PLAN (QAP)
10.3.1 The Contractor shall furnish the Quality Assurance Plan (QAP) for the respective structural unit / component after finalisation of billing schedule for Owner's approval at least two months prior to start of manufacturing.

10.3.2 The Contractor shall indicate the procurement source and furnish to Owner during discussions on QAP, copies of Owner Order, Sub-Owner Order, and data sheets as backup reference materials for scrutiny & finalisation of QAP.

10.3.3 QAP shall be prepared & furnished by the Contractor in the prescribed format (enclosed as Annexure- B) for structural components, in four sets.

10.3.4 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 component. Any, additional type or special test or routine tests if found necessary to establish the intended quality, shall be incorporated in the QAP on mutual agreement without any commercial implication.

10.3.5 Detailed QAP shall be prepared by the Contractor based on the general plan given by Owner and shall be approved by Owner to avoid any complication later.

10.3.6 QAP shall clearly indicate the followings through use of codes in the appropriate columns:

   a) Range of inspection & tests to be done by the Contractor during fabrication of structures from raw materials to finishing stage.

   b) Suggestive check / hold points for Owner's inspection and witnessing of tests during the fabrication and final product inspection.

   c) Details of test certificates, internal inspection reports and calibration certificates to be furnished by the Contractor to Owner.

   d) Inspection documents to be furnished by the Contractor to Owner for reference during inspection.

10.3.7 Sampling method for lot inspection of similar bulk items, if any, shall be indicated under column 16 of QAP with linkage to applicable standard.

10.3.8 While submitting the QAP, the Contractor shall indicate the acceptance criteria under column 15 of QAP form regarding check parameters of each
component. Acceptance criteria shall have reference of documents viz. Owner Order, Sub-Owner Order, T.S., Approved fabrication drawings. Wherever the acceptance criterion is not available in above documents, the same shall be specified with traceability to national / international specifications.

10.4 **INDICATIVE SURVEILLANCE BY OWNER.**

10.4.1 Surveillance level of Owner may vary from component to component as per product characteristics.

Indicative extent of inspection for buildings and structures is furnished below for guidance of Contractors in developing QAP.

<table>
<thead>
<tr>
<th>Categories of Equipment</th>
<th>Extent of Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Manufactured items</td>
<td>Material &amp; manufacturer’s test certificate</td>
</tr>
<tr>
<td>(Structural fabricated and welded)</td>
<td>to be submitted by giving inspection call for the main equipment in the final stage.</td>
</tr>
</tbody>
</table>

Scrutiny of welding procedure and welder’s qualification record shall be carried out if required as per governing code.

Following checks / tests shall be carried out in the final stage:
- Visual inspection
- Alignment and fitment checking
- Dimensional checking
- Weld inspection - visual and NDT as per design requirements. Radiographs are to be shown and reports to be submitted to Owner for review during inspection, if applicable.

10.5 **CALIBRATION OF MEASURING EQUIPMENT.**

10.5.1 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.

10.5.2 Calibration Certificate of All Measuring Equipments.

Valid calibration certificates for all measuring equipments used during inspection and testing with traceability to national standards of NPL / NPL accredited laboratories shall be furnished along with inspection call prior to undertaking inspection by Owner.

Calibration certificates shall also indicate reference number of calibration standards calibrated by NPL / NPL accredited laboratories and copies of such calibration certificates of calibration standards shall also be furnished when asked for.

10.6 TEST CERTIFICATES AND DOCUMENTS.

10.6.1 For each of the items being fabricated, the following test certificates and documents, as applicable, in requisite copies including original shall be submitted to Inspection Agency. All test certificates must be endorsed by the Contractor with linkage to project, purchase order and acceptance criteria.

i) Raw materials identification & physical and chemical test certificates for all materials used in fabrication of the component (except IS 2062-1992).

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

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

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

v) Details of heat-treatment and stress relieving charts as per specification.

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

vii) Hardness test certificate.

viii) Performance Test Certificates for all characteristics.
ix) Geometric accuracy and repeatability test reports of machine tools.

x) Surface preparation and painting certificates.

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

10.6.2 The Inspection Agency shall have the right to be present and witness all tests being carried out by the 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.

10.7 MANUFACTURING AND INSPECTION SCHEDULE

The Contractor shall submit the schedule for fabrication and inspection indicating components/assembly/sub-assembly, date of approval of drawings/data sheets, address of Fabricator with contact person and scheduled date of inspection. Such reports shall be submitted to Owner with a copy to Inspection Coordinating Office once in a month. These monthly reports shall state the planning for next three months. Submission of first report must commence one month prior to commencement of fabrication activities of the component.

10.8 INTERNAL INSPECTION BY CONTRACTOR

10.8.1 The Contractor in accordance with approved drawings, T.S., Owner Order, and approved QAP shall carry out inspection and tests. The Contractor shall maintain records of each inspection and test carried out and signed documents shall be submitted to Owner for verification.

10.8.2 The Contractor shall carry out their internal inspection & obtain clearance from statutory bodies e.g. IBR, CCE, TAC, Weights & Measures, safety, IE rules etc. as and where applicable, prior to offering any component for Owner's inspection in accordance with approved QAP.

10.8.3 The Contractor shall ensure use of appropriate calibrated measuring equipment during their internal inspection, as well as, make available the same during Owner's inspection and tests. Also, they shall make necessary arrangement for access and use of Owner owned measuring equipment during inspection.

10.8.4 The Contractor shall identify all the inspected component / raw materials & shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification / rework, rejected etc.
10.8.5 The Contractor shall establish and maintain procedures to ensure that 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 Owner by concession and / or repairs shall be recorded.

Repaired and reworked product shall be offered for re-inspection to Owner along with records of corrective action taken.

10.8.6 The Contractor shall not despatch any equipment till receipt of despatch clearance from Owner.

10.9 \textbf{METHOD OF UNDERTAKING INSPECTION \& TESTING BY OWNER}.

10.9.1 Agency Responsible:-

Inspection / Waiver of component shall be undertaken by various MECON Offices depending upon the location of manufacturers.

10.9.2 Method of Issuing Inspection Call to MECON:

(i) Inspection call shall be given only on readiness of the assembly / sub-assembly and approval of all relevant drawings and QAP. In case assembly sub-assembly offered for inspection are found not ready, all the cost of visit of Owner's personnel shall have to be borne by the Contractor. Also, if the assembly / sub-assembly after inspection found not acceptable, require rework and involve Owner's re-inspection, all the cost of such re-inspections shall also be borne by the Contractor.

(ii) Inspection call shall be floated to Owner with ten days clear margin, enclosing all documents like test Certificates, Internal Inspection Reports, Purchase Order, Sub-Purchase Order, T.S., Approved QAP, approved GA drawings/ data sheets and fabrication drawings with a copy of call letter to Inspection Co-ordinating Office. Inspection calls without above documents shall be ignored.

(iii) The supplier shall offer substantial quantities for economical inspection consistent with the size of order.

10.10 \textbf{OBLIGATIONS OF CONTRACTOR}.
10.10.1 The Contractor shall provide all facilities and ensure full and free access of the Inspection Engineer of Owner to the Contractor’s 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.

10.10.2 The Contractor shall delegate a Representative / Co-ordinate to deal with Owner / Consultant on all inspection matters. Also, Contractor’s Representative shall be present during all inspection at Sub-Contractor’s works.

10.10.3 The Contractor shall comply with instructions of the Inspection Engineer fully and with promptitude.

10.10.4 The Contractor / Sub-Contractor shall provide all instruments, tools, necessary testing & other inspection facilities to Inspection Engineer free of cost for carrying out inspection.

10.10.5 The cost of testing welds by ultrasonic, radiographic and dye penetration tests etc. in the fabrication workshop shall be borne by the Contractor.

10.10.6 The Contractor shall ensure that the assembly / component of the plant and equipment required to be inspected, are not dismantled or despatched before inspection.

10.10.7 The Contractor shall not offer equipment for inspection in painted condition unless otherwise agreed in writing by Owner / Consultant.

10.10.8 The Contractor shall ensure that the equipment and materials once rejected by the Inspection Engineer are not re-used in the manufacture of the plant and equipment. Where parts rejected by the Inspection Engineer 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.

10.11 STAMPING AND ISSUE OF INSPECTION DOCUMENTS.

Inspection Memo: -

For stage inspection & 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 in
standard form indicating therein the details of observation & remarks. Fabricator shall indicate all the non-conformities with respect to specification of the product in the Inspection Memo for further control.

Inspection Certificate: -

On satisfactory completion of final inspection & testing by Owner / Third Party Inspector, all accepted plant & equipment shall be stamped suitably and the Inspection Engineer for the accepted items shall issue Inspection Certificate in standard form.

Inspection Waiver Certificate: -

For the waiver category of items identified in the approved QAP, Owner shall issue Inspection Waiver Certificate after scrutiny of Contractor’s Internal Inspection Report, Test Certificates and other Documents as identified in QAP.

10.12. GENERAL CLAUSES

10.12.1 Inspection & tests carried out by Owner / Third Party Inspector shall not absolve the responsibility of the Contractor to provide acceptable product nor shall it preclude subsequent rejection.

10.12.2 Owner / Third Party Inspector reserves the right to inspect any product at any stage of manufacturing without prior notice to Contractor beyond pre-identified stages & hold points of approved QAP.

11. PERMISSIBLE DEVIATION IN ASSEMBLY OF WELDED JOINTS

A) SQUARE BUTT-JOINT
   a) Gap between the ends of plates : + 1.0 mm
   b) Stepping of one plate over the other : + 1.0 mm

B) SINGLE VEE-GROOVE JOINT
   a) Bevel angle : + 5 deg
b) Gap between two plates : + 1.0 mm

c) Stepping of one plate over the other : + 2.0 mm

d) Root thickness : + 1.0 mm

C) LAP JOINT

a) Over lap : + 5.0 mm

b) Gap between the surfaces : + 1.0 mm

D) TEE FILLET JOINT

a) Gap between the edge of the web and the surface of the flange : + 2.0 mm

E) DOUBLE VEE-GROOVE JOINT

a) Stepping of plate over one another : + 2.0 mm

b) Deviation in value of root thickness : + 1.0 mm

c) Deviation in bevel angle : + 1.0 mm

d) Deviation in value of gap : + 1.0 mm

12. PERMISSIBLE DEVIATIONS IN FABRICATION & ERECTION

<table>
<thead>
<tr>
<th>Description</th>
<th>Tolerance in mm</th>
</tr>
</thead>
</table>

DUST CATCHER SHELL
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>DEVIATION IN mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellipticity (max. difference in diameters) of a course.</td>
<td>$+0.002$ of the theoretical diameter of the course.</td>
</tr>
<tr>
<td>Stepping of the edges of plates in the vertical and circular weld joint.</td>
<td>$0.1$ of shell thickness but not more than $3$ mm.</td>
</tr>
<tr>
<td>Local warping of shell along the generatrix and periphery as measured by gauge over the length of $1500$ mm.</td>
<td>Not more than $15$ mm.</td>
</tr>
</tbody>
</table>
Caving in or bulging of joints measured by gauge over a length of 200 mm.

Note: H - height measured from the base of the point of alignment.

### TABLE – 3

**COVERAGE OF NDT FOR WELDS**

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>NORMS FOR CONTROLLING AS A % OF TOTAL LENGTH OF WELDING (NOT LESS THAN) FOR</th>
<th>PLACES TO BE SUBJECTED TO RADIOGRAPHIC TESTING COMPULSORILY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ULTRASONIC TESTING</td>
<td>RADIOGRAPHIC TESTING</td>
</tr>
<tr>
<td>BF Shell</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Stoves, hot blast main &amp; bustle main</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

Portions of the welded joint found defective by ultrasonic testing.

Portions of the welded joint found defective by ultrasonic testing and crossing of welded joint.
<table>
<thead>
<tr>
<th>Dust catcher, Junction &amp; places of variable cross sections by the following norms without ultrasonic testing with ultrasonic testing</th>
<th>--</th>
<th>3</th>
<th>1.5</th>
<th>Crossing of welded joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portions of gas pipelines from BF to DC &amp; DC to GCP</td>
<td>--</td>
<td>1</td>
<td>0.5</td>
<td>Portions of the welded joints found defective by ultrasonic testing</td>
</tr>
</tbody>
</table>

**TABLE – 4**

**ERECTION TOLERANCES**
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TOLERANCE (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMNS</td>
<td></td>
</tr>
<tr>
<td>Deviation of column axes at foundation top level with respect to true axes</td>
<td>± 5</td>
</tr>
<tr>
<td>In longitudinal direction</td>
<td>± 5</td>
</tr>
<tr>
<td>In lateral direction</td>
<td></td>
</tr>
<tr>
<td>Deviation in the level bearing surface of columns at foundation top level with respect to true level</td>
<td>± 5</td>
</tr>
<tr>
<td>Out-of-plumbness (verticality of column axis from true vertical axis, as measured at column top)</td>
<td>± H/1000 or ±25 mm whichever is less.</td>
</tr>
<tr>
<td>For columns without any special requirements</td>
<td>± H/1200 or ±35 mm max.</td>
</tr>
<tr>
<td>Up to and including 30 M height</td>
<td></td>
</tr>
<tr>
<td>Over 30 M height</td>
<td>± H/1000 or ±20 mm whichever is less.</td>
</tr>
<tr>
<td>For columns with special requirement like cranes or such similar requirements.</td>
<td>± H/1500 or ±25 mm max.</td>
</tr>
<tr>
<td>Upto and including 30 M height</td>
<td></td>
</tr>
<tr>
<td>Over 30 M height</td>
<td></td>
</tr>
<tr>
<td>Deviations in straightness in longitudinal and transverse plans of columns at any point along the height.</td>
<td>± H/1000 or ±10 mm whichever is less.</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>TOLERANCES (mm)</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>TRUSSES</strong></td>
<td></td>
</tr>
<tr>
<td>Shift, at the centre of span of top chord member with respect to the vertical plan passing through the centre of bottom chord.</td>
<td>± 1/250 of height of truss at centre of span or ± 15 mm whichever is less.</td>
</tr>
<tr>
<td>Lateral shift of top chord of truss at the centre of span from the vertical plan passing through the centre of supports of the truss.</td>
<td>± 1/1500 of height of truss at centre of span or</td>
</tr>
</tbody>
</table>

**Note:**

Tolerance specified under 3(a) & 3(b) should be read in conjunction with 4 & 5. 'H' above is the column height in mm.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TOLERANCES (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral shift in location of truss from its true vertical position.</td>
<td>± 10 mm</td>
</tr>
<tr>
<td>Lateral shift in location of purlins from its true positions.</td>
<td>± 5</td>
</tr>
<tr>
<td>Deviation in difference of bearing levels of trusses or beam from the true difference.</td>
<td>L/1200 or ± 20 mm whichever is less (L = span)</td>
</tr>
</tbody>
</table>

contnd..

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TOLERANCES (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift in the centre line of crane rail with respect to centre line of web of crane girder.</td>
<td>± (web thickness + 2)/2</td>
</tr>
<tr>
<td>Shift in plan of alignment of crane rail with respect to true axis of crane rail at any point.</td>
<td>± 5</td>
</tr>
<tr>
<td>Deviations in crane track gauge with respect to true crane gauge.</td>
<td>± 5</td>
</tr>
<tr>
<td>For track gauge up to and including 15 M.</td>
<td>(5 + 0.25(S-15)) subject to a max. of 10 mm, where S in</td>
</tr>
<tr>
<td>Description</td>
<td>Tolerance</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Deviations in crane rail level at any point from true level.</td>
<td>± 10</td>
</tr>
<tr>
<td>Difference in levels between crane track rails (across the bay) at:</td>
<td></td>
</tr>
<tr>
<td>Support of crane girder</td>
<td>± 15</td>
</tr>
<tr>
<td>Mid span of crane girders</td>
<td>± 20</td>
</tr>
<tr>
<td>Relative shift of crane rail surfaces at a joint in plan and elevations.</td>
<td>2 mm</td>
</tr>
<tr>
<td>Relative shift in location of crane stops (end buggers) along the crane track gauge.</td>
<td>1/1000 of track gauge S in mm subject to max. of 20 mm</td>
</tr>
<tr>
<td>CHIMNEYS &amp; TOWERS</td>
<td></td>
</tr>
<tr>
<td>Out of plumbness (vertically from the true vertical axis).</td>
<td>1/1000 of the height of chimney or tower in mm.</td>
</tr>
<tr>
<td>BUNKERS</td>
<td></td>
</tr>
<tr>
<td>Deviation in length of bunker from the true length.</td>
<td>± 1/1000 of length in mm</td>
</tr>
<tr>
<td>Deviation in width of bunker from the true width.</td>
<td>± 1/1000 of width in mm</td>
</tr>
<tr>
<td>Deviation in height of bunker from the true height.</td>
<td>± 1/1000 of height in mm</td>
</tr>
<tr>
<td>Section</td>
<td>Specification Details</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>BF SHELL</strong></td>
<td>Ellipticity (the maximum difference in diameter in diameter) of courses. 0.002 of the theoretical diameter of the courses.</td>
</tr>
<tr>
<td><strong>STOVE SHELL</strong></td>
<td>The dome centre shift with respect to the bottom centre. ± 20</td>
</tr>
<tr>
<td><strong>TOP STRUCTURES</strong></td>
<td>Shift of frame centre from the designed position. ± 20 mm</td>
</tr>
<tr>
<td></td>
<td>Non horizontality of girders 3 mm per 1 m of girder length.</td>
</tr>
<tr>
<td><strong>DOWN COMERS</strong></td>
<td>Erection and sag of down comers 0.0015 L but not more than 80 mm. (L is the length of pipeline)</td>
</tr>
<tr>
<td><strong>GAS PIPELINE SUPPORTS</strong></td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Deviations of support axes from the vertical plane.</td>
<td>0.002 h, but not more than 20 mm, h is the height of the support.</td>
</tr>
<tr>
<td>GAS &amp; AIR</td>
<td>Distortion of flange /surfaces (except for the furnace top one ) with respect to the branch pipe/ pipe socket axis.</td>
</tr>
<tr>
<td>DUST CATCHER</td>
<td>Ellipticity</td>
</tr>
<tr>
<td>BUSTLE PIPE</td>
<td>The deviations of the bottom level ( of the shell ) of the ring pipe ( measured along the axis of air tuyere ) from the designed one.</td>
</tr>
<tr>
<td></td>
<td>Ellipticity</td>
</tr>
</tbody>
</table>
Note:

The tolerances given at Sections 11 and 12 above, are meant as general guidelines, mainly for technological structures, and for those not covered in IS Codes. Tolerances for fabrication and erection in general, shall be as per stipulations of IS : 7215-1974, and IS : 12843 -1989. In case of a conflict between the guidelines given in IS Codes and this Specification, those specified herein shall prevail.

ANNEXURE-A

Permissible deviations in pitch and gauge of holes for bolts of normal accuracy (high strength bolts included)

<table>
<thead>
<tr>
<th>Description</th>
<th>Hole diameter (mm)</th>
<th>Permissible deviations in spacing (mm)</th>
<th>Permissible deviations in each group of holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel</td>
<td>Low Alloysed Steel</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>a) Deviation in the hole diameter</td>
<td>Upto 17.0</td>
<td>+1</td>
<td>No limits</td>
</tr>
<tr>
<td></td>
<td>Above 17.0</td>
<td>+1.5</td>
<td></td>
</tr>
<tr>
<td>b) Ovality (difference between the biggest and the smallest diameter)</td>
<td>Upto 17.0</td>
<td>+1</td>
<td>No limits</td>
</tr>
<tr>
<td></td>
<td>Above 17.0</td>
<td>+1.5</td>
<td></td>
</tr>
<tr>
<td>c) Curves, exceeding 1mm and</td>
<td>—</td>
<td>—</td>
<td>Not permissible</td>
</tr>
</tbody>
</table>
cracks on the hole edges

d) (i) Non-coincidence of holes in separate details of the assembled unit, upto 1mm
(ii) Above 1 mm upto 1.5 mm

<table>
<thead>
<tr>
<th></th>
<th>--</th>
<th>--</th>
<th>Upto 50%</th>
<th>Upto 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits</td>
<td></td>
<td></td>
<td>Upto 10%</td>
<td>Upto 10%</td>
</tr>
<tr>
<td>of the thickness</td>
<td></td>
<td></td>
<td>No Limits</td>
<td>No Limits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>--</th>
<th></th>
<th>Upto 30%</th>
<th>No Limits</th>
<th>No Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PAINTING

(CHAPTER-09)
STEEL AUTHORITY OF INDIA LIMITED
BHILAI STEEL PLANT

GENERAL SPECIFICATION
FOR
PAINTING
(GS – 09)

MECON LIMITED
RANCHI - 834002

No. MEC/S/1901/11/38/0/00/00/F1889/R2
JULY, 2007
## 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>
</tbody>
</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 pipe work 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 system specified here-in 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.
02.02 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)

02.03 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.

02.03.01 **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.

02.03.02 **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 and 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.

02.03.03 **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.

02.03.04 **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 cutting 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 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

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 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.

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 be 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) 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 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.
### 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</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: 95% of any section</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
</tr>
<tr>
<td></td>
<td>of surface area is free from all rusts, mill-scales and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>visible residues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blast cleaning to commercial quality: At least 2/3 of</td>
<td>Sa 2</td>
<td>Sa 2</td>
</tr>
<tr>
<td></td>
<td>any section of the 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>4</td>
<td>Brush-off blast cleaning: Removal of all loose mill-</td>
<td>Sa 1</td>
<td>Sa 1</td>
</tr>
<tr>
<td></td>
<td>scales, rust and foreign matters etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Power tool cleaning: Very thorough scrapping and wire</td>
<td>St 3</td>
<td>St 3</td>
</tr>
<tr>
<td></td>
<td>brushing to remove loose mill-scale, rust and foreign</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>matters to have pronounced metallic shine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hand tool cleaning: Removal by hand brushing of loose</td>
<td>St 2</td>
<td>St 2</td>
</tr>
<tr>
<td></td>
<td>mill-scale, loose 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 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 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
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)
  
  Full cure 7 days
- **DFT / Coat** - 100 microns

01.09 **Wood Varnish-P9**

A 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 (M10).

- **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-I2 (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-I3 (PVC – Alkyd Based)**

- **PVC Coploymer** - Resin 1 : 1
- **Pigments** - Micaceous iron oxide (MIO)
- **DFT / Coat** - 80 microns (min)
02.04 **Intermediate paint-I4**

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 resistance: 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 resistance: Up to 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: Up to 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
  - Upto 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)
- **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**

A 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 (Temp. not exceeding 80°C)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Technological steel structures for plant and equipment</td>
<td>Indoor: SP – Sa 2.5 2P1 CRT 2F1 130</td>
<td>Outdoor: SP – Sa 2.5 2P1 1I1 CRT 2F1 205</td>
</tr>
<tr>
<td>1.2</td>
<td>Fabricated steel structures at site for rung ladders, cat-ladders, gates, rolling shutters, etc. (Springs/rubbing surfaces excluded)</td>
<td>Indoor / Outdoor: SP – St-2 and/or St-3 2P1 CRT 2F1 130</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Walkways, stairs, platforms etc. which are of wearing surface</td>
<td>Indoor: SP – St-2 and/or St-3 2P1 CRT 2F1 130</td>
<td>Outdoor: SP-St2 and/or St-3 2P1 1I1 CRT 2F1 205</td>
</tr>
<tr>
<td>1.4</td>
<td>Steel doors and windows</td>
<td>Indoor / outdoor: SP–St-2 and/or St-3 2P1 CRT 2F2 215</td>
<td></td>
</tr>
</tbody>
</table>

### Sl. No. 2.0 MECHANICAL EQUIPMENT
- Mechanical equipment (Temp. not exceeding 80°C)
  - Static equipment like storage tanks, vessels, bins, bunkers, heat exchangers, coolers,
### General Technical Specification

**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></td>
<td>Cyclones, scrubbers, etc.</td>
<td>SP – Sa 2.5</td>
<td>CRT 2F5/2F6</td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>2P2/2P3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SP – Sa 2.5</td>
<td>CRT 2F5/2F6</td>
</tr>
<tr>
<td></td>
<td>- Outdoor</td>
<td>2P1 + 1/11/13</td>
<td>CRT 2F6/2F7</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Rotary/moving equipment and machineries</td>
<td>SP – Sa 2.5</td>
<td>CRT 2F6/2F7</td>
</tr>
<tr>
<td></td>
<td>like crushers, mills, vibratory screens, bin activators, blowers, fan,</td>
<td>2P3/2P4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>air/gas compressors, pumps, gear boxes, machine housings etc.</td>
<td>CRT 2F6/2F7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indoor</td>
<td>SP-Sa 2.5</td>
<td>CRT 2F6/2F7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P3 + 1/11/14</td>
<td>CRT 2F6/2F7</td>
</tr>
</tbody>
</table>

### Sl. No. 3.0 Description

Pipe / Duct work (Overground)

### Sl. No. 3.1 Description

Non – insulated (temperature up to 80°C)

- Indoor
  - SP – St2 and/or St3
    - SP – St2 and/or St3
      - CRT 2F1
      - 130
- Outdoor
  - SP – St2 and/or St3
    - 2P1 + 1/11
    - CRT 2F1
    - 205

### Sl. No. 3.2 Description

Insulated (hot)

- Indoor/Outdoor
  - SP – St2 and/or St3
    - 1P1
    - Remove paint and insulate

### Sl. No. 4.0 Description

Oxygen Plant

### Sl. No. 4.1 Description

Outdoor steel structures

- SP – St2 and/or St3
  - CRT

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Painting
Page 16 of 19

GS-09
### 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></td>
<td></td>
<td>2P1 + 1I1</td>
<td>2F3</td>
</tr>
<tr>
<td>4.2</td>
<td>Rotary equipment like air compressors</td>
<td>Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P4</td>
<td>2F7</td>
</tr>
<tr>
<td>5.0</td>
<td><strong>Others</strong></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>As per manufacturer’s standards</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Laboratory equipment like ovens, screens, magnetic stirrers, samplers, etc.</td>
<td>Stove enamelling</td>
<td>CRT</td>
</tr>
<tr>
<td>5.3</td>
<td>Steel structures partly immersed in water</td>
<td>SP – Sa 2.5</td>
<td>CRT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2P8</td>
<td></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.
**ANNEXURE - 04**

**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>
<tr>
<td></td>
<td>Crane bridges, trolleys, hooks etc. and other mobile equipment</td>
<td>Base : Lemon yellow  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  Strips : Same shade as for piping around the tnk at half the tank height</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire-fighting equipment</td>
<td>Signal red</td>
<td>537</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Pipe work</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 care 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.
### Service Colour Colour No. of IS:5

<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, Band - White</td>
<td>217, -</td>
</tr>
<tr>
<td>Cooling water</td>
<td>Base – Sea green, Band - White</td>
<td>217, 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, Band – Light brown</td>
<td>217, 410</td>
</tr>
<tr>
<td>Drinking water</td>
<td>Base – Sea green, First band - French blue, Second band – Signal red</td>
<td>217, 166, 537</td>
</tr>
<tr>
<td>Industrial water</td>
<td>Base – Sea green, Band – Light orange</td>
<td>217, 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, Band – Light brown</td>
<td>101, 410</td>
</tr>
<tr>
<td>Drainage</td>
<td>Base – Black</td>
<td>-</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>Base – Light brown, Band – Signal red</td>
<td>410, 537</td>
</tr>
<tr>
<td>Coke oven/BF gas/other fuel gases</td>
<td>Base – Canary yellow, Band – Signal red</td>
<td>309, 537</td>
</tr>
<tr>
<td>Argon</td>
<td>Base – Canary yellow, Band – French blue</td>
<td>309, 166</td>
</tr>
<tr>
<td>Acetylene</td>
<td>Base – Canary yellow, Band – Dark violet</td>
<td>309, 796</td>
</tr>
<tr>
<td>LP Gas (LPG)</td>
<td>Base – Canary yellow, First band – Signal red, Second band – Traffic green</td>
<td>309, 537, 267</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Base – Canary yellow, Band – Black</td>
<td>309, -</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Base – Canary yellow, Band – White</td>
<td>309, -</td>
</tr>
<tr>
<td>Non-acidic slurries</td>
<td>Base – Sea green, Band – White</td>
<td>217, -</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, Band – Sky blue</td>
<td>217, 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.
TENDER DOCUMENT

TENDER NO.: DLI/C&E/VI-675/316

FOR

Tender for Supply, Fabrication and Painting (Two Coats Primer) of “Horizontal Gravity Take-up Unit for Conveyor Y7-12 & Wheel Assembly for Reversible Shuttle Conveyor RSC-L106 & RSC-L118” for the Project of “Augmentation of Fuel & Flux Crushing Facilities (Package No. – 064)” for Bhilai Steel Plant at Bhilai, Chhattisgarh”

VOLUME – IV

DRAWINGS
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Drawing No.</th>
<th>Rev</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>BSP-EPI-02-064-02-002-55-DE-01116 (Sheet 01 to 07)</td>
<td>01</td>
<td>DETAIL OF TAKE UP FOR CONV. NO. Y7-12</td>
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<td>2.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01522 (Sheet 02)</td>
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<td>NON-DRIVE SHAFT DETAIL FOR CONV. NO. RSC-L106</td>
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<td>3.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01522 (Sheet 03)</td>
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<td>DRIVE SHAFT DETAIL FOR CONV. NO. RSC-L106</td>
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<td>4.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01522 (Sheet 04)</td>
<td>00</td>
<td>RAIL CLAMPING ARRANGEMENT FOR CONV. NO. RSC-L106 (TAIL)</td>
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<td>5.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01512 (Sheet 03)</td>
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<td>RAIL CLAMPING ARRANGEMENT FOR CONV. NO. RSC-L106 (HEAD)</td>
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<tr>
<td>6.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01513 (Sheet 03)</td>
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<td>RAIL CLAMPING ARRANGEMENT FOR CONV. NO. RSC-L118 (HEAD)</td>
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<tr>
<td>7.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01523 (Sheet 03)</td>
<td>00</td>
<td>RAIL CLAMPING ARRANGEMENT FOR CONV. NO. RSC-L118 (TAIL)</td>
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<td>8.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01523 (Sheet 04)</td>
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<td>DRIVE SHAFT DETAIL FOR CONV. NO. RSC-L118</td>
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<tr>
<td>9.</td>
<td>BSP-EPI-02-064-02-005-55-DE-01523 (Sheet 05)</td>
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<td>NON-DRIVE SHAFT DETAIL FOR CONV. NO. RSC-L118</td>
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