

BCCL



Bharat Coking Coal Limited
(A Subsidiary of Coal India Ltd)
Contract Management Cell
Koyla Bhawan: Koyla Nagar
Dhanbad-826 005 (India)
Tele-Fax: 0326-2230206
e-mail: cgmcmc@bccl.gov.in

PART- I (COMMERCIAL BID)

1. Name of Work : Planning, Design, Engineering, Construction, Fabrication, Supply, Erection, Trial-run, Commissioning and Testing of Rapid Loading System on Existing Railway siding for Proposed 5.0 Mtpa capacity Madhuband Washery & comprising of all Civil, Structural, Electrical and Mechanical Works and all other accessories and facilities as required to make it complete in all respects, on turnkey basis.
2. Place of Work : Railway siding of existing Madhuband washery
3. Tender Notice No. & Date : BCCL/CGM(CMC)/RLS-MB/2013/ 452.
Date: 04.04.2013
4. Earnest Money : Rs.16,00,000 (Sixteen lacks) only
5. Date & Time of submission of tender : On 20.05.2013 upto 3.30 P.M.
6. Date & Time of Opening of Part-I Tender : On 21.05.2013 at 4.00 P.M.
7. Date & Time of opening of Price bid (Part-II) : Shall be communicated in due course after evaluation of Part – I tender
8. Date of Issue of Tender Document :
9. Money Receipt No/Bank draft no. towards cost of Tender Document. :
10. Tender Document sold to :

CGM (CMC)

TENDER DOCUMENT
FOR
DESIGN, SUPPLY, ERECTION, COMMISSIONING
AND TESTING
OF
RAPID LOADING SYSTEM
FOR
MADHUBAND NLW WASHERY (5 Mtpa)
AT
BHARAT COKING COAL LIMITED, DHANBAD

VOLUME - I : COMMERCIAL



Bharat Coking Coal Limited
(A subsidiary of Coal India Ltd)
Contract Management Cell(CMC)
Koyla Bhawan, Koyla Nagar
Dhanbad-826005(Jharkhand)

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VOLUME – I: COMMERCIAL

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SECTION-1

TENDER NOTICE

BCCL



Bharat Coking Coal Limited
(A Subsidiary of Coal India Ltd)
Contract Management Cell(CMC)
Koyla Bhawan:Koyla Nagar
Dhanbad-826 005 (India)
Tele-Fax: 0326-2230206
e-mail: cgmcmc@bccl.gov.in

TENDER NOTICE

NIT No. BCCL/CGM(CMC)/RLS-MB/2013/452

Date: 04.04.2013

COMPANY	PROJECT / AREA	Tender Notice No.
Bharat Coking Coal Limited	Madhuband Washery, Block- II Area	BCCL/CGM(CMC)/RLS-MB/2013/ 452 Date: 04.04.2013
Sealed turn-key tenders are invited in three sets (One original and two copies) from reputed and experienced contractors for the following work :		

Name and Description of Work	Location	Period of completion
Planning, Design, Engineering, Construction, Fabrication, Supply, Erection, Trial-run, Commissioning and Testing of Rapid Loading System on Existing Railway siding for Proposed 5.0 Mtpa capacity Madhuband Washery & comprising of all Civil, Structural, Electrical and Mechanical Works and all other accessories and facilities as required to make it complete in all respects, on turnkey basis.	Railway siding of existing Madhuband washery	9 (NINE) months

1. The total scope of supply and works & services shall be split up into two contracts - one covering the supply part and the other covering the works & services part. Both contracts will contain a cross fall breach clause specifying the breach of any one contract will also constitute breach of the other contract and the whole contract combined.

2. EARNEST MONEY

Rs.16,00,000 (Sixteen lacks) only as Earnest Money / Bid Security is to be deposited in the form of irrevocable Bank Guarantee from any Scheduled Bank **payable at its branch at Dhanbad / Kolkata with validity of 28 (Twenty eight) days beyond the validity of the Bid** in the format given in the Bid Document .

Certified Cheques and demand drafts will also be acceptable as Earnest Money / Bid Security drawn in favour of M/S BHARAT COKING COAL LIMITED on any scheduled bank **payable at its branch at DHANBAD.**

Earnest Money / Bid Security of the unsuccessful bidders shall be refundable as promptly as possible after finalization of tender and shall bear no interest.

3. APPLICATION FEE FOR TENDER DOCUMENT

The price of a tender document will be INR 5000/- (five thousand) only payable either in cash or by bank draft drawn in favour of M/S BHARAT COKING COAL LIMITED on any scheduled bank payable at its branch at DHANBAD.

4. AVAILABILITY OF TENDER DOCUMENTS

Tender documents including terms and conditions of work, shall be available on payment, from the following places, during the period as stated below:

From 18.04.2013 to 08.05.2013 (during working hours only).

Place:

- i) Office of the General Manager(CMC), Bharat Coking Coal Limited, Level –V, Koyla Bhawan, Dhanbad-826005, Jharkhand, India.
- ii) Office of Chief Sales Manager, 6, Lyons Range, Kolkata-700001, India.

Tender document will also be available on our website <http://www.bccl.gov.in> from the date of sale of tender document. The tenderers who downloads the tender documents will have to enclose a Bank Draft towards cost of tender document along with their tenders in a separate envelope superscribing "COST OF TENDER DOCUMENT". The bank draft should be payable in favour of M/S BHARAT COKING COAL LIMITED drawn on any scheduled bank payable at its branch at DHANBAD.

5. GENERAL INSTRUCTIONS FOR SUBMISSION OF TENDER

A tenderer should strictly comply with the following instructions:

- A tenderer is required to submit his offers in sealed covers giving reference to this Tender Notice No. and Date, containing offers in two parts prominently superscribed as Part-I and Part-II respectively.

Sealed Tenders / bids have to be submitted by the tenderers in four envelopes duly sealed in one outer envelope indicating full postal address and telephone nos. of the tenderer. Four Envelopes as mentioned above will consist of :

- **Envelope for cost of tender document & undertaking** (in case tender document is downloaded from website)
- **Envelope for Earnest Money Deposit**
- **Envelope for Techno commercial bid (Part-I)**
- **Envelope for Price Bid (Part-II).**

Outer sealed envelope will be marked as “Bidding Documents for.....”

- The two parts of the offers shall contain details as follows:

Part - I

- i) Full details of the firms (bidder), qualification information with documentary evidences in support of qualification criteria, details of the projects handled, testimonials and documentary evidences in support of satisfactory performance, financial capabilities and any other relevant information.
- ii) Technical offer along with technical specifications of the equipments /wagon / train loading system, plants & machineries to be used, know-how offered, drawings, pamphlets etc. strictly in terms of tender enquiry.

Part - II

Price bid only in the format given in the tender document.

6. VALIDITY PERIOD OF OFFER

The rates offered in Part II should be valid for **six calendar months** from the date of opening of Part - I of the tender.

7. RECEIPT OF TENDERS

Tenders are to be received in sealed covers **on 20.05.2013 up to 3.30 PM** at the following offices:

- Office of the General Manager(CMC), Bharat Coking Coal Limited,
Level –V, Koyla Bhawan, Dhanbad-826005, Jharkhand, India
- Office of Chief Sales Manager, Bharat Coking Coal Limited
6, Lyons Range, Kolkata-700001, India

8. OPENING OF THE TENDERS

Tenders will be opened **on 21.05.2013 at 4.00 PM** at the office of the Director (Technical), OP of BCCL, Level-IV, Koyla Bhawan, Dhanbad-826005.

Part - II of the offer shall be opened only in respect of such tenders as are found valid after scrutiny of Part - I.

9. Purchase Preference: Purchase preference would be applicable to Indian CPSEs if applicable.

10. Eligibility criteria for the Bidders :

(a) The intending bidder must have in its name as a prime contractor experience of having successfully completed work related to Planning, Design, Engineering, Fabrication, Supply, Construction, Erection, Commissioning, Trial Run and Testing of Rapid Loading System in Coal Handling / Bulk Material Handling Plant / System consists of a Silo / Loading Hopper with Pre-weigh Rapid Loading System on Turn Key Basis during last 7 (seven) years ending last day of the month previous to one in which bid applications are invited should be either of the following :

(i) Three similar completed works each costing not less than the amount of Rs. 6.40 Crores

Or

(ii) Two similar completed works each costing not less than the amount of Rs.8.00 Crores.

Or

(iii) One similar completed work costing not less than the amount of Rs.12.80 Crores.

(b) Average annual financial turnover of work during the last 3(three) years, ending 31st March of the previous financial year should be at least Rs.4.80 Crores.

(c) Evidence of possessing adequate working capital of at least Rs. 3.20 Crores inclusive of access to lines of credit and availability of other financial resources to meet the requirement.

(d) Other details are available in bid document.

11. DEPUTATION OF REPRESENTATIVES FOR CLARIFICATION

After opening of the tender, if the company decides to get clarification, the tenderers should be in a position to depute their representatives at short notice with full authority for clarifying the same on technical as well as commercial terms and conditions of the contract.

12. NOTE

The company is not under any obligation to accept the lowest tender/ tenders and reserves the right to reject any or all the tenders without assigning any reason whatsoever and also to distribute the work and allot the work / works to more than one tenderer, at its sole discretion.

13. The bidders are required to sign the Integrity Pact as per format given in the Tender document Part-I

Name & Address of Independent Monitor:

Name:- Justice Ashok Kumar Chakraborty (Retd.)

Address :- BB-69, Sector-I, Salt Lake, Kolkata-700064

Sd/-

Chief General Manager(CMC)
Bharat Coking Coal Limited

Distribution:

CC: Justice Ashok Kumar Chakraborty (Retd.), BB-69, Sector-I, Salt Lake, Kolkata-700064

CC: PRO – with a request to publish the abridged NIT as enclosed in local as well as National dailies as per norms of the Company and also arrange to send the paper cutting to the Contract Management Cell.

CC: D(T) OP /D(T) P&P /D(F) /D(P) /CVO, BCCL.

CC: GM (Co-ordn.) /GM(F) /GM (P&P)/GM(MM)/CGM(E&M), BCCL/ RD,CMPDI, RI-II

CC: GM (System), BCCL with a request to display this NIT as per company norms. The downloading facilities should be available during the period of sale of Tender document only.

CC: Sr. ES to CMD for kind information of CMD.

CC: HOD (Admn) with a request to display this NIT in Koyla Bhawan Notice Boards.

CC: All CGMs/GMs in the Areas including Washery Zones for wide circulation through display in the Notice Boards.

CC: Inspector, CISF- with a request to deploy security personnel at the office of CGM(CMC), BCCL Koyla Bhawan, Level-V from 9.30 AM to 4.00 PM on 20.05.2013 and also from 3.30 PM on 21.05.2013 till end of meeting.

CC: Chief Sales Manager, Sales & Marketing Deptt, BCCL 6, Lyons Range, Kolkata

CC: CGM/GM (Contract Management Cell), ECL/WCL/CCL/SECL/NCL/MCL

CC : Sri R K Choubey, Sr. DEO, CMC Deptt. – To display this NIT in BCCL Website (soft copy of the same is enclosed for needful).

Sd/-

Chief General Manager(CMC)
Bharat Coking Coal Limited

SECTION -2

INSTRUCTIONS TO BIDDERS

SECTION-2 INSTRUCTIONS TO BIDDERS

1. SCOPE OF TENDERER

- 1.1 Bharat Coking Coal Limited, Dhanbad P.O. BCCL Township, Dist. Dhanbad, Jharkhand, India (referred to as Employer/ Owner/ Company in these documents) invites bids for the construction on turnkey basis for the works (as defined in these documents and referred to as "the works") detailed in the table given in the Notice Inviting Tenders (NIT). The tenderers must submit tenders for all of the works detailed in the NIT.
- 1.2 The successful Bidder will be expected to complete the Works by the Intended Completion date specified in the Contract.
- 1.3 The total scope of supply and works & services shall be split up into two contracts - one covering the supply part and the other covering the works & services part. Both contracts will contain a cross fall breach clause specifying the breach of any one contract will also constitute breach of the other contract and the whole contract combined.

2. ELIGIBLE TENDERERS :

- 2.1 The invitation for bids is open to all bidders eligible to participate as per qualifying criteria laid down separately hereinafter.
- 2.2 All bidders shall provide in Part-I, Forms of Bid and Qualification Information, a statement that the Bidder (including all members of a joint venture and sub contractors) is not associated, nor has been associated in the past, directly or indirectly, with the consultant or any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Engineer for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the Works shall not be eligible to Bid.
- 2.3 Joint Venture : Two or three companies/ contractors may jointly undertake contract(s). Each entity will be jointly responsible for completing the task as per the contract.
- 2.4 The company reserves its right to allow Public Enterprises purchase preference facility as admissible under prevailing policy.

3.0 QUALIFICATION OF THE TENDERER:

- 3.1 All bidders shall provide in Part-I, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.
- 3.2 In the event that prequalification of potential bidders has been undertaken, only Bids from pre-qualified bidders will be considered for award of Contract. These qualified bidders should submit with their Bids any information updating their original prequalification applications or, alternatively, confirm in their Bids that the originally submitted prequalification information remains essentially correct as of the date of Bid submission. The update or confirmation should be provided in Part-I.
- 3.3 If the Employer has not undertaken prequalification of potential bidders, all bidders shall include the following information and documents with their bids (copies of all documentary evidences are to be duly authenticated by the tenderers/ constituted attorney of the tenderer with full signature and seal. All

signed declarations are to be made in the tenderer's letter head.)

- a) Copies of original documents, defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of signatory of the Bid to commit the Bidder;
- b) i) total monetary value of contractual work performed for each of the last five years,
ii) experience of having successfully executed similar works as per clause 3.4 of Instruction to bidders
- c) reports on financial standing of Bidder, such as profit and loss statement and auditor's reports for the past three years;
- d) evidence of adequacy of working capital for this Contract (access to lines of credit and availability of other financial resources);
- e) authority to seek references from the Bidder's bankers;
- f) information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned and disputed amount including status of final settlement of contracts including claims/ counter claims, liquidated damages, bonus etc., if any;
- g) proposals for sub contracting components of the works amounting to more than 10 percent of the Contract Price and
- h) Permanent Income Tax No (PAN);
- i) The bidders would give a declaration that they have not been banned or de listed by any Government or Quasi-govt. Agencies or PSU's. If a bidder has been banned by any Govt. or Quasi-Govt. Agencies or PSU's that fact must be clearly stated and it may not necessarily be a cause for disqualifying him. If this declaration is not given the bid will be rejected as non responsive.
- j) Two or three companies/ contractors participating in the bid as Joint Venture should submit firm-wise participation details, Banker's name, execution of work with details of contribution of each and all other relevant details.
- k) Service Tax registration with competent statutory authority.
- l) Copy of registration certificate with CMPF/PF alongwith declaration that bidder shall abide by and implement the provisions of CMPF/PF as applicable during execution of work.
- m) Duly signed 'Integrity Pact' with BCCL should be submitted at the time of offer.
- n) The intending tenderer will have to submit a declaration in support of the authenticity of the credentials submitted by them along with the tender in the form of an affidavit as per the format provided in the bid document (Section-3)

3.4 To qualify for award of the contract -

The intending bidder must have in its name as a prime contractor experience of having successfully completed similar work related to Planning, Design, Engineering, Fabrication, Supply, Construction, Erection, Commissioning, Trial Run & Testing of Rapid Loading System in Coal handling / Bulk material handling plant/ System consists of a silo/loading hopper with pre-weigh rapid loading system on turnkey basis during last 7 (seven) years ending last day of month previous to the one in which bid applications are invited should be either of the following :

- (i) Three similar completed works each costing not less than Rs.6.4 Crores
Or
 - (ii) Two similar completed works each costing not less than Rs 8 Crores.,
Or
 - (iii) One similar completed work costing not less than Rs.12.80 Crores.
- (b) Average annual financial turnover of works during the last 3 (three) years, ending 31st March of the previous financial year should be at least Rs.4.80 Crores.

- (c) Evidence of possessing adequate working capital of Rs.3.20 Crores inclusive of access to lines of credit and availability of other financial resources to meet the requirement.
- (d) Evidence of possessing adequate infrastructural support with respect to design, construction, manufacture/ supply of major equipment inclusive of legally bound back-up MOU/ Agreement with other agencies in the respective field of specialization as joint venture partners or sub-contractors.
- 3.5 Subcontractors experience and resources will not be taken into account in determining the bidder's compliance with qualifying criteria.
- 3.6 Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under :

$$\text{Assessed available bid capacity} = (A \times N \times 2 - B)$$

Where – A : Maximum value of works executed in any one Year during the last five years (updated to current level) taking into account the completed as well as works in progress.

N : Number of years prescribed for completion of the Works for which bids are invited.

B : Value at current price level of existing commitments and ongoing works to be completed during the next 9 months.

[Note 1: Financial turnover and cost of completed works of previous works shall be given a weightage of 5% per year (average annual rate of inflation) to bring them at current price level.]

- 3.7 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have
- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirement; and /or
 - record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.
- 3.8 Bidders are required to submit the duly-signed 'Integrity Pact' with BCCL at the time of submission of bid (for format, refer to Section-6). Any bidder who does not submit this duly-signed document, shall be disqualified from participation in the tender process.

4.0 ONE BID PER BIDDER

- 4.1 Each Bidder shall submit only one Bid, either individually, or as a partner in a partnership firm or a partner in a joint venture or a public limited firm. A Bidder who submits or participates in more than one Bid (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

5.0 COST OF BIDDING

- 5.1 The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible or liable for those costs.

6.0 SITE VISIT

- 6.1 The Bidder, at the Bidder's own responsibility, cost and risk, is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.
- 6.2 It shall be deemed that the tenderer has visited the site/ area and got fully acquainted with the working conditions and other prevalent conditions and fluctuations thereto whether he actually visits the site/ area or not and has taken all the factors into account while quoting his rates and prices.
- 6.3 Site investigation reports: The bidder, in preparing the bid, shall rely on the site investigation report referred to in the bid document, supplemented by any information available to the Bidder.

7.0 CONTENT OF BIDDING DOCUMENTS

- 7.1 The set of bidding documents comprises the documents listed in the table below and addenda issued in accordance with Clause 9:

Section - 1	Tender Notice
Section - 2	Instructions to Bidders
Section - 3	Forms of Bid and Qualifications Information
Section - 4	Conditions of Contract
Section - 5	Format of Price Bid
Section - 6	Miscellaneous Forms
Section - 7	Technical Specifications and tender Drawings

8. CLARIFICATION OF BIDDING DOCUMENTS

- 8.1 A prospective Bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (cable includes telex and facsimile) at the Employer's address indicated in the Notice Inviting Tender. The Employer will respond to any request for clarification received earlier than 15 days prior to the deadline for the submission of Bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

9.0 AMENDMENT OF BIDDING DOCUMENTS

- 9.1 Before the deadline for submission of Bids, the Employer may modify the bidding documents by issuing addenda.
- 9.2 Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing or by cable to all purchasers of the bidding documents. Prospective Bidders shall acknowledge receipt of each addendum by cable to the Employer.
- 9.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer shall extend, as necessary, the deadline

for submission of Bids, in accordance with Sub-clause 19.2 below. And the same is also to be communicated simultaneously to all the purchaser of the bidding document.

10.0 LANGUAGE OF BID

10.1 All documents relating to the Bid shall be in the English language.

11.0 DOCUMENTS COMPRISING THE BID

11.1 The Bid, comprising of two parts, will be submitted by the bidder in the following manner (each of two parts will be submitted in ORIGINAL with TWO nos. of exact replica copies):

A tenderer should strictly comply with the following instructions:

- (a) A tenderer is required to submit his offers in sealed covers giving reference to this Tender Notice No. and date, containing offers in two parts prominently superscribed as Part-I and Part-II respectively.

Sealed Tenders/bids have to be submitted by the tenderers in four envelopes duly sealed in one outer envelope indicating full postal address and telephone nos. of the tenderer. Four envelope as mentioned above will consist of :

- i) Envelope for cost of tender document & undertaking (in case tender document is downloaded from website)
- ii) Envelope for earnest money deposit
- iii) Envelope for Techno Commercial bid (Part-I)
- iv) Envelope for price bid (Part-II)

Outer sealed envelope will be marked as "Bid Documents for"

- (b) The two parts of the offers shall contain details as follows:

Part-I

i) Full details of the firms (bidder), qualification information with documentary evidences in support of qualification criteria, details of projects handled, testimonials and documentary evidences in support of satisfactory performance, financial capabilities and any other relevant information.

ii) Technical offer alongwith technical specifications of the equipments/wagon/train loading system, plants & machineries to be used, know-how offered, drawings, pamphlets etc. strictly in terms of tender enquiry.

Part-II

Price bid only in the format given in tender document.

(c) If the tender documents are downloaded from the company's website, the bidders shall deposit requisite application fee as the cost of tender documents in the form of Bank Draft from any scheduled bank in favor of **Bharat Coking Coal Limited payable at Dhanbad**. The bidders are also required to submit an undertaking that they will accept the Tender Documents as available in the website and their tender shall be rejected if any tampering in the tender document is found to be done at the time of opening of tender or thereafter during subsequent scrutiny. In case of any discrepancy between the tender documents downloaded from the web site and the master copy available in the office of the Employer, the latter shall prevail and will be binding on the tenderers. No claim on this account will be entertained. The Company shall not be responsible for any delay/ difficulties or inaccessibility of the downloading facility for any reason, whatsoever. The downloading facility shall be available during the period of sale of tender documents.

- (d) All pages of the documents submitted by the bidder shall be **paginated**.
- (e) The bidder shall fill the Check sheet format provided in Vol-I, Sec-3, Clause No.1.18(d) of bidding document.

12 BID PRICES

- 12.1 The contract shall be for the whole Works as described in Sub-Clause 1.1, based on the scope of work as detailed in the bidding document.
- 12.2 The Bidder shall submit rates and prices for all items of the Works described in the scope of works. Corrections, if any, shall be made by crossing out, initialing, dating and rewriting.
- 12.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause shall be included in the rates, prices and the total Bid Price submitted by the Bidder. All incidentals, overheads, leads, lifts, carriages etc. as may be attendant upon execution and completion of works as stipulated in the bidding document shall also be included in the rates, prices and total Bid price submitted by the bidder.
- 12.4 The rates and prices quoted by the Bidder shall be fixed for the duration of the contract and shall not be subject to variations on any account except to the extent variations allowed as per the conditions of the contract indicated in clause no. 2.6 of section 4.2 (Additional Terms & Conditions of Contract) in the bidding document.

13.0 CURRENCIES OF BID AND PAYMENT

- 13.1 The unit rates and prices shall be quoted by the Bidder entirely in Indian Rupees.

14.0 BID VALIDITY:

- 14.1 Bid shall remain valid for a period not less than one hundred and eighty days (after the deadline for bid submission specified in clause-19). A bid valid for a shorter period shall be rejected by the Employer.
- 14.2 In exceptional circumstances, prior to expiry of the original time limit, the employer may request the bidders to extend the period of validity for a specified additional period. The request and the bidder's responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid but will be required to extend the validity of his bid security for a period of the extension and in compliance with clause no. 15 in all respects.

15.0 BID SECURITY/EARNEST MONEY DEPOSIT :

- 15.1 The bidder shall furnish ,as part of his bid, a Bid Security/ Earnest Money in the amount as shown in NIT for this particular work. Bid Security/ EMD will be required to be deposited in the form of irrevocable Bank Guarantee (from any Nationalised/Scheduled Bank Branch acceptable to the owner) with validity 28 days beyond the validity of the bid in the format given in the bid document. Certified Cheques and Demand Drafts will also be acceptable as Earnest Money/ Bid Security drawn in favor of Bharat Coking Coal Limited. Refer to clause No.2 of section-1 about bank draft details (as for earnest money, other details and conditions of bank draft are applicable in this case also).
- 15.2 Any bid not accompanied by an acceptable Bid Security/ EMD shall be rejected by the Employer as non-responsive.

- 15.3 The Bid security/ EMD of the unsuccessful bidder shall be refundable as promptly as possible after opening of price bid and finalisation of the tender.
- 15.4 The Bid Security/ EMD of the successful Bidder will be discharged when the Bidder has signed the agreement and furnished the required Performance Security/ Security Deposit.
- 15.5 The Bid Security / Earnest Money may be forfeited :
- a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity; or
 - b) in the case of a successful Bidder, if the Bidder fails within the specified time limit to :
 - (i) sign the Agreement;
 - (ii) or furnish the required Performance Security/ Security Deposit.
 - c) if the Bidder does not accept the correction of the bid price pursuant to clause 26 of ITB (Instructions To Bidders).
- 15.6 The Bid Security / EMD deposited with the Employer will not carry any interest.

16.0 Alternative proposals by bidders :(This clause is not applicable to this tender)

- 16.1 Bidders shall submit offers that comply with the requirements of the Bidding documents, including the basic technical design as indicated in the drawings and specifications. Alternatives will not be considered, unless specifically allowed in the Bidding Data. If so allowed, Sub-Clause 16.2 shall govern.
- 16.2 If so allowed in the Bidding Documents, Bidders wishing to offer technical alternatives to the requirements of the Bidding documents must also submit a Bid that complies with the requirements of the Bidding documents, including the basic technical design as indicated in the drawings and specifications. In addition to submitting the basic Bid, the Bidder shall provide all information necessary for a complete evaluation of the alternative by the Employer, including design calculations, technical specifications, breakdown of prices, proposed construction methods and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements stipulated in the Bidding Document shall be considered by the Employer.

17.0 Format and Signing of Bid

- 17.1 The Bidder shall prepare the bid documents comprising the Bid as described in Clause 11 of these Instructions to Bidders.
- 17.2 All documents of the Bid shall be typed or written in indelible ink and shall be signed by a person(s) duly authorized to sign on behalf of the Bidder, pursuant to Sub-Clauses 3.3(a). All pages of the Bid document shall be signed by the person(s) signing the Bid.
- 17.3 The Bid shall contain no alterations, or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person(s) signing the Bid. Erasing or overwriting in the Bid Document may disqualify the Bidder.

18. SEALING, MARKING AND SUBMISSION OF BIDS

18.1 A tenderer is required to submit his offers in sealed covers giving reference to this Tender Notice No. and Date, containing offers in two parts prominently superscribed as Part-I and Part-II respectively.

Sealed Tenders / bids have to be submitted by the tenderers in four envelopes duly sealed in one outer envelope indicating full postal address and telephone nos. of the tenderer. Four Envelopes as mentioned above will consist of :

- i) **Envelope for cost of tender document & undertaking** (in case tender document is downloaded from website)
- ii) **Envelope for Earnest Money Deposit**
- iii) **Envelope for Techno commercial bid (Part-I)**
- iv) **Envelope for Price Bid (Part-II).**

Outer sealed envelope will be marked as "Bidding Documents for....."

18.2 The inner envelopes placed in the outer envelope shall be addressed to BCCL at the following address and submitted accordingly before the deadline for submission of bid as indicated in Clause 19:

- 1) General Manger (CMC), Bharat Coking Coal Limited, Level-5, Koyla Bhawan, Dhanbad-826005, Jharkhand, India.
- 2) Chief Sales Manager, Bharat Coking Coal Limited, 6, Lyons Range, Kolkata-700001, India

18.3 In addition to the identification required in Sub-Clause 18.2 the inner and outer envelopes shall indicate the name and address of the Bidder.

18.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

19. DEADLINE FOR SUBMISSION OF BIDS

19.1 Bids shall be submitted at the address specified above **on 20.05.2013 up to 3.30 P.M..** In the event of the specified date for the submission of bids being declared a holiday for the Employer, the Bids will be received up to the appointed time on the next working day.

19.2 The BCCL may extend the deadline for submission of Bids by issuing an amendment in accordance with Clause 9, in which case all rights and obligations of the BCCL and the Bidders previously subject to the original deadline will then be subject to the new deadline.

20. LATE BIDS

Any Bid received after the deadline prescribed in Clause 19 due to any reason whatsoever will not be accepted.

21.0 PROCESS TO BE CONFIDENTIAL

- 21.1 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

22.0 CLARIFICATION OF BIDS

- 22.1 No document presented by the bidder after closing date and time of the bid will be taken into account by the Evaluation Committee unless otherwise called for during technical scrutiny by the tender committee as clarification. This, however, will have no bearing with the price quoted in the price bid.

23.0 EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

- 23.1 Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid :

- a. meets the eligibility criteria defined in Clause 3;
- b. has been properly signed;
- c. is accompanied by the required securities; and
- d. is substantially responsive to the requirements of the Bidding documents.

- 23.2 A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the Bidding documents without material deviation or reservation. A material deviation or reservation is one :

- a. which affects in any substantial way the scope, quality, or performance of the works;
- b. which limits in any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or
- c. whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

- 23.3 If a Bid is not substantially responsive, it may be rejected by the Employer at its sole discretion.

24. CORRECTION OF ERRORS

- 24.1 Bids determined to be substantially responsive will be checked by BCCL for any arithmetical errors. Errors will be corrected by BCCL as follows :

- a. where there is a discrepancy between the amounts in figures and in words, the amounts in words will govern; and
- b. where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.
- c. discrepancy in totaling or carry forward in the amount quoted by the contractor shall be corrected .

The tendered sum so corrected and altered shall be substituted for the sum originally tendered and considered for acceptance instead of the original sum quoted by the tenderer along with other tender(s). Rounding off to the nearest rupee should be done in the final summary of the amount instead of in totals of various sections of the offer.

- 24.2 The amount stated in the Bid will be adjusted by BCCL in accordance with the above procedure for the correction of errors and, shall be considered as binding upon the Bidder.

25 EVALUATION AND COMPARISON OF BIDS

- 25.1 BCCL will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 23.
- 25.2 In evaluating the Bids, BCCL will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows :
- a. Making any correction for errors pursuant to Clause 23..
 - b. Making an appropriate adjustment for any other quantifiable acceptable variations, deviations or alternative offers submitted in accordance with Clause 16 and
 - c. Making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Clause 20.
- 25.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer and other factors that are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits for the employer shall not be taken into account in Bid evaluation.
- 25.4 If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the work, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.

26.0 AWARD CRITERIA

- 26.1 Subject to Clause 27, BCCL will award the Contract to the best qualified Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price. BCCL shall be the sole judge in this regard.

27.0 BCCL'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

- 27.1 Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Bid, and to cancel the bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder(s) or any obligation to inform the affected Bidder(s) of the grounds for BCCL's action.

28.0 NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT

- 28.1 The Bidder, whose Bid has been accepted, will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex, or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called "the Contract Price").
- 28.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of a Performance Security/ Security Deposit in accordance with Clause 31.

28.3 The Agreement will incorporate all agreements between the Employer and the successful Bidder within 28 days following the notification of award along with the Letter of Acceptance.

28.4 Upon the furnishing by the successful Bidder of the Performance Security/ Security Deposit, the Employer will promptly notify the other Bidder that their Bids have been unsuccessful and refund the Bid Security/ Earnest Money Deposit.

28.5 Bidders are required to submit the duly-signed 'Integrity Pact' (for format, refer to Section-6).

29.0 PERFORMANCE SECURITY/ SECURITY DEPOSIT/ PERFORMANCE GUARANTEE

29.1 Security deposit shall consist of two parts

- a) Performance security to be submitted at award of work and
- b) Retention money to be recovered from running bills. The security deposit shall bear no interest

29.1.1 Performance security should be 5% of contract amount and should be submitted with in 28 days of receipt of the Letter of Acceptance by the successful Bidder in any of the form given below after which bid scrutiny/ earnest money will be refunded to the contractor.

- A bank Guarantee on a bank as indicated by the employer in the form given in section-8 from any Nationalised/scheduled Indian bank for full amount of 5%of the contract price after which the bid security/earnest money will be refunded to the contractor.
- Demand Draft for the full amount of contract performance security drawn in favor of Bharat Coking Coal Limited. Refer to clause #3 of section-1 about bank draft details. (as for earnest money, other details and conditions of bank draft are applicable in this case also).

29.1.2 If performance security is provided by the successful bidders in the form of bank guarantee it shall be issued either –

(a) at Bidder's option by a Nationalized/ Scheduled Indian Bank or

(b) by a foreign Bank located in India and acceptable to the Employer.

29.1.3 Retention Money shall be deducted at 5% from running bills. Total of performance security and Retention Money should not exceed 10% of contract amount or lesser sum indicated in the bid document.

29.2 The Guarantee amount shall be payable to the Employer without any condition whatsoever.

29.3 The Performance Guarantee shall cover additionally the following guarantees to the Employer:

- (a) The successful bidder guarantees the successful and satisfactory operation of the equipment furnished and erected under the contract, as per the specifications and documents,

- (b) The successful bidder further guarantees that the equipment provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from the employer fully remedy free of expenses to the Employer such defects as developed under the normal use of the said equipment within the period of guarantee specified in the relevant clause of the Conditions of Contract.
- 29.4 The Contract Performance Guarantee is intended to secure the performance of the entire Contract. However it is not construed as limiting the damages under clause entitled 'Equipment Performance Guarantee' in section Technical Conditions of Contract and damages stipulated in the other clauses in the bidding documents.
- 29.5 Bank Guarantee is to be submitted in the format prescribed by the company in Section-6. Bank Guarantee shall be irrevocable and it shall be from any Nationalised Bank/ Scheduled Bank.
- 29.6 The Company shall be at liberty to deduct/ appropriate from the Contract Performance Guarantee/ Security Deposit such sums as are due and payable by the contractor to the company as may be determined in terms of the contract, and the amount appropriated from the Contract Performance Guarantee/ Security Deposit shall have to be restored by Contractor subsequently.
- 29.7 The Contract Performance Guarantee will be returned to the Contractor without any interest at the end of the Guarantee Period.
- 29.8 Failure of the successful Bidder to comply with the requirements of Sub-Clause 29.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security.
- 29.9 Performance Security/ Security Deposit shall be converted into Performance Guarantee on successful completion of work in accordance with contract and upon satisfactory trial operations and shall be valid for 90 days after the end of Guarantee period.
30. **EMPLOYMENT OF LOCAL LABOUR**
- 30.1 "Contractors are to employ, to the extent possible, only local project affected people and pay wages not less than the minimum wages fixed by the local Government".
31. **LEGAL JURISDICTION**
- 31.1 Matter relating to any dispute or difference arising out of this tender and subsequent contract awarded based on the bid shall be subject to the jurisdiction of Dhanbad Court or Ranchi High Court, Jharkhand (India) only.
32. **DEEMED EXPORTS**
- 32.1 If the bidder has quoted any item(s) under the deemed exports then it will be the responsibility of the Bidder to get all the benefits under deemed exports from the Government. The Company's responsibility shall only be limited to the issuance of required certificates. The quotation of the Bidder will be unconditional and phrases like "Subject to availability of deemed exports benefit" will not find place in it.
33. **CONSULTANTS NOT TO BID & VICE-VERSA :**
- 33.1 A firm which has been engaged by the Company to provide Goods or Works for a project or any of its affiliates will be barred from providing consultancy services for the same project. Conversely, a firm hired to provide consultancy services for the

preparation or implementation of a project and any of its affiliates will be barred from subsequently providing Goods or Works or services related to the initial assignment for the same project.

34. SUB-CONTRACTOR/ SUB-VENDOR :

- 34.1 The contract agreement will specify major items of supply of services for which the contractor proposes to engage Sub-Contractor/ Sub-Vendor. The contractor may from time to time propose any addition or deletion from any such list and will submit the proposals in this regard to the Engineer in Charge/ Designated Officer in Charge for approval well in advance so as not to impede the progress of work. Such approval of the Engineer in Charge/ Designated Officer will not relieve the contractor from any of his obligation, duties and responsibilities under the contract.
- 34.2 If a contractor submits his bid, qualifies and does not get the contract because of his not being the lowest, he will be prohibited from working as a sub-contractor for the contractor who is executing the work.

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SECTION -3

**FORMS OF BID &
QUALIFICATION INFORMATION**

SECTION - 3

FORMS OF BID AND QUALIFICATION INFORMATION

CONTRACTOR'S BID

Sub : BID for the Work _____

To :

Dear Sir,

We offer to execute the Works described above in accordance with the Conditions of Contract accompanying the Bidding Documents issued to us. The Bid Security/ Earnest Money in accordance with the NIT/ Tender Notice and Instructions to Bidders amounting to ` (in figures) (in words) in the form as stipulated in Clause 15 of the Instructions to Bidders is enclosed herewith (*to be filled in by the Bidder*).

This Bid and your written acceptance of it shall constitute a binding contract between us . We understand that you are not bound to accept the lowest or any Bid you receive.

We hereby confirm that this Bid complies with the Bid validity and Bid security required by the Bidding documents. We also confirm that EMD and other required documentary evidences related to this part of the Bid are enclosed (as listed below) herewith either in original/ copy attested by Gazetted Officer / copy duly authenticated by us with signature and seal along with affidavit as per the format provided in the bidding documents.

Yours faithfully,

Authorised Signature : _____
Name and Title of the Signatory : _____
Name of the Bidder : _____(the Contractor)
Address : _____
Date : _____
(To be filled in by the Bidder)

- Encl.
- i)
ii)
iii)
iv)

EMD of ` vide dt.

QUALIFICATION INFORMATION
(The information to be submitted by all the Bidders)

1.0 Individual Bidders or Individual Members of Joint Ventures

1.1 Constitution or Legal status of Bidder (attach copy)

Place of registration: _____
Principal place of business: _____
Power of Attorney of signatory Bid: (attach)

1.2 Details of the turnover during last 3 (three) years:

Annual Turnover Data (Construction only)		
Year	Turnover in `	Remarks

1.3 Joint Venture details :

Name of all partners of a joint venture
1. Lead partner
2. Partner
3. Partner

Notes: Joint ventures must comply the following requirements :

- i) Following are the minimum qualification requirements for joint ventures
 - a) The lead partner shall meet not less than 40% of all the qualifying criteria stated in the bidding documents.
 - b) The other partners shall meet not less than 30% of all the qualifying criteria stated in the bidding documents.
- ii) The formation of joint venture or change in the joint venture character / partners after submission of the bid and any change in the bidding regarding joint venture will not be permitted.
- iii) Any bid shall be signed so as to legally bind all partners jointly and severally and any bid shall be submitted with a copy of the Joint Venture Agreement (JV agreement) providing the joint and several liability with respect to the contract
- iv) The pre qualification of a joint venture does not necessarily pre qualify any of its partners individually or as a partner in any other joint venture or association. In case of dissolution of a joint venture, each one of the constituent firms may pre qualify if they meet all the pre qualification requirements, subject to the written approval of the employer.
- v) The bid submission must include documentary evidence to the relationship between joint venture partners in the form of JV Agreement to legally bind all partners jointly and severally for the proposed agreement, which should set out the principals for the constitution, operation, responsibilities regarding work and financial arrangements, participation (percentage share in the total) and liabilities (joint and several) in respect of each and all of the firms in the joint venture. Such JV Agreement must evidence the commitment of the parties to bid for the facilities

applied for (if pre-qualified) and to execute the contracts for the facilities if their bid is successful.

- vi) One of the partners responsible for performing a key component of the contract shall be designated as Lead Partner, this authorization shall be evidenced by submitting with the Bid a Power of Attorney signed by legally authorized signatories of all the partners.
- vii) The JV agreement must provide that the Lead Partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the contract shall be done with the active participation of the Lead Partner.
- viii) The contract agreement should be signed jointly by each Joint Venture Partners.
- ix) An entity can be a partner in one Joint Venture. Bid submitted by Joint Ventures including the same entity as partners will be rejected.

1.4 Details of experience for similar nature and complexity of work:

Use a separate sheet for each contract (Attach performance certificates from concerned customer).

1.	Number of contract :
	Name of contract :
2	Name of the employer :
3.	Employers address :
4.	Nature of work and special features, if any :
5.	Contract role (check one) 1. Sole contractor 2. Subcontractor 3. Partner in Joint venture
6.	Value of the total contract
7.	Date of award :
8.	Date of completion with original schedule and slippage, if any.
9.	Specified requirements : a) concrete : b) structural steelworks : c) equipment :

1.5 Subcontractors/ Consultants and firms proposed to be involved :

(Attach performance credentials including Bio-data of design personnel of Consultants)

Section of work	Approx.. value of subcontract	Sub-contractor (Name & Address)	Experience in similar works

1.6 Information on Bid Capacity.

Works for which bids have been submitted and work which are yet to be completed) as on the date of this bid :

- a. Total value of work executed in last five years (year wise):
- b. Details of existing commitments and ongoing works.
- c. Details of Works for which bids already submitted.

1.7 Financial reports of the last five years : balance sheets, profit and loss statement, auditors report etc. (copies to be submitted and the following format be filled up)

Financial information in Rs.	Actual : Previous five years					Projected : Next two years	
	1	2	3	4	5	6	7
1. Total assets							
2. Current assets							
3. Total liabilities							
4. Current liabilities							
5. Profits Before taxes							
6. Profits After taxes							

1.8 Evidence of access to financial resources to meet the qualification requirements:

Cash in hand, liquid assets, unencumbered real assets, lines of credit and other financial means etc. sufficient to meet the construction cash flow (the copies to be submitted and the following format to be filled up)

Source of financing	Amount in Rs.
1.	
2.	

1.9 Details of the bankers :Give details for e-payment also

Banker	Name of the banker	
	Address of the banker	
	Telephone	Contact name ant title
	Fax	Telex
	Account number	Contractor has to give authorisation duly signed for E-payment to them

1.10 Information about litigations, if any, in which bidder is involved:

Year	Award FOR or AGAINST applicant	Name of the client, Clause of Litigation and Matter of dispute	Disputed amount in Rs.

1.11 Details of the major construction equipment to be used for the work :

	Equipment type and capacity	Make and model	Minimum number
1			
2			

1.12 Details of additional construction equipment to be purchased new for the project, indicating delivery times required in the form given below :

	Equipment to be purchased new -type and capacity	Make and model	Delivery period	Number
--	--	----------------	-----------------	--------

1				
2				

1.13. Personnel capabilities

The applicant must have suitably qualified personnel to fill the following key positions for the project. The applicant will supply information on a prime candidate and an alternate for each positions both of whom, wherever possible meet the experience requirements as specified in format below :

Position	Name	Total post qualification experience (years)	In similar Works (years)	As Manager or Section Leader of Similar Works (years)
Project Manager Alternative name				
Site engineers of respective discipline Alternative names				
Cost controller Alternative name				
Quality Assurance Engineer Alternative name				
Site supervisors of resp. disc. Alternative names				

1.14 The bidder should list transport available for personnel, construction, plant, stores and machinery. Where transport is to be subcontracted the proposed arrangements should be clearly demonstrated.

1.15 The bidder should provide full details of his plant and maintenance facilities together with the full details of laboratory personnel, workshop personnel including fitters, mechanics, machinists etc.

1.16 Permanent Income Tax Account No. (PAN) :

1.17 DETAILS OF EARNEST MONEY/ PERFORMANCE SECURITY

Deposit of Earnest Money by :		
Draft No. :	}	Bank Guarantee Details :
Drawn on :	}	Name of the Bank :
Amount (Rs.) :	}	Amount of BG. :
	}	Bank Guarantee valid upto :

1.18 OTHER DETAILS

- (a) Details of registration/ enlistment with Government organisations/ PSUs/ Subsidiaries of Coal India.
- (b) Certificate of registration as per statutory requirements under Sales Tax, Contract Labour Laws etc. as may be applicable
- (c) Existing commitments and on-going works

Description of works	Place & state	Contract no & date	Name & address of employer	Value of contract (Rs million)	Stipulated period of completion	Value of remaining to be completed	Anticipated date of completion
1	2	3	4	5	6	7	8

(d) Bidder shall fill the following Check sheet format (but filled up check sheet shall be placed just after covering letter of Bidding Document.)

CHECK-SHEET

SI No.	PARTICULARS	Page Nos.
1	Original and two copies of each part of the bid document, Part-I & II shall be submitted by the tenderer alongwith the bid. The copies shall be exact replica of the original copy (Sec-2, Clause-11.1)	Yes/No
2	Vol-I(Commercial) , Vol-II (Technical & tender drawings) of the NIT (Purchased copy from the owner or downloaded copy from the specified web site) should be duly signed on all pages by the bidders as acceptance of all the terms and conditions of the NIT and should be submitted alongwith Part-I of the bid document .	Yes/No
3	All the pages of the bid document shall be paginated serially starting from first page .	Yes/No
4	Copy of the money receipt (incase of bid has been purchased) or the demand draft (in case of the bid document has been downloaded) of the cost of bid document shall be submitted with the offer	
5	Copies of original documents, defining the constitution or legal status, place of registration and principal place of business	
6	Power of attorney of signatory bid	
7	Total monetary value of contractual work performed for each of the last five years	
8	Copy of EMD Draft/Bank Gurantee (Original in separate sealed envelope)	
9	Affidavit by bidders (as per enclosed Format for Affidavit at the end of section - 3)	
10	Forms of Bid(if copy attached)	
11	Declaration by the bidder regarding non-banning or delisting by other Govt. /quasi-Govt. agencies or PSU	
12	Copy of Service Tax Registration	
13	Permanent Income Tax account Number (PAN)	
14	Copy of Registration with PF authorities	
15	Integrity pact with BCCL	
16	Information on Bid capacity	
17	Details of Bankers	
18	Details of experience for similar nature and complexity of work (Under minimum qualification criteria)	
A.1	Details of executed contracts : Customer's satisfactory performance certificate	
B.1	Details of executed contract : Customer's satisfactory performance certificate	
C.1	Details of executed contract : Customer's satisfactory performance certificate	
19	Financial reports of last three years : Balance sheet, Profit and loss statement, auditors report etc.	
20	Evidence of access ti financial resources to meet the qualification requirements	
21	Information about litigation, if any, in which bidder is involved (Current or during last five years)	

NOTE : THIS CHECK-SHHET SHALL BE PLACED AFTER THE COVERING LETTER OF BID DOCUMENT

Signature of the Tenderer

Along with Seal/ Stamp

- NOTE :
1. *Separate sheets may be attached to furnish details, if necessary.*
 2. *All information furnished shall be serially arranged and supported with documentary evidence, bankers certificate, performance certificates from customers etc.*

UNDERTAKING

(Only for Tenderer using downloaded tender document from Website)

1. We undertake that the tender submitted by us, is downloaded from website and is same in content and form(verbatim), and any deviation, if detected, at any stage, would entitle BCCL to reject our bidding/offer without assigning any reason or recourse to any penal action and would be legally binding on us.
2. We undertake, we will accept the tender document as available in web site and our tender will be rejected if any tempering in the tender document is found to be done at time of opening of tender.
3. In case of any discrepancy between the tender document downloaded from web site & the master copy available in the office, the later shall prevail and will be binding on us. We will not claim on this account.

Signature : _____ (of tenderer)

Seal : _____

AFFIDAVIT

(NON JUDICIAL STAMP PAPER OF ` 50/-)

I.....
..... Partner/Legal Attorney Proprietor/Accredited Representative of
M/s. Solemnly declared that :

- 1. I/We are submitting tender for the work
.....
.....
.....
against Tender Notice No. ----- dated -----
- 2. None of the partners of our firm is relative of employee of Bharat Coking Coal Limited and BCCL.
- 3 All information furnished by me / us in respect of fulfillment of eligibility criteria and information given in this Bid is complete, correct and true.
- 4. All documents / credentials submitted along with this tender are genuine, authentic, true and valid.
- 5. If, any information or document submitted is found to be false /incorrect at any time, Employer may cancel my Bid and action as deemed fit may be taken against me /us including termination of the contract, forfeiture of all dues including Earnest Money and blacklisting of our firm and all Partners of the firm etc.

Signature of the Tenderer

Dated-----

Seal of Notary

SECTION -4

CONDITIONS OF CONTRACT

SUB-SECTION – 4.1

**GENERAL TERMS AND CONDITIONS OF
CONTRACT**

SUB-SECTION – 4.1**GENERAL TERMS AND CONDITIONS OF CONTRACT****1. DEFINITIONS :**

- i. The word "Company" or "Employer" or "Owner" wherever occurs in the conditions, means the Bharat Coking Coal Limited, Koyla Bhawan Complex, Dhanbad represented at the headquarters of the Company by the Chairman-cum-Managing Director or his authorised representative or any other officer specially deputed for the purpose.
- ii. The word "Principal Employer" or "Engineer" wherever occurs, means the authorised representative or any other officer specially deputed by the Company for the purpose of contract.
- iii. The word "Contractor"/"Contractors" or "Manufacturer" wherever occurs means the successful Bidder/Bidders who has/have deposited the necessary Earnest Money and has/have been given written intimation about the acceptance of tender and shall include legal representative of such individual or persons composing a firm or a company or the successors and permitted assignees of such individual, firm or company, as the case may be.
- iv. "The Site" shall mean the site of the contract work including land and any building and erections thereon and any other land allotted by the company for contractor's use in the performance of the contract.
- v. The term "sub-contractor", as employed herein, includes those having a direct contract with contractor either on piece rate, items rate, time rate or on any other basis and it includes one who furnishes work to a special design according to the plans or specifications of this work but does not include one who merely supplied materials.
- vi. "Consulting Engineer"/"Consultant" shall mean any firm or person duly appointed as such from time to time by the owner.
- vii. 'Accepting authority' shall mean the management of the company and includes an authorised representative of the company or any other person or body of persons empowered in this behalf by the company.
- viii. A 'Day 'shall mean a day of 24 hours from midnight to midnight.
- ix. Engineer-in-charge/Designated Officer-in-charge will be clearly defined in the contract document. Engineer-in-charge/Designated Officer-in-charge who is of an appropriate seniority will be responsible for supervising and administering the contract, certifying payment due to the contractor, valuing variations to the contract, awarding extension of time and valuing compensation events. Engineer-in-charge/Designated Officer-in-charge may further appoint his representatives i.e. another person/ Project Manager or any other competent person and notify to the contractor who is directly responsible for supervising the work being executed at the site, on his behalf under the Delegation of Powers of the company. However, overall responsibility, as far as the contract is concerned will be that of the Engineer-in-charge/Designated Officer-in-charge.
- x. The 'contract' shall mean the notice inviting tender, the tender as accepted by the company and the formal agreement executed between the company and the contractor together with the documents referred to therein including conditions of

contract, special conditions, if any, specifications, designs & drawings including those to be submitted during progress of work, scope of work, billing schedule/schedule of quantities with rates and amounts.

- xi. The 'works' shall mean and include the furnishing of equipment, labour, and the services in accordance with the contract or parts thereof as the case may be and shall also include all extra or additional, altered or substituted works or any work of emergent nature, which in the opinion of the Engineer-in-charge, become necessary during the progress of the works to obviate any risk or accident or failure or become necessary for security.
- xii. "Specification" shall mean the technical specifications forming a part of the contract and such other schedules and drawings as may be mutually agreed upon.
- xiii. 'Contract price' shall mean the total sum for which tender is accepted by the company.
- xiv. 'Written notice' shall mean a notice or communication in writing and shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an office of the Corporation/Company for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.
- xv. "Letter of Acceptance" of the tender shall mean the official notice issued by the company notifying the contractor that his tender has been accepted.
- xvi. "Date of Contract" shall mean the date on which both the parties have signed the contract agreement.
- xvii. "Manufacturer's Works' or Contractor's Works" shall mean the place of work used by the Manufacturer, the Contractor, their collaborators or sub-contractors for the performance of the works.
- xviii. "Inspector" shall mean the Owner or any person nominated by the Owner from time to time, to inspect the equipment stores or Works under the contract and/or the duly authorised representative of the owner.
- xix. When the words "Approved", "Subject to Approval", "Satisfactory", "Equal to", "Proper", "Requested", "As directed", "Where directed", "When directed", "Determined by", "Accepted", "Permitted", or words and phrases of like import are used, the approval, judgement, direction etc. is understood to be a function of the Owner/Engineer/Engineer-in-Charge.
- xx. "Test of Completion" shall mean such tests as prescribed in the contract to be performed by the contractor before the Works is taken over by the Owner.
- xxi. "Start-up" shall mean the time period required to bring the equipment covered under the Contract from an inactive condition, when construction is essentially complete, to the state ready for trial operation. The start-up period shall include preliminary inspection and check out of equipment and supporting sub-systems; initial operation of the complete equipment covered under the Contract to obtain necessary pre-trial operation data, perform calibration and corrective action; shut down inspection and adjustment prior to the trial operation period.
- xxii. "Initial operation" shall mean the first integral operation of the complete equipment covered under the contract with sub-systems and supporting equipment in service.

- xxiii. "Trial Operation", "Reliability Test", Trial Run", "Complete Test" shall mean the extended period of time after the "Start-up" period. During this trial operation period the unit shall be operated over the full load range. The length of Trial Operation shall be as determined by the Engineer, unless otherwise specified elsewhere in the Contract.
- xxiv. "Performance and Guarantee Tests" shall mean all operation checks and tests required to determine and demonstrate capacity, efficiency, and operating characteristics as specified in the contract document.
- xxv. "Commercial Operation" shall mean the condition of operation in which the complete equipment covered under the contract is officially declared by the owner to be available for continuous operation at different loads upto and including rated capacity. Such declaration by the owner however, shall not relieve or prejudice any of the contractor's obligation under this contract.
- xxvi. "Final Acceptance" shall mean the owner's written acceptance of the works performed under the contract, after successful completion of performance and guarantee tests.
- xxvii. "Guarantee Period/ Maintenance Period" shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the works performed under the contract.
- xxviii. "Drawings"/"Plans" shall mean all :
- (a) drawings furnished by the owner/consultant as a basis for proposals,
 - (b) supplementary drawings furnished by the Owner/Consultant to clarify and to define in greater detail the intent of the contract,
 - (c) drawings submitted by the contractor with his proposal provided such drawings are acceptable to the Owner/Consultant,
 - (d) drawings furnished by the Owner/Consultant to the Contractor during the progress of the work, and
 - (e) engineering data and drawings submitted by the Contractor during the progress of the work provided such drawings are acceptable to the Engineer,
- xxix. "Codes" shall mean the following, including the latest amendments, and/or replacements, if any :
- (a) Standards of Bureau of Indian Standards relevant to the works under the contract and their specifications.
 - (b) Other Internationally approved Standards and/or rules and regulations touching the subject matter of the contract.
 - (i) A.S.M.E. Test codes.
 - (ii) A.I.E.E. Test codes.
 - (iii) American Society of Materials Testing Codes.
 - (iv) Indian Electricity Act and Rules and Regulations made thereunder.
 - (v) Indian Explosive Act and Rules and Regulations made thereunder.
 - (vi) Indian Petroleum Act and Rules and Regulations made thereunder.
 - (vii) Indian Mines Act and Rules and Regulations made thereunder.
 - (c) Any other laws, rules, regulations and Acts applicable in the country with respect to labour, safety, compensation, insurance etc.
- xxx. Words importing singular only shall also include the plural and vice-versa where the context so requires.
- xxxi. Words importing "Person" shall include firms, companies, corporations, and associations or bodies of individuals, whether incorporated or not.

- xxxii Terms and expressions, not defined herein, shall have the same meaning as are assigned to them in the Indian Sale of Goods Act, failing that in the Indian Contract Act, and failing that in the General Clauses Act.
- xxxiii "Commissioning" the plant/project shall mean completion in all respects of construction rendering the plan/project ready for performance test and commercial operation as per xxv.
- xxxiv "Government Approvals" shall mean all permits, licenses, authorisations, consents, clearances, decrees, waivers, privileges, approvals from and filing with government instrumentalities necessary for the development, construction and operation of the plant/project.
- xxxv "Month" shall mean a calendar month according to the Gregorian calendar.
- xxxvi "Bank Guarantee" shall mean the Bank Guarantee to be provided by to.....

2. CONTRACT DOCUMENTS :

The following documents shall constitute the contract documents :

- (i) Articles of Agreement,
- (ii) Notice Inviting Tender,
- (iii) Letter of Acceptance of Tender indicating deviations, if any, from the conditions of contract incorporated in the Tender Documents issued to the bidder and/ or the Bid submitted by the bidder,
- (iv) Conditions of contract, including general terms and conditions, additional terms and conditions, technical terms and conditions, erection terms and conditions, special conditions, if any etc. forming part of the Agreement,
- (v) Specifications, where it is part of Tender Documents,
- (vi) Scope of works/ Bills of quantities/ schedule of works/ quantities and
- (vii) Contract Drawings/ finalized work programme.

- 2.1 After acceptance of tender the Contractor shall be deemed to have carefully examined all Contract Documents to his satisfaction. If he shall have any doubt as to the meaning of any portion of the Contract Documents, he shall before signing the Contract, set forth the particulars thereof, and submit them to the Owner in writing in order that such doubt may be removed. The Owner will provide such clarifications as may be necessary in writing to the Contractor. Any information otherwise obtained from the Owner or the Engineer shall not in any way relieve the Contractor of his responsibility to fulfill his obligations under the Contract.
- 2.2 The Contractor shall enter into a Contract Agreement with the Owner within 60 (sixty) days from the date of 'Acceptance of Tender' or within such extended time as may be granted by the owner. The performance Bank Guarantee for the proper fulfillment of the contract shall be furnished by the contractor in the prescribed form within 30 (thirty) days of 'Acceptance of tender'. The performance Guarantee shall be as per terms prescribed in clause 29 of Instructions to Bidders of this tender.
- 2.3 The owner, after the issue of the Letter of Acceptance of Tender, will send one copy of the final agreement to the contractor for his scrutiny and approval.
- 2.4 The agreement, unless otherwise agreed to, shall be signed within 60 (sixty) days of the issue of the letter of Acceptance of tender, at the office of the owner on a date and time to be mutually agreed. The contractor shall provide for signing of the contract, performance guarantee in copies as required, appropriate power of

attorney and other requisite materials. In case it is agreed mutually that the contract is to be signed beyond the stipulated time, the bid guarantee submitted with the tender will have to be extended accordingly.

- 2.5 The agreement will be signed in six originals and the contractor shall be provided with one signed original and the rest will be retained by the owner. None of these documents shall be used by the contractor for any purpose other than this contract and the contractor shall ensure that all persons employed for this contract strictly adhere to this and maintain secrecy, as required of such documents.
- 2.6 The contractor shall provide free of cost to the owner all the engineering data, drawings and descriptive materials submitted with the bid, in at least six (6) copies to form a part of the contract immediately after issue of letter of acceptance.
- 2.7 Subsequent to signing of the contract, the contractor at his own cost shall provide the owner with at least 6 (six) true copies of agreement within 30 (thirty) days after the signing of the contract.
- 2.8 The contract shall be considered as having come into force from the date of signing of the agreement or handing over the site which ever is later.
- 2.9 The laws applicable to this contract shall be the laws in force in India. The courts of Dhanbad, India shall have exclusive jurisdiction in all matters arising under this contract.

3.0 CONTRACT PERFORMANCE GUARANTEE/ SECURITY DEPOSIT :

- 3.1 Security deposit shall consist of two parts

- a) Performance security to be submitted at award of work and
 - b) Retention money to be recovered from running bills.
- The security deposit shall bear no interest

- 3.1.1 Performance security should be 5% of contract amount and should be submitted within 28 days of receipt of the Letter of Acceptance, the successful Bidder in any of the form given below after which bid security/ earnest money will be refunded to the contractor.

- Bank Guarantee on a bank indicated by the Employer in the form given in Section 8 from any scheduled Indian Bank for full amount of 5% of the contract price after which the Bid Security/ Earnest Money will be refunded to the contractor.

or

- Bank draft for the full amount of Contract Performance Security/ Security Deposit amounting to 5% of the contract price, in favour of Bharat Coking Coal Limited. Refer to clause 2 of section-1 about bank draft details (as for earnest money, other details and conditions of bank draft are applicable in this case also).

- 3.1.2 If performance security is provided by the successful bidders in the form of bank guarantee it shall be issued either –

(a) at Bidder's option by a nationalized/ Scheduled Indian Bank or

(b) by a foreign bank located in India and acceptable to the employer.

- 3.1.3 Retention Money should be deducted at 5% from running bills. Total of performance security and Retention Money should not exceed 10% of contract amount or lesser sum indicated in the bid document.

- 3.2 Bank Guarantee shall be valid up to ninety (90) days after the end of Guarantee Period.
- 3.3 The Guarantee amount shall be payable to the Employer without any condition whatsoever.
- 3.4 The Performance Guarantee shall cover additionally the following guarantees to the Employer:
- (a) The successful bidder guarantees the successful and satisfactory operation of the equipment furnished and erected under the contract, as per the specifications and documents,
 - (b) The successful bidder further guarantees that the equipment provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from the employer fully remedy free of expenses to the Employer such defects as developed under the normal use of the said equipment within the period of guarantee specified in the relevant clause of the Conditions of Contract.
- 3.5 The Contract Performance Guarantee is intended to secure the performance of the entire Contract. However it is not construed as limiting the damages under clause entitled 'Equipment Performance Guarantee' in section Technical Conditions of Contract and damages stipulated in the other clauses in the bidding documents.
- 3.6 Bank Guarantee is to be submitted in the format prescribed by the company in Section-6. Bank Guarantee shall be irrevocable and it shall be from any Nationalised Bank/ Scheduled Bank.
- 3.7 The Company shall be at liberty to deduct/ appropriate from the Contract Performance Guarantee/Security Deposit such sums as are due and payable by the contractor to the company as may be determined in terms of the contract, and the amount appropriated from the Contract Performance Guarantee/Security Deposit shall have to be restored by Contractor subsequently.
- 3.8 The Contract Performance Guarantee will be returned to the Contractor without any interest at the end of the Guarantee Period.

4.0 ASSIGNMENT AND SUBLETTING OF CONTRACT

- 4.1 The contractor may, after informing the engineer and getting his written approval, assign or sub-let the contract or any part thereof other than for raw materials, for minor detail or any part of the plant for which makes are identified in the contract. Suppliers of the equipment not identified in the contract or any change in the identified supplier shall be subject to approval by the engineer. The experience list of the equipment vendors under consideration by the contractor for this contract shall be furnished to the engineer for approval prior to procurement of all such items/equipments. Such assignment sub-letting shall not relieve the contractor from any obligation, duty or responsibility under the contract. Any assignment as above without prior written approval of engineer shall be void.
- 4.2 For components/equipments procured by the contractors for the purposes of the contract, after obtaining the written approval of the owner, the contractor's purchase specifications and enquiries shall call for quality plans to be submitted by the suppliers along with their proposals. The quality plans called for from the vendors shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection

documentation raised, etc. Such quality plans of the successful vendor shall be discussed and finalised in consultation with the engineer and shall form a part of the purchase order/contract between the contractor and the vendor. Within 3 weeks of the release of the same purchase order/contracts for such bought out items/components, a copy of the same without price details but together with detailed purchase specifications, quality plans and delivery conditions shall be furnished to the engineer by the contractor.

5.0 PATENT RIGHTS AND ROYALTIES

- 5.1 Royalties and fees for patent covering materials, articles, apparatus, devices, equipment or processes used in the works shall be deemed to have been included in the contract price. The contractor shall satisfy all demands that may be made at any time for such royalties or fees and he alone shall be liable for any damages or claims for patent infringements and shall keep the owner indemnified in that regard. The contractor shall, at his own cost and expense, defend all suits or proceedings that may be instituted for alleged infringement of any patent involved in the works, and, in case of an award of damages, the contractor shall pay for such award. In the event of any suit or other proceedings instituted against the owner, the same shall be defended at the cost and expense of the contractor who shall also satisfy/comply and decree, order or award made against the owner. But it shall be understood that no such machine, plant, work, material or thing has been used by the owner for any purpose or any manner other than that for which they have been furnished and installed by the contractor and specified under these specifications. Final payment to the contractor by the owner will not be made while any such suit or claim remains unsettled. In the event any apparatus or equipment, or any matter thereof furnished by the contractor, is in such suit or proceedings held to constitute infringement, and its use is enjoined, the contractor shall, at his option and at his own expense, either procure for the owner, the right to continue use of said apparatus, equipment or part thereof, replace it with non-infringing apparatus or equipment or modify it, so it becomes non-infringing.

6.0 TIME - THE ESSENCE OF CONTRACT

- 6.1 The time and the date of completion of the works as stipulated in the contractor's proposal and accepted by the owner without or with modifications, if any and so incorporated in the award letter shall be deemed to be the essence of the contract. The contractor shall so organise his resources and perform his work as to complete it not later than the date agreed to.
- 6.2 The contractor shall submit a detailed PERT network within the time frame agreed above consisting of adequate number of activities covering various key phases of the works such as design, procurement, manufacturing, shipment and field erection activities within fifteen (15) days after the date of acceptance of tender. This network shall also indicate the interface facilities to be provided by the owner and the dates by which such facilities are needed. Contractor shall discuss the network so submitted with the owner and the agreed network which may be in the form as submitted or in revised form in line with the outcome of discussions and shall form part of the contract to be signed within sixty (60) days from the date of letter of acceptance or notice of award of contract. During the performance of contract, if in the opinion of the engineer proper progress is not maintained suitable changes shall be made in the contractor's operations to ensure proper progress.
- 6.3 The above PERT network shall be reviewed and periodic review reports shall be submitted by the contractor as directed by the engineer.

- 6.4 Subsequent to the award of the contract, the contractor shall make available to the engineer, a detailed manufacturing programme, in line with the agreed contract network. Such manufacturing programme shall be reviewed, updated and submitted to the Engineer, once every two month thereafter.

7.0 CONTRACT PRICE

- 7.1 The lump sum prices quoted by the contractor in his bid with additions and deletions as may be agreed before signing of the contract, for the entire scope of the work including furnishing and erection of equipment covered under the specifications and documents and shall be treated as the contract price.

8.0 CHANGED QUANTITY

- 8.1 The owner reserves the right to vary the quantities of items or groups of items to be ordered as specified in the accompanying technical specifications, as may be necessary, during the execution of the contract, but such variations unless otherwise specified in the accompanying technical specifications shall be limited to plus or minus twenty percent (20%) of the original quantity ordered.

9.0 DEDUCTIONS FROM CONTRACT PRICE

- 9.1 All costs, damages or expenses which the owner may have paid, for which under the contract the contractor is liable, will be claimed by the owner. All such claims shall be billed by the owner to the contractor regularly as and when they fall due. Such bills shall be supported by appropriate and certified vouchers or explanations, to enable the contractor to properly identify such claims. Such claims shall be paid by the contractor within fifteen (15) days of the receipt of the corresponding bills and if not paid by the contractor within the said period, the owner may then deduct the amount, from any moneys due or becoming due by him to the contractor under the contract or may be recovered by actions of law or otherwise, if the contractor fails to satisfy the owner of such claims.

10.0 CONTRACT PRICE ADJUSTMENT

- 10.1 All adjustments in the contract price shall be computed in accordance with the conditions and formulae prescribed in the relevant clauses of 'Additional Terms and Conditions of Contract', the accompanying technical specifications and further satisfying the requirements specified herein.
- 10.2 The contract price stated in the contract agreement is the base price. A certain fixed percentage of the base price as indicated in the technical specifications shall not be subject to any price adjustment. The balance percentage viz. the cost portion shall only be subject to price adjustment.
- 10.3 Price adjustment shall be applicable to the cost portion, only if changes in the cost of labour and materials (either increases or decreases) occur during the contract period, directly affecting the cost portion.
- 10.4 Variations in the cost of materials shall be determined by comparing published material indices as of thirty (30) days prior to the date set for opening of bids or the revised price bid, whichever is later, with the same indices published during the manufacture at the respective cut off periods for material as specified in clause 2.0 of Additional Terms and Conditions of Contract. Variations in the cost of labour shall be determined by comparing the wages as per the Minimum Wages Act/ Rules of the State or Central Government, whichever is more, applicable to the place of work as of thirty (30) days prior to the date set for opening of bids or the revised

price bid, whichever is later, with the same wages as per the Minimum Wages Act/ Rules of the State or Central Government, whichever is more, during the work/manufacture applicable to the place of work/manufacture at the respective cut off periods for labour as specified in clause 2.0 of Additional Terms and Conditions of Contract of this volume.

- 10.5 The total computed variation in the contract price shall be restricted to a limiting percentage as specified in clause 2.5 of Additional Terms and Conditions of Contract of this volume.
- 10.6 The price adjustment for the erection shall be made on the value of erection work done as indicated in each billing.
- 10.7 Every three months after the award of contract, and a month prior to shipment of equipment (in the case of ex-factory price component of contract price), and every month after establishing his site office (in the case of erection) the contractor shall submit to the engineer a written notice of the changes, if any, that have occurred in the specified material and labour indices during the previous reporting period containing the effective date of such change, the amount of change, the amount of contract price adjustment and documentary evidence to substantiate the price adjustment.
- 10.8 The contract price adjustment provisions detailed above, shall only be applicable if so specified in the Additional Terms and Conditions of Contract.

11.0 PACKING, FORWARDING AND SHIPMENT

- 11.1 The contractor, wherever applicable, shall after proper painting, pack and crate all equipment in such a manner as to protect them from deterioration and damage during rail and road transportation to the site and storage at the site till the time of erection. The contractor shall be held responsible for all damages due to improper packing.
- 11.2 The contractor shall notify the owner of the date of each shipment from his works, and the expected date of arrival at the site for the information of the owner.
- 11.3 The contractor shall also give all shipping information concerning the weight, size and content of each packing including any other information the owner may require.
- 11.4 The following documents shall be sent by registered post to the owner within 3 days from the date of shipment, to enable the owner to make progressive payments to the contractor:

Application for payment in the standard format of the owner (3 copies)

Invoice (6 copies)

Packing list (6 copies)

Pre-despatch clearance certificate, if any (3 copies)

Test certificate, wherever applicable (3 copies)

- 11.5 The contractor shall prepare detailed packing list of all packages and containers, bundles and loose material forming each and every consignment dispatched to site. The contractor shall further be responsible for making all necessary arrangements for loading, unloading and other handling right from his works up to the site and also till the equipment is erected, tested and commissioned. He shall be solely responsible for proper storage and safe custody of all equipment.

12.0 DEMURRAGE, WHARFAGE, ETC.

- 12.1 All demurrage, wharfage and other expenses incurred due to delayed clearance of the material or any other reason shall be to the account of the contractor.

13.0 INSURANCE

- 13.1 The contractor shall arrange, secure and maintain insurance as may be necessary and for all such amounts to protect his interests and the interests of the owner, against all risks as detailed herein in the joint names of the Owner and the Contractor with the condition that payments against all claims shall be payable by insurers to the owner as elaborated at clause 13.5. All premiums and other charges of the said insurance policies shall be paid by the contractor. The form and the limit of such insurance, as defined herein together with the under-writer thereof in each case shall be acceptable to the owner. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage on comprehensive all risks basis at all time during the period of contract shall be that of the contractor alone. The contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations.
- 13.2 Any loss of damage to the equipment, during handling, transporting, storage and erection, till such time the plant is taken over by the owner, shall be to the account of the contractor. The contractor shall be responsible for preferring of all claims and make good for the damage or loss by way of repairs and/or replacement of the portion of the works damaged or lost. The transfer of title shall not in any way relieve the contractor of the above responsibilities during the period of the contract. The contractor shall provide the owner with a copy of all insurance policies and documents taken out by him in pursuance of the contract. Such copies of document shall be submitted to the owner immediately after such insurance coverage. The contractor shall also inform the owner in writing at least sixty (60) days in advance, regarding the expiry, cancellation and/or change in any of such documents and ensure revalidation/renewal, etc. as may be necessary well in time.
- 13.3 The risk that are to be covered under the insurance shall include, but not be limited to, the loss or damage in transit, theft, pilferage, riot, civil commotion, weather conditions, accidents of all kinds, fire, etc. The scope of such insurance shall cover the entire value of the works from time to time.
- 13.4 All costs on account of insurance liabilities covered under the contract will be on contractor's account and will be included in contract price. However, the owner may from time to time, during the pendency of the contract, ask the contractor in writing to limit the insurance coverage risks and in such a case, the parties to the contract will agree for a mutual settlement for reduction in contract price to the extent of reduced premium amounts.
- 13.5 All insurance claims, payable by the insurers, shall be paid to the Owner which shall be released to the contractor in installments as may be certified by the Engineer-in-charge for the purpose of rebuilding or replacement or repair of the works and/or goods destroyed or damaged for which payment was received from the insurers.
- 13.6 The clause entitled insurance under the section erection terms and conditions of contract of this volume, covers the additional insurance requirements for the portion of the works to be performed at the site of work.

14.0 LIABILITY FOR ACCIDENTS AND DAMAGES

- 14.1 Under the contract, the contractor shall be responsible for loss or damage to the plant until the plant is taken over in accordance with clause entitled 'Taking Over' in section technical terms and conditions of contract of this volume.

15.0 LIQUIDATED DAMAGES FOR DELAY IN COMPLETION

- 15.1 If the contractor fails to maintain the required progress in terms of the agreed time and progress chart or to complete the work and clear the site on or before the contract or extended date of completion, he shall without prejudice to any other right or remedy available under the law to the company on account of such breach, pay as agreed compensation/liquidated damages @half percent (1/2 %)of the contract price per week of delay. The aggregate of such compensation/compensations shall not exceed 10 (ten) percent of the total value as shown in contract.

This will also apply to items or group of items for which separate period of completion has been specified. The amount of compensation may be adjusted or setoff against any sum payable to the contractor under this or any other contract with the company.

- 15.1.1 The company, if satisfied ,that the works can be completed by the contractor within a reasonable time after the specified time of completion, may allow further extension of time at its discretion with or with out the levy of L.D. In the event of extension granted being with L.D., the company will be entitled without prejudice to any other right or remedy available in that behalf, to recover from the contractor as agreed damages equivalent to half percent of the contract value of the works for each week or part of the week subject to a ceiling of 10% of the contract price.
- 15.1.2 The company, if not satisfied ,that the works can be completed by the contractor, and in the event of failure on the part of the contractor to complete work with in further extension of time allowed as aforesaid, shall be entitled , without prejudice to any other right or remedy available in that behalf, to rescind the contract.
- 15.1.3 The company , if not satisfied with the progress of the contract and in the event of failure of the contract to recoup the delays in the mutually agreed time frame ,shall be entitled to terminate the contract.
- 15.1.4 In the event of such termination of the contract as described in clause 15.1.2 or 15.1.3 or both, the company, shall be entitled to recover L.D. up to (10%) of the contract value and forfeit the security deposit made by the contractor besides getting the work completed by other means at the risk and cost of the contractor.
- 15.2 The company may, waive the payment of compensation, depending upon merit of the case, on request received from the contractor if the entire work is completed within the date as specified in the contract or as validly extended without stipulating any penalty.

16.0 CONTRACTOR'S DEFAULT

- 16.1 If the contractor shall neglect to execute the works with the diligence and expedition or shall refuse or neglect to comply with any reasonable orders given to him, in writing by the engineer in connection with the works or shall contravene the provisions of the contract, the owner may give notice in writing to the contractor to make good the failure, neglect or contravention complained of. Should the contractor fail to comply with the notice within thirty (30) days from the date of service thereof, then and in such case the owner shall be at liberty to employ other workmen and forthwith execute such part of the works as the contractor may have neglected to do or if the owner shall think fit, it shall be lawful for him, without prejudice to any other right he may have under the contract, to take the works wholly or in part thereof and in that event the owner shall have free use of all contractor's equipment that may have been at the time on the site in connection with the works without being responsible to the contractor for fair wear and tear thereof and to the exclusion of any right of the contractor over the same, and the owner shall be entitled to retain and apply any balance which may otherwise be due on the contract by him to the contractor, or such part thereof as may be necessary, the payment of the cost of executing the said part of the works or of completing the

works as the case may be. If the cost of completing the works or executing a part thereof as aforesaid shall exceed the balance due to the contractor, the contractor shall pay such excess. Such payment of excess amount shall be independent of the liquidated damages for delay which the contractor shall have to pay if the completion of works is delayed.

- 16.2 In addition, such action by the owner as aforesaid shall not relieve the contractor of his liability to pay liquidated damages for delay in completion of works as defined in clause 15.0 of this section
- 16.3 The termination of the contract under this clause shall not entitle the contractor to reduce the value of the performance bank guarantee nor the time thereof. The performance guarantee shall be valid for the full value and for the full period of the contract including guarantee period.
- 16.4 The bidding documents will clearly state that, if the contractor fails to complete the work and the order is cancelled, the amount due to him on account of work executed by him, if payable, shall be paid to him only after due recoveries as per the provisions of the contract and that too after alternative arrangements to complete the work has been made.

17.0 FORCE MAJEURE

- 17.1 Force majeure is herein defined as any cause which is beyond the control of the contractor or the owner as the case may be which they could not foresee or with a reasonable amount of diligence could not have foreseen and which substantially affect the performance of the contract, such as:
- (a) natural phenomena, including but not limited to floods, draughts, earthquakes and epidemics:
 - (b) acts of any government, including but not limited to war, declared or undeclared, priorities, quarantines, embargoes,
- Provided either party shall within fifteen (15) days from the occurrence of such a cause notify the other in writing of such causes.
- 17.2 The bidding documents will clearly state that :
- (a) The successful bidder will advise, in the event of his having resort to this clause by a registered letter duly certified by the local chamber of commerce or statutory authorities, the beginning and end of the clause of delay, within fifteen days of the occurrence and cessation of such Force Majeure condition . In the event of delay lasting over two months, if arising out of Force Majeure, the contract may be terminated at the discretion of the company.
 - (b) For delays arising out of Force Majeure, the bidder will not claim extension in completion date for a period exceeding the period of delay attributable to the causes of Force Majeure and neither company nor the bidder shall be liable to pay extra costs (like increase in rates, remobilisation advance, idle charges for labour and machinery etc.) Provided it is mutually established that the Force Majeure conditions did actually exist.
 - (c) If any of the Force Majeure conditions exists in the place of operation of the bidder even at the time of submission of bid he will categorically specify them in his bid and state whether they have been taken into consideration in their quotations.
- 17.3 The contractor or the owner shall not be liable for delays in performing his obligations resulting from any Force Majeure cause as referred to and/or defined above. The date of completion will, subject to hereinafter provided, be extended by

a reasonable time even though such cause may occur after contractor's performance of his obligations has been delayed for other causes.

18.0 DELAYS BY OWNER OR HIS AUTHORISED AGENT

- 18.1 In case the contractor's performance is delayed due to any act of omission on the part of the owner or his authorised agents, then the contractor shall be given due extension of time for the completion of the works, to the extent such omission on the part of the owner has caused delay in the contractor's performance of his work. Regarding reasonableness or otherwise of the extension of time, the decision of the engineer shall be final.
- 18.2 In addition, the contractor shall be entitled to claim demonstrable and reasonable compensation if such delays have resulted in any increase in the cost of work. The owner shall examine the justification for such a request for claim, and if satisfied, the extent of compensation shall be mutually agreed depending upon the circumstances at the time of such an occurrence
- 18.3 Any delay in finalization of mutual agreement in regard to any of the contractor's claim/ compensation against any act of omission on the part of the owners or his authorised agents should not result in any work stoppage/ further delay on the part of the contractor.

19.0 EXTENSION OF DATE OF COMPLETION

- 19.1 On happening of any events causing delay as stated hereinafter, the contractor shall intimate immediately in writing the Engineer-in-Charge :
- due to any reasons defined as Force Majeure.
 - non-availability of stores which are the responsibility of the owner to supply
 - non-availability or breakdown of tools and plant to be made available or made available by the owner
 - delay on the part of the contractors or tradesmen engaged by the owner not forming part of the contract, holding up further progress of the work
 - non-availability of working drawings/work programme in time, which are to be made available by the company during progress of the work
 - any other causes which, at the sole discretion of the company is beyond the control of the contractor.
- 19.2 A "Hindrances Register" shall be maintained by both the Company and the Contractor at site to record the various hindrances, as mentioned above, encountered during the course of execution.
- 19.3 The contractor may request the company in writing for extension of time within 14 days of happening of such event causing delay stating also, if practicable, the period for which extension is desired. The company may, considering the eligibility of the request, give a fair and reasonable extension of time for completion of the work. Such extension shall be communicated to the contractor in writing by the company through the Engineer-in-charge within 1 month of the date of receipt of such request. The contractor shall however use his best efforts to prevent or make good the delay by putting his endeavours constantly as may be reasonably required of him to the satisfaction of the Engineer-in-charge.
- 19.4 Provisional extension of time may also be granted by the Engineer -In-charge during the course of execution, on written request for extension of time within 15 (fifteen) days of happening of such events as stated above, reserving the company's right to impose/ waive liquidated damages at the time of granting final extension of time as per contract agreement.

- 19.5 When the period fixed for the completion of the contract is about to expire, the question of extension of the contract may be considered at the instance of the Contractor or the Company or the both. The extension will have to be by party's agreement, expressed or implied.
- 19.6 In case the Contractor does not apply for grant of extension of time within 15 (fifteen) days of hindrance occurring in execution of the work and the Company wants to continue with the work beyond the stipulated date of completion for reason of the work having been hindered, the Engineer-in-charge at his sole discretion can grant provisional extension of time even in the absence of application from the Contractor. Such extension of time granted by the Engineer-in-charge is valid provided the Contractor accepts the same either expressly or implied by his actions before and subsequent to the date of completion. Such extension of time shall be without prejudice to Company's right to levy compensation under the relevant clause of contract.

20.0 TERMINATION, SUSPENSION, CANCELLATION & FORECLOSURE OF CONTRACT

- 20.1 The owner shall, in addition to other remedial steps to be taken as provided in the conditions of contract, be entitled to cancel the contract in full or in part, if the contractor
- a. makes default in proceeding with the works with due diligence and continues to do so even after a notice in writing from the Engineer-in-charge, then on the expiry of the period as specified in the notice
OR
 - b. commits default/breach in complying with any of the terms and conditions of the contract and does not remedy it or fails to take effective steps for the remedy to the satisfaction of the Engineer-in-charge, then on the expiry of the period as may be specified by the Engineer-in-charge in a notice in writing
OR
 - c. fails to complete the work or items of work with individual dates of completion, on or before the date/dates of completion or as extended by the company, then on the expiry of the period as may be specified by the Engineer-in-charge in a notice in writing
OR
 - d. shall offer or give or agree to give any person in the service of the company or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for act/acts of favour in relation to the obtaining or execution of this or any other contract for the company.
OR
 - e. shall try to obtain a contract with the company by way of ring tendering or other non-bonafide method of competitive tendering.
OR
 - f. transfers, sublets, assigns the entire work or any portion thereof without the prior approval in writing from the Engineer-in-charge. The Engineer-in-charge may by giving a written notice, cancel the whole contract or portion of it in default.
- 20.2 The owner shall in such an event give fifteen (15) days notice in writing to the contractor of his decision to do so.

- 20.3 The contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and contracts to the extent they are related to the work terminated and terms satisfactory to the owner, stop all further sub-contracting or purchasing activity related to the work terminated, and assist the owner in maintenance, protection, and disposition of the works acquired under the contract by the owner.
- 20.4 The contract shall stand terminated under the following circumstances unless the owner is satisfied that the legal representatives of the individual contractor or of the proprietor of the proprietary concern and in the case of partnership the surviving partners, are capable of carrying out and completing the contract and the owner shall in any way not be liable to payment of any compensation to the estate of deceased contractor and/or to the surviving partners of the contractor's firm on account of the termination of the contract.:
- a. If the contractor being an individual in the case of proprietary concern or in the case of a partnership firm any of its partners is declared insolvent under the provisions of insolvency act for the time being in force, or makes any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors amounting to proceedings for liquidation or composition under any insolvency act.
 - b. In the case of the contractor being a company, its affairs are under liquidation either by a resolution passed by the company or by an order of court, not being a voluntary liquidation proceedings for the purpose of amalgamation or reorganisation, or a receiver or manager is appointed by the court on the application by the debenture holders of the company, if any.
 - c. If the contractor shall suffer an execution being levied on his/their goods, estates and allow it to be continued for a period of 21 days.
 - d. On the death of the contractor being a proprietary concern or of any of the partners in the case of a partnership concern and the company is not satisfied that the legal representative of the deceased proprietor or the other surviving partners of the partnership concern are capable of carrying out and completing the contract. The decision of the company in this respect shall be final and binding which is to be intimated in writing to the legal representative or to the partnership concern.
- 20.5 If the contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the contractor is a partnership concern and one of the partners dies, then unless the owner is satisfied that the legal representatives of the individual contractor or of the proprietor of the proprietary concern and in the case of partnership the surviving partners, are capable of carrying out and completing the contract the owner shall be entitled to cancel the contract as to its incomplete part without being in any way liable to payment of any compensation to the estate of deceased contractor and/or to the surviving partners of the contractor's firm on account of the cancellation of the contract.

The decision of the owner that the legal representatives of the deceased contractor or surviving partners of the contractor's firm cannot carry out and complete the contract shall be final and binding on the parties. In the event of such cancellation the owner shall not hold the estate of the deceased contractor and/or the surviving partners of the estate of the deceased contractor and/or the surviving partners of the contractor's firm liable to damages for not completing the contract.

- 20.6 On cancellation of the contract or on termination of the contract, the Engineer-in-charge shall have powers
- a. to take possession of the site and any materials, constructional plant, implements, stores, etc. thereon.
 - b. to carry out the incomplete work by any means at the risk of the contractor
 - c. to determine the amount to be recovered from the contractor for completing the remaining work or in the event the remaining work is not to be completed the loss/damage suffered, if any, by the company after giving credit for the value of the work executed by the contractor up to the time of termination/cancellation less on a/c payments made till date and value of contractor's materials, plant, equipment, etc., taken possession of after termination/cancellation.
 - d. to recover the amount determined as above, if any, from any moneys due to the contractor or any account or under any other contract and in the event of any shortfall, the contractor shall be called upon to pay the same on demand.

The need for determination of the amount of recovery of any extra cost/ expenditure or of any loss/ damage suffered by the company shall not however arise in the case of termination of the contract for death/demise of the contractor as stated in 20.4(d).

- 20.7 Suspension of work - The company shall have power to suspend the progress of the work or any part thereof and the Engineer-in-charge may direct the contractor in writing to suspend the work, for such period and in such manner as may be specified therein, on account of any default on the part of the contractor, or for proper execution of the work for reasons other than any default on the part of the contractor, or on ground of safety of the work or part thereof. In the event of suspension for reason other than any default on the part of the contractor, extension of time shall be allowed by the company equal to the period of such suspension. Any necessary and demonstrable costs incurred by the contractor as a result of such suspension of the works will be paid by the owner, provided such costs are substantiated to the satisfaction of the engineer. The owner shall not be responsible for any liabilities if suspension or delay is due to some default on the part of the contractor or his sub-contractor.

The work shall, throughout the stipulated period of contract, be carried out with all due diligence on the part of the contractor. In the event of termination or suspension of the contract, on account of default on the part of the contractor, as narrated hereinbefore, the security deposit and other dues of his work or any other work done under this company shall be forfeited and brought under the absolute disposal of the company provided, that the amount so forfeited shall not exceed 10% of the contract value.

- 20.8 Foreclosure of contract in full or in part - If at any time after acceptance of the tender, the company decides to abandon or reduce the scope of the work for any reason whatsoever the company, through its Engineer-in-charge, shall give notice in writing to that effect to the contractor. In the event of abandonment/reduction in the scope of work, the company shall be liable
- a. to pay the contractor at the contract rates full amount for works executed and measured at site up to the date of such abandonment/reduction in the work.

- b. to pay reasonable amount assessed and certified by the Engineer-in-charge of the expenditure incurred, if any, by the contractor on preliminary works at site. e.g. temporary access roads, temporary construction for labour and staff quarters, office accommodation, storage of materials, water storage tanks and supply for the work including supply to labour/staff quarters, office, etc.
- c. to pay for the materials brought to site or to be delivered at site, which the contractor is legally liable to pay, for the purpose of consumption in works carried out or were to be carried out but for the foreclosure, including the cost of purchase and transportation and cost of delivery of such materials. The materials to be taken over by the company should be in good condition and the company may allow at its discretion the contractor to retain the materials in full or part if so desired by him and to be transported by the contractor from site to his place.
- d. to take back the materials issued by the company but remaining unused, if any, in the work on the date of abandonment/reduction in the work, at the original issued price less allowance for any deterioration or damage caused while in custody of the contractor
- e. to pay for the transportation of tools and plants of the contractor from site to contractor's place or to any other destination, whichever is less.

The contractor shall, if required by the Engineer-in-charge, furnish to him books of accounts, papers, relevant documents as may be necessary to enable the Engineer-in-charge to assess the amount payable in terms of part 20.8(b), (c) and (e) above, the contractor shall not have any claim for compensation whatsoever either for abandonment or for reduction in the scope of work, other than those as specified above.

21.0 NO WAIVER OF RIGHTS

Neither the inspection by the owner or the engineer or any of their officials, employees or agents nor any order by the owner or the engineer for payment of money or any payment for or acceptance of, the whole or any part of the works by the owner or the engineer, nor any extension of time, nor any possession taken by the engineer shall operate as a waiver of any provision of the contract, or of any power herein reserved to the owner, or any right to damages herein provided, nor shall any waiver of any breach in the contract be held to be a waiver of any other or subsequent breach.

22.0 CERTIFICATE NOT TO AFFECT RIGHT OF OWNER AND LIABILITY OF CONTRACTOR

No interim payment certificate of the engineer, nor any sum paid on account, by the owner, nor any extension of time for execution of the works granted by the engineer shall affect or prejudice the rights of the owner against the contractor or relieve the contractor of his obligations for the due performance of the contract, or be interpreted as approval of the works done or of the equipment furnished and no certificate shall create liability for the owner to pay for alterations, amendments, variations or additional works not ordered, in writing, by the engineer or discharge the liability of the contractor for the payment of damages whether due, ascertained, or certified or not, or any sum against the payment of which he is bound to indemnify the owner, nor shall any such certificate nor the acceptance by him of any sum paid on account or otherwise affect or prejudice the rights of the contractor against the owner.

23.0 GRAFTS AND COMMISSIONS ETC.

Any graft, commission, gift or advantage given, promised or offered by or on behalf of the contractor or his partner, agent, officers, director, employee or servant or any one of his or their behalf in relation to the obtaining or to the execution of this or any other contract with the owner, shall, in addition to any criminal liability which it may incur, subject the contractor to the cancellation of this and all other contracts and also to payment of any loss or damage to the owner resulting from any cancellation. The owner shall then be entitled to deduct the amount so payable from any moneys otherwise due to the contractor under the contract.

24.0 LANGUAGE AND MEASURES

All documents pertaining to the contract including specifications, schedules notices, correspondence, operating and maintenance instructions, drawings or any other writing shall be written in English language. The metric system of measurement shall be used exclusively in the contract.

25.0 RELEASE OF INFORMATION

The contractor shall not communicate or use in advertising, publicity, sales releases or in any other medium photographs or other reproduction of the works under this contract, or descriptions of the site, dimensions, quantity, quality or other information, concerning the works unless prior written permission has been obtained from the owner.

26.0 CONSTRUCTION OF THE CONTRACT

- 26.1 Notwithstanding anything stated elsewhere in the bid documents, the contract to be entered into will be treated as a divisible supply and erection contract. The supply portion of the contract will relate to the supply of equipment and materials and the erection portion will relate to the handling at the site, storage, erection, construction, testing, commissioning etc. as defined in the bid documents. Both contracts will contain a cross breach clause specifying that breach of any one contract will also constitute breach of the other contract and the whole contract combined. The contractor will pay the sales tax for the supply of equipment and materials in accordance with law and the same will be reimbursed by the owner as a part of the total contract price on actuals. The sales tax should be included in the total bid price in the proposal and should also be indicated separately. The invoice should be issued in favour of Bharat Coking Coal Ltd. for getting concessional CST and input /cenvat credit.
- 26.2 In case of divisible supply and erection contract, or where the owner hands over his equipment to the contractor for executing, then the contractor shall at the time of taking delivery of the equipment/ despatch documents be required to execute an indemnity bond in favour of the owner in the form acceptable to the owner for keeping the equipment in safe custody and to utilise the same exclusively for the purposes of the said contract.
- 26.3 The contract shall in all respects be construed and governed accordingly to Indian Laws.
- 26.4 It is clearly understood that the total consideration for the contract(s) has been broken up into various components only for the convenience of payment of advance under the contract(s) and for the measurement of deviations or modifications under the contract(s).

27.0 COMPLETION OF CONTRACT

Unless otherwise terminated under the provisions of any other relevant clause, this contract shall be deemed to have been completed at the expiration of the guarantee period as provided for under the clause entitled 'Guarantee' in this section.

28.0 ENFORCEMENT OF TERMS

The failure of either party to enforce at any time of the provisions of this contract or any rights in respect thereto or to exercise any option herein provided, shall in no way be construed to be a waiver of such provisions, rights or options or in any way to affect the validity of the contract. The exercise by either party of any of its rights herein shall not preclude or prejudice either party from exercising the same or any other right it may have hereunder.

29.0 ENGINEER'S DECISION

- 29.1 In respect of all matters which are left to the decision of the engineer including the granting or withholding of the certificates, the engineer shall, if required to do so by the contractor give in writing a decision thereon.
- 29.2 If in the opinion of the contractor, a decision made by the engineer is not in accordance with the meaning and intent of the contract, the contractor may file with the engineer within fifteen (15) days after receipt of the decision, a written objection to the decision. Failure to file an objection within the allotted time will be considered as acceptance of the engineer's decision and the decision shall become final and binding.
- 29.3 The engineer's decision and the filing of the written objection thereto shall be a condition precedent to the right to any legal proceedings. It is the intent of the agreement that there shall be no delay in the execution of the works and the decision of the engineer as rendered shall be promptly observed.

30.0 CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS

The contractor shall agree to co-operate with the owner's other contractors and consulting engineers and freely exchange with them such technical information as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The engineer shall be provided with three copies of all correspondence addressed by the contractor to other sub-contractors and consulting engineers in respect of such exchange of technical information,

31.0 TRAINING OF OWNER'S PERSONNEL

- 31.1 The contractor shall undertake to train free of cost, engineering personnel selected and sent by the owner at the works of the contractor unless otherwise specified in the technical specifications. The period and the nature of training for the individual personnel shall be agreed upon mutually between the contractor and the owner. These engineering personnel shall be given special training in the shops, where the equipment will be manufactured and/or their collaborator's works and where possible, in any other plant where equipment manufactured by the contractor or his collaborator is under installation or test, to enable those personnel to become familiar with the equipment being furnished by the contractor.
- 31.2 All travelling and living expenses for the engineering personnel to be trained during the total period of training will be borne by the owner. These engineering personnel while undergoing training shall be responsible to the contractor for discipline.

- 31.3 In the event of the owner, for any reason, failing to avail of the training facilities, he shall not be entitled for any rebate whatsoever on this account.

32.0 POWER TO VARY OR OMIT WORK

- 32.1 No alterations, amendments, omissions, suspensions or variations of the works (hereinafter referred to as 'Variation') under the contract as detailed in the contract documents, shall be made by the contractor except as directed in writing by the engineer, but the engineer shall have full power subject to the provision hereinafter contained from time to time during the execution of the contract, by notice in writing, to instruct the contractor to make such variation without prejudice to the contract. The contractor shall carry out such variation and be bound by the same conditions as far as applicable as though the said variation occurred in the contract documents. If any suggested variation would, in the opinion of the contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the contract, he shall notify the engineer thereof in writing and the engineer shall decide forthwith, whether or not the same shall be carried out and if the engineer confirm his instructions, contractor's obligations and guarantees shall be modified to such an extent as may be mutually agreed. Any agreed difference in cost occasioned by any such variation shall be added to or deducted from the contract price as the case may be.
- 32.2 In the event of the engineer requiring any variation, such reasonable and proper notice shall be given to the contractor to enable him to work his arrangements accordingly, and in cases where goods or materials are already prepared or any design, drawings of pattern made or work done requires to be altered, a reasonable and agreed sum in respect thereof shall be paid to the contractor.
- 32.3 In any case in which the contractor has received instructions from the engineer as to the requirement of carrying out the altered or additional substituted work which either then or later on, will in the opinion of the contractor, involve a claim for additional payments, the contractor shall immediately and in no case later than thirty (30) days, after receipt of the instructions aforesaid and before carrying out the instructions, advise the engineer to that effect. But the engineer shall not become liable for the payment of any charges in respect of any such variations, unless the instructions for the performance of the same shall be confirmed in writing by the engineer.
- 32.4 If any variation in the works, results in reduction of contract price, the parties shall, agree, in writing, so to the extent of any change in the price, before in contractor proceeds with the change.
- 32.5 In all the above cases, in the event of a disagreement as to the reasonableness of the said sum, the decision of the engineer shall prevail.
- 32.6 Notwithstanding anything stated above in this clause, the engineer shall have the full power to instruct the contractor, in writing, during the execution of the contract, to vary to quantities of the items or groups of items. The contractor shall carry out such variations and be bound by the same conditions, as though the said variations occurred in the contract documents. However, the contract price shall be adjusted at the rates and the prices provided for the original quantities in the contract.

33.0 GUARANTEE

- 33.1 The contractor shall warrant that the equipment will be new and in accordance with the contract documents and be free from defects in material and workmanship for a period of twelve (12) calendar months commencing immediately upon the satisfactory completion of the trial operations. The contractor's liability shall be

limited to the replacement of any defective parts in the equipment of his own manufacture of those of his sub-contractors, under normal use and arising solely from faulty design, materials, and/or workmanship provided always that such defective parts are repairable at the site and are not in the meantime essential in the commercial use of the plant. Such replaced defective parts shall be returned to the contractor unless otherwise arranged. No repairs or replacements shall normally be carried out by the engineer when the plant is under the supervision of the contractor's supervisory engineers.

34.0 REPLACEMENT OF DEFECTIVE PARTS AND MATERIALS

- 34.1 If during the progress of the works the engineer shall decide and inform in writing to the contractor, that the contractor has manufactured any plant or part of the plant unsound or imperfect or has furnished any plant inferior than the quality specified, the contractor on receiving details of such defects or deficiencies shall at his own expense within seven (7) days of his receiving the notice, or otherwise, within such time as may be reasonably necessary for making it good, proceed to alter, re-construct or remove such work and furnish fresh equipment up to the standards of the specifications. In case the contractor fails to do so, the engineer may on giving the contractor seven (7) days' notice in writing of his intentions to do so, proceed to remove the portion of the works so complained of and, at the cost of the contractor, perform all such work or furnish all such equipment provided that nothing in this clause shall be deemed to deprive the owner of or affect any rights under the contract which the owner may otherwise have in respect of such defects and deficiencies.
- 34.2 The contractor's full and extreme liability under this clause shall be satisfied by the payments to the owner of the extra cost, of such replacement procured, including erection, as provided for in the contract, such extra cost being the ascertained difference between the price paid by the owner for such replacements and the contract price portion for such defective plant and repayments of any sum paid by the owner to the contractor in respect of such defective plant. Should the owner not so replace the defective plant, the contractor's extreme liability under this clause shall be limited to repayment of all sums paid by the owner under the contract for such defective plant.

35.0 DEFENCE OF SUITS

If any action in court is brought against the owner or engineer or an officer or agent of the owner. for the failure or neglect on the part of the contractor to perform any acts, matters, covenants or things under the contract, or for damage or injury caused by the alleged omission or negligence on the part of the contractor, his agents, representatives or his sub-contractors, workmen, suppliers or employees, the contractor shall in all such cases indemnify and keep the owner, and the engineer and/or his representative, harmless from all losses, damages, expenses or decrees arising of such action.

36.0 LIMITATIONS OF LIABILITIES

The final payment by the owner in pursuance of the contract shall mean, the release of the contractor from all his liabilities under the contract. Such final payment shall be made only at the end of the guarantee period as detailed in clause 33 above and till such time as the contractual liabilities and responsibilities of the contractor, shall prevail. All other payments made under the contract shall be treated as on account payments.

37.0 MARGINAL NOTES

The marginal notes to any clause of the contract shall not affect or control the construction of such clause.

38.0 TAXES, PERMITS & LICENCES

The contractor shall be liable and pay all Indian taxes (including service tax also), duties, levies, lawfully assessed against the owner or the contractor in pursuance of the contract. In addition the contractor shall be responsible for payment of all Indian duties, levies and taxes lawfully assessed against the contractor for his personal income and property only. This clause shall be read in conjunction with clause 12.3 of section Instruction to Bidders.

38.0.1 CENVAT CREDIT

All Taxes, Duties, Levies and CENVAT rules enforceable in India, as enacted and amended from time to time and in accordance and in compliance with the relevant provisions of the respective Tax laws and Rules, in respect of the nature and type of the work, Contract, Service, Service provider, Service receiver, Point of taxation, Valuation etc. shall be applicable

i) Invoice issued by the supplier should contain following elements as per rule in Rule-11 of Central Excise Rule.

- Sl. no. of invoice (should not be hand-written)
- Registration number
- Address of concerned Central Excise Division
- Name & Address of consignee
- Description of goods
- Classification of goods
- Time and date of removal
- Mode of Transport and vehicle registration No.
- Rate of duty
- Quantity and value of goods
- Duty payable thereon
- Name & address of assesses.
- Education Cess & Higher Education Cess to be shown separately for complying with requirement of CCR (Cenvat Credit Rule)

ii) For availing CENVAT credit on input services following information must contain in the invoice/bill.

- Sl.No. of Invoice/ Bill (should not be hand-written)
- Name address and registration no. of person providing taxable service
- Name and address of person receiving taxable service
- Description/ classification and value of taxable services provided or to be provided
- Service Tax payable thereon
- Date of invoice / bill
- Education cess and Higher Education Cess to be shown separately for complying with requirement of CCR (Cenvat Credit Rule)

iii) Vendors / service providers should show excise / service tax element separately in their offer and invoice should be raised as per CENVAT credit rules as stated earlier.

iv) CENVAT CREDIT is also available on countervailing duty, on special additional duty of customs and educational and higher educational cess etc. for which bidders are required to confirm in their offer that they will submit a copy of the bill of Entry along with their bills in case of import cases.

v) All bidders including first stage and second stage dealers shall be required to submit cenvatable invoice for excisable goods unless the bidder is exempted from doing so as per relevant provision of excise notification. Firms claiming exemption from submission of cenvatable invoice shall submit documentary evidence to this effect. Failing in compliance to this, the offer are liable for rejection.

39.0 PROGRESS REPORTS AND PHOTOGRAPHS

During the various stages of the works in the pursuance of the contract, the contractor shall at his own cost submit periodic progress reports as may be reasonably required by the engineer with such materials as charts, net-works, photographs, test certificates, etc. such progress report shall be in the form and size as may be required by the engineer and shall be submitted in at least three (3) copies.

40.0 LONG TERM AVAILABILITY OF SPARES

- 40.1 The contractor shall guarantee the long term availability of spares to the owner for the full life of the equipments covered under the contract. The contractor shall guarantee that before going out of production of spare parts of the equipment covered under the contract, he shall give the owner at least twelve (12) months advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractor. Further, in case of discontinuance of manufacture of any spares by the contractor or his sub-contractors the contractor will provide the owner two years in advance, with full manufacturing drawings, material specifications and technical information required by the owner for the purpose of manufacture of such items.
- 40.2 Further, in case of discontinuance of supply of spares by the contractor or his sub-contractors the contractor will provide the owner with full information for replacement of such spares with other equivalent makes, if so required by the owner.
- 40.3 The contractor shall provide the owner with a "directory" of his sub-contractors giving the addresses and other particulars of his sub-contractors. The owner, if he so desires, shall have the right to procure the spares directly from sub-contractors.
- 40.4 Notwithstanding anything stated elsewhere in the bid documents, the prices of all spares which may be procured to cover long term requirements beyond the 2 years' maintenance and operational requirements, will be generally in accordance with the mutually agreed prices.
- 40.5 The contractor will indicate in advance the delivery period of the items of spares, which the owner may procure in accordance with the sub-clause 40.4 . In case of emergency requirements of spares, the contractor would make every effort to expedite the manufacture and delivery of such spares on the basis of mutually agreed time schedule.
- 40.6 The procedure specified in clause 40.4 and 40.5 shall apply for future procurement of items included in stand by spare list, mandatory spares lists, optional spares list and special tools, plants and equipment list, if any, specified in the bid documents.
- 40.7 The Contractor shall indemnify the owner for the availability of long time spares as per the terms and conditions laid down above in clause 40.1 to clause 40.6.

41.0 PAYMENT

- 41.1 The payment to the contractor for the performance of the works under the contract will be made by the owner as per the guidelines and conditions specified herein. All payment made during the contract shall be on account payments only. The final payment will be made on completion of all the works and on fulfillment by the contractor of all his liabilities under the contract.

41.2 CURRENCY OF PAYMENT

All payments under the contract shall be in Indian Rupees only.

41.3 DUE DATES FOR PAYMENT

Owner will make progressive payment as and when the payment is due as per the terms of payment set forth in the accompanying technical specifications. Payment will become due and payable by the owner within thirty (30) days from the date of receipt of contractor's bill/invoice/debit note by the owner, provided the documents submitted are complete in all respects.

41.4 PAYMENT SCHEDULE

The contractor shall prepare and submit to the engineer for approval, a break-up of the contract price. This contract price break-up shall be interlinked with the agreed detailed PERT network of the contractor setting forth his starting and completion dates for the various key phases of works prepared as per condition of this section. Any payment under the contract shall be made only after the contractor's price break-up is approved by the engineer. The aggregate sum of the contractor's price break-up shall be equal to the lump sum contract price.

41.5 APPLICATION FOR PAYMENTS

41.5.1 The contractor shall submit application for the payment in the prescribed proforma of the owner. Proforma for application for payment is enclosed in section-6.

41.5.2 Each such application shall state the amount claimed and shall set forth in detail, in the order of the payment schedule, particulars of the works including the works executed at site and of the equipment shipped/brought on to the site pursuant to the contract up to the date mentioned in the application and for the period covered since the last preceding certificate, if any.

41.5.3 Every interim payment certificate shall certify the contract value of the works executed up to the date mentioned in the application for the payment certificate, provided that no sum shall be included in any interim payment certificate in respect of the works that, according to the decision of the engineer, does not comply with the contract, or has been performed, at the date of certificate prematurely.

41.6 MODE OF PAYMENT

The payments due on receipt of equipment and materials, and those for the inland transportation and the erection portion of the works shall be made direct to the contractor by the owner.

41.7 TERMS OF PAYMENTS

41.7.1 Since the total job is on turn-key basis, any payment to the Contractor before the final payment shall be treated as provisional payment towards the total contract value.

The Contractor may at intervals of not less than one month submit claims/ bills for payment on account of work done after proper scrutiny and certification of the same by the Employer. The progressive payment shall be made in respect of the following :

- a) Design engineering
- b) Civil construction including foundation and buildings
- c) Structural fabrication and erection

- d) Supply of equipment
- e) Machinery Erection
- f) Trial Run and commissioning
- g) Final Bill after successful performance test etc.

All such payments shall be made by the Employer through Account Payee Cheque within a month from the date of the submission of claims/bills. Payment will also be governed by Clauses 29.1.1, 29.1.3 and 29.7 of Instructions to Bidders. Any sum due from the Contractor shall be deducted from the first or next subsequent on account of payments as the case may be, in general the following procedure of payment shall be followed :

41.7.1.1 Design and Engineering.

- a) 80% payment on completion of approval of system, mechanical, electrical, civil, structural design, drawings etc. as per contract on pro-rata basis.
- b) 10% payment on Preliminary acceptance of the works after start-up and trial operation as per clause 14.1/14.2 of General Technical Conditions (GTC).
- c) 10% on issue of final acceptance certificate of the works after performance and guarantee test as per clause 14.3 of GTC.

41.7.1.2 Supply of Equipment :

- a) 80% payment on receipt of the equipment conforming to stipulated specifications and quality in good condition at site to be certified by the site engineer.
- b) 10% on preliminary acceptance of the works after start-up and trial operation as per clause 14.1/14.2 of GTC
- c) 10% on issue of final acceptance certificate of the works after performance and guarantee test as per clause 14.3 of GTC

41.7.1.3 Civil/Structural Works :

- a) 80% payment on progress of work completed, duly measured and certified by the engineer.
- b) 10% payment on preliminary acceptance of the works after start-up and trial operation as per clause 14.1/14.2 of GTC
- c) 10% on issue of final acceptance certificate of the works after performance and guarantee test as per clause 14.3 of GTC

41.7.1.4 Installation & Commissioning :

- a) 80% progress payment based on the installation and commissioning of plant and equipment duly certified by site engineer.
- b) 10% payment on preliminary acceptance of the works after start-up and trial operation as per clause 14.1/14.2 of GTC
- c) 10% on issue of final acceptance certificate of the works after performance and guarantee test as per clause 14.3 of GTC

41.7.1.5 Final Bill :

As soon as possible after completion of the works to the satisfaction of the Employer the Contractor shall forward a certified final bill. It shall be accompanied by all relevant vouchers, such as royalty clearance certificate (if any) from appropriate authorities, submission of copies of working drawings, technical documents as required documents showing therein all additions and alternations etc. in the process of execution, completion certificate for embedded and covered up works, plant

handing over certificate etc. as applicable. The Contractor shall be paid full and final payment only after deduction of amounts paid against on account bill and any other amount due etc. payable by Contractor.

41.7.2 INLAND TRANSPORTATION AND INSURANCE

Inland transportation (including port handling) and inland insurance charges shall be paid to the contractor on pro-rata to the value of the equipment received at site and on production of the invoices by the contractor. However, wherever equipment wise inland transportation charges have been called for in the bid proposal sheets and have been furnished by the contractor, the payment of inland transportation charges shall be made after receipt of equipment at site based on the charges thus identified by the contractor in his proposal and incorporated in the contract. The aggregate of all such pro-rata payments shall however, not exceed the total amount quoted by the bidder in his bid and incorporated in the contract.

42.0 SETTLEMENT OF DISPUTES

It is incumbent upon the contractor to avoid litigation and disputes during the course of execution. However, if such disputes take place between the contractor and the department, effort shall be made first to settle the disputes at the company level. The contractor should make request in writing to the Engineer-in-charge for settlement of such disputes/ claims within 30 (thirty) days of arising of the cause of dispute/ claim failing which no disputes/ claims of the contractor shall be entertained by the company.

If differences still persist, the settlement of the dispute with Govt. Agencies shall be dealt with as per the Guidelines issued by the Ministry of Finance, Govt. of India in this regard. In case of parties other than Govt. Agencies, the redressal of the dispute may be sought in the Court of Law.

43.0 TAXES

All taxes, levies, cess, royalties, whether local, municipal, provincial or central pertaining to the contract are payable during the entire periods of contract, shall be to the contractor/ contractors account and shall be deemed to have been included in the contracted rate for the work to be executed by the contractor. The Company shall not be liable for any taxes or levies etc. whatsoever in connection with this contract.

The Company reserves the right to deduct/ withhold any amount towards taxes/ Statutory levies, as may be required under the Statute or in terms of direction from any Authority from the amount as directed by the appropriate Authority and the Company shall only provide with certificate towards deduction and shall not be responsible for any reason whatsoever.

This clause is to be read with clause 2.6 of ADDITIONAL TERMS AND CONDITIONS.

Necessary " C " form will be issued as applicable.

SERVICE TAX- Service tax if any applicable to this contract will be reimbursed by the company at actual on production of documentary proof.

44.0 DEFAULT AND DELAY IN COMMENCING THE WORK

If the contractor, without reasonable cause or valid reason, commits default in commencing the execution of the work within the aforesaid date, the company shall

without prejudice to any other right or remedy, be at liberty, by giving 15 days notice in writing to the contractor to commence the work, failing which to forfeit the Earnest Money Deposited by him.

Additionally, the Company will reserve the right to debar such defaulting Contractors from participating in future Tenders for a minimum period of one year.



SUB-SECTION -4.2

**ADDITIONAL TERMS AND
CONDITIONS
OF
CONTRACT**

SUB-SECTION – 4.2

ADDITIONAL TERMS & CONDITIONS OF CONTRACT

The following additional terms & conditions are also acceptable to the company. The tenderers are requested not to quote any additional conditions in their tender.

1. MOBILISATION ADVANCE :

No mobilization advance will be given.

2.0 PRICE VARIATION CLAUSE :

2.1 The contract price shall remain firm without any price variation due to escalation for the portions of survey, geo-engineering investigations, design and engineering and supply of equipments, plant and machineries as envisaged in the scope of work and the price agreed thereon as per the contract except the statutory increase/decrease in taxes and duties such as excise duty, sales tax, import duty etc.

2.1.1 If the contract is to be extended beyond the stipulated period for completion of the work due to fault on the part of the contractor escalation on prices shall not be allowed further if not provided otherwise in the accepted contract .

2.2 For the portions of civil and structural works and erection and commissioning works of the plant & machineries, the price variation due to escalation shall be allowed to the extent as detailed hereinafter

2.2.1 If the prices of materials (not being materials supplied at fixed issue rates by the company) and wages of labour, required for execution of the work, increase, the contractor shall be compensated for such increase as per provisions detailed below :

- a) The amount of the contract shall accordingly be varied, subject to the condition that such compensation for variation in prices shall be available only for the work done during the stipulated period of the contract as per the work programme agreed including such period for which the contract is validly extended under the provisions of the contract without any penal action.
- b) The base date for working out such price variation shall be thirty (30) days prior to the date set for opening of the bids or the revised price bid whichever is later.
- c) The compensation of Price variation shall be worked out at quarterly intervals and shall be with respect to the cost of work done during the previous three months . The first such payment shall be made at the end of three months after the month (Excluding) in which the tender was accepted and thereafter at three months' interval.

2.2.1.1 PRICE VARIATION FOR LABOUR:

The amount paid to the contractor for the work done shall be adjusted for increase or decrease in the cost of labour and the cost shall be calculated quarterly in accordance with the following formula:

$$V_L = W \times \frac{A}{100} \times \frac{L - L_o}{L_o}$$

Where :

V_L = Variation in labour cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

- W = Value of work done during the period under reckoning to which the price variation relates as indicated in clause no. 2.3 of the ' ADDITIONAL TERMS & CONDITIONS OF CONTRACT'.
- A = Component of labour expressed as percentage of the total value of work adopted from **Table-1**
- L_o = Minimum wages for unskilled workers payable as per the Minimum Wages Act / Rules of the State or Central Government ., whichever is more , applicable to the place of work as on the last date stipulated for receipt of the Price bids or Revised Price bids whichever is later.
- L = Revised minimum wages of unskilled workers corresponding to L_o during the period to which the escalation relates.

2.2.1.2 Price Variation on Materials :

The amount to be paid to the contractor for the work done shall be adjusted for increase or decrease in the cost of materials and the cost shall be calculated quarterly in accordance with the following formula:

$$V_m = W \times \frac{B}{100} \times \frac{M - M_o}{M_o}$$

Where :

V_m = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Value of work done during the period under reckoning to which the price variation relates as indicated in clause no. 2.3 of the ' ADDITIONAL TERMS & CONDITIONS OF CONTRACT'.

B = Component of material expressed as percentage of the total value of work adopted from **Table-1**

M = Average All India Wholesale Price Index for all commodities for the period to which price variation relates as published by the RBI Bulletin , Ministry of Industry & Commerce, Govt. Of India.

M_o = All India Wholesale Price Index for all commodities as published by the RBI Bulletin , Ministry of Industry & Commerce , Govt. Of India , relating to the last date on which the price bids or revised price bids whichever is later were stipulated to be received.

2.2.1.3 PRICE VARIATION ON POL :

The amount to be paid to the contractor for the work done shall be adjusted for increase or decrease in the cost of POL and the cost shall be calculated quarterly in accordance with the following formula:

$$V_f = W \times \frac{C}{100} \times \frac{F - F_o}{F_o}$$

Where :

V_f = Variation in the cost of fuel , oil & lubricants increase or decrease in the amount in rupees to be paid or recovered.

- W = Value of work done during the period under reckoning to which the price variation relates as indicated in clause no. 2.3 of the ' ADDITIONAL TERMS & CONDITIONS OF CONTRACT'.
- C = Component of POL expressed as percentage of the total value of work adopted from **Table-1**
- F = Average Index Number for Wholesale Price for the group of fuel , power, light and lubricants as published by Economic Advisor , Ministry of Industry , Govt. Of India for the period to which price variation relates .
- F₀ = Index Number for Wholesale Price for the group of "fuel , power, light and lubricants" as published by Economic Advisor , Ministry of Industry , Govt. Of India prevalent on the last date of receipt of price bids whichever is later.

2.3 WHILE CALCULATING THE VALUE OF "W" THE FOLLOWING MAY BE NOTED. :

The cost on which the escalation/price variation shall be payable shall be reckoned as 85% of the cost of work as per the bills to which escalation relates , and from this amount the value of materials supplied or services rendered at the prescribed charges under the relevant provisions of the contract , and proposed to recovered in the particular bill , shall be deducted before the amount of compensation for escalation/price variation is worked out. Further the cost shall not include any work for which payment is made at prevailing market rates.

2.4 In the event the price of materials and/ or wages of labour required for execution of the work decreases , there shall be downward adjustment of the work so that such price of materials and/or wages of labour shall be deductible from the cost of work under this contract and in this regard the formulae hereinbefore stated under this clause shall mutatis /mutandis apply.

For all other works not listed above , the component of labour , material and POL of the total cost of work shall be as specifically indicated in the tender document.

The price variation clause as stated above will be applied for extended time frame of a contract by following the principles as under

- i) Normally, if and when it is understood that a contract is not going to be completed within the scheduled time period, the contract is kept operative by extending the time of completion provisionally. During this provisional extended period the operation of the Price Variation Clause will remain suspended.
- ii) If and when it is decided at the end of the successful completion of the work that the delay was due to causes not attributable to the contractor, then the Price Variation Clause will be revived and applied as if the scheduled date of completion has been shifted to the approved extended date.
- iii) If it is decided at the end of successful completion of the work that the delay was due to the fault of the contractor then the Price Variation Clause will not be revived and no payment will be made to the contractor on this account. Additionally the Clause related to Compensation for delay will be applied.
- iv) In some cases the total delay may be partially due to causes not attributable to the contractor and partially due to his fault. It may be difficult to exactly quantify the total delay proportionately in such cases. The Price Variation Clause under such condition will be made operative for the entire extended time period by freezing the

relevant indices on the date of the scheduled date of completion as originally fixed in the contract/ agreement. At the same time the Clause related to the compensation for delay will also be applied.

2.5 CEILING ON PRICE VARIATION DUE TO ESCALATION

There shall be a ceiling on price variation due to escalation covered under clauses mentioned hereinbefore on the whole contract, limited to 10% of the 'contract price' only.

2.6 VARIATION IN THE TAXES, DUTIES, LEVIES ETC.

Other statutory variation due to increase in taxes, duties, levies etc. by Govt. (Central or State or Local) as of thirty (30) days prior to the date of opening of the part-I of the bid or the revised price bid, whichever is later, with the taxes, duties, levies etc. during the manufacture/works/supply, as the case may be, shall be born by the owner. Similarly decrease in taxes, duties, levies etc. shall be returned/deducted to/by the owner.

Table - 1

Value of A , B & C in the Price variation formula in the 'Additional Terms and Conditions of Contract :

Sl. No.	Particulars	A (Labour component)	B (Material component)	C (POL component)	Remarks
1.	For Building works	25	75	NIL	
2.	For Road works	15	80	05	
3.	For external sewerage, external water supply and external electrification	10	90	NIL	
4.	For external water supply, external sanitary and external electrification (Through labour rate contract)	75	25	NIL	
5.	For steel structural works	15	85	NIL	
6.	For steel structural works with Department free supply of rolled steel sections (Through labour rate contract)	75	25	NIL	
7.	For Coal Handling Plant Civil works	25	75	NIL	
8.	For Erection and Commissioning of P&M	65	35	NIL	

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SUB-SECTION -4.3

GENERAL TECHNICAL CONDITIONS

SUB-SECTION – 4.3**GENERAL TECHNICAL CONDITIONS****1.0 GENERAL**

This part covers technical conditions pursuant to the contract and will form an integral part of the contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out in the accompanying technical specifications. The contractor's proposal shall be based on the use of equipment and materials complying fully with the requirements, specified herein. It is recognised that the contractor may have standardised on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the owner.

2.0 LIMIT OF CONTRACT

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the technical specifications unless included in the list of exclusions. All similar standard components/parts of similar standard equipment provided, shall be inter-changeable with one another.

3.0 EQUIPMENT PERFORMANCE GUARANTEE

- 3.1 The performance tests of the equipment under the scope of the contract are detailed in the technical specifications. These guarantee shall supplement the general performance guarantee provisions covered under general terms & conditions of contract in clause entitled "Guarantee".
- 3.2 Liquidated damages for not meeting performance guarantee during the performance and guarantee tests shall be assessed and recovered from the contractor, as detailed in the technical specifications. Such liquidated damages shall be without any limitation whatsoever and shall be in addition to damages, if any payable under any other clauses of conditions of contract.

4.0 ENGINEERING DATA

- 4.1 The furnishing of engineering data by the contractor shall be in accordance with the schedule for each set of equipment as specified in the technical specifications. The review of these data by the engineer will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect plant layout. This review by the engineer may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the engineer shall not be construed by the contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.
- 4.2 All engineering data submitted by the contractor after final process including review and approval by the engineer shall form part of the contract documents and the entire works covered under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the engineer in writing.

5.0 DRAWING

- 5.1 All drawings submitted by the contractor including those submitted at the time of bid shall be sufficiently detailed to indicate the type, size, arrangement, weight of each component, break-up for packing and shipment, the external-connections, fixing arrangements required, the dimensions required for installation and inter-connections with other equipment and materials, clearances and spaces required between various portions of equipment and any other information specifically requested in the specifications.
- 5.2 Each drawing submitted by the contractor shall be clearly marked with the name of the owner, the unit designation, the specifications title, the specification number and the name of the project. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
- 5.3 The Contractor shall make his drawings in AutoCAD format and shall supply the drawings in CDs along with hardcopies.
- 5.3.1 Copies of drawings returned to the contractor will be in the form of a print with the owner's marking or print made from CDs for computer based drawings.
- 5.4 The drawings submitted by the contractor shall be reviewed by the engineer as far as practicable within four (4) weeks and shall be modified by the contractor if any modifications and/or corrections are required by the engineer. The contractor shall incorporate such modifications and/or corrections and submit the final drawings for approval. Any delay arising out of failure by the contractor to rectify the drawings in good time shall not alter the contract completion date.
- 5.5 Approval by the Nodal Officer or his Nominee the contractor shall submit specifications and drawings showing the proposed Temporary Works to the Nodal Officer/Engineer-In-Charge or his nominee, who is to approve them if they comply with the specification and drawings. The contractor shall be responsible for design of Temporary Works.
- The Nodal Officer/Engineer-In-Charge or nominee's approval shall not alter the contractor's responsibility for design of the Temporary Works.
- 5.6 The drawings sent for approval to the engineer shall be in quintuplicate. One print of such drawings will be returned to the contractor by the engineer marked approved/ approved with corrections. The contractor shall thereupon furnish the owner with nine prints and one reproducible original of the drawings after incorporating all corrections.
- 5.7 Further work by the contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the engineer, if so required.
- 5.8 All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the contractor's risk. The contractor may make nay changes in the design which are necessary to make the equipment conform, to the provisions and intent of the contract and such changes will again be subject to approval by the engineer. Approval of contractor's drawings or work by the engineer shall not relieve the contractor of any of his responsibilities and liabilities under the contract.
- 5.9 Drawings shall include all installation and detailed piping drawings wherever applicable. All piping 100 mm and larger shall be routed in detail and smaller pipe

shall be shown schematically or by isometric drawings. All drawings shall be fully corrected to agree with actual as built construction.

- 5.10 **Operating and Maintenance Manual** : If "as built" drawings and/or operating and maintenance manuals are required the contracts shall supply them by the dates stated in the contract data.

If the contractor does not supply the drawings and/or manuals by the dates stated in the contract data, or they do not receive the Nodal Officer or his nominee's approval, the Nodal Officer or his nominee shall withhold the amount stated in the contract data from payments due to the contractor.

6.0 INSTRUCTION MANUALS

- 6.1 The contractor shall submit to the engineer, preliminary instruction manuals for all the equipment, covered under the contract within the time agreed upon between the owner & the contractor. The final instruction manuals complete in all respects shall be submitted by the contractor thirty (30) days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipment furnished, the erection procedures, testing procedures, operation and maintenance procedures of the equipment. These instruction manuals shall be submitted in the form of one (1) reproducible original and twelve (12) copies.
- 6.2 If after the commissioning and initial operation of the plant, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals in the form of one (1) reproducible original and twelve (12) copies shall be submitted by the contractor to the owner.
- 6.3 The contractor shall furnish to the owner, twelve (12) sets of spare parts catalogue.
- 6.4 In addition, the contractor shall supply two sets of all the document, specifications, operation and maintenance manuals (in hard copies also) and as built drawings in CDs to BCCL. The documents supplied shall be in easily readable, search & printable format.

7.0 FIRST FILL OF CONSUMABLE, OILS AND LUBRICANTS

All the first fill of consumable such as oils, lubricants and essential chemicals etc., which will be required to put the equipment covered under the scope of the specifications, into successful trial operation, shall be furnished by the contractor unless specifically excluded under the exclusions in the specifications and other documents.

8.0 MANUFACTURING SCHEDULE

The contractor shall submit to the engineer his manufacture and delivery schedules for all equipment within thirty (30) days from the date of the letter of acceptance of tender. Such schedules shall be in line with the detailed net-work for all phases of the work of the contractor. Such schedules shall be reviewed, up-dated and submitted to the engineer, once every two (2) months thereafter, by the contractor. Schedule shall also include the materials and equipment purchased from outside suppliers.

9.0 REFERENCE STANDARDS

- 9.1 The codes and/or standards referred to in these specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, the latter shall govern. Such codes and/or

standards referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies. In case of any further conflict in this matter, the same shall be referred to the engineer whose decision shall be final and binding.

- 9.2 Other internationally acceptable standards which ensure equal or higher performance than those specified shall also be accepted.

10.0 DESIGN IMPROVEMENT

- 10.1 The engineer or the contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.
- 10.2 If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the contractor proceeds with the change. Following such agreement the provision thereof, shall be deemed to have been amended accordingly.

11.0 QUALITY ASSURANCE

11.1 Quality Assurance Programme

To ensure that the equipment and services under the scope of this contract whether manufactured or performed within the contractor's works or at his sub-contractor's premises or at the owner's site or at any other place of work are in accordance with the specifications, the contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the contractor and shall be finally accepted by the engineer after discussions before the issue of letter of acceptance of tender. A quality assurance programme of the contractor shall generally cover the following :

- a. his organisation structure for the management and implementation of the proposed quality assurance programme:
- b. documentation control system:
- c. qualification data for bidder's key personnel:
- d. the procedure for purchase of materials, parts components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.:
- e. system for shop manufacturing and site erection control including process control and fabrication and assembly controls:
- f. control of non-conforming items and system for corrective actions:
- g. inspection and test procedure both for manufacture and field activities:
- h. control of calibration and testing of measuring and testing equipment:
- i. system for indication and appraisal of inspection status:
- j. system for quality audits:
- k. system for authorising release of manufactured product to the owner:
- l. system for maintenance of records:
- m. system for handling storage and delivery: and
- n. a quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment furnished and each work at different stages executed at work site.

11.2 Quality Assurance Documents

The contractor shall be required to submit the following Quality Assurance Documents within three weeks after despatch of the equipment :

- i. all non-destructive examination procedures stress relief and weld repair procedure actually used during fabrication.
- ii. welder and welding operator qualification certificates.
- iii. welder identification list, listing welder's and welding operator's qualification procedure and welding identification symbols.
- iv. material mill test reports on components as specified by the specification.
- v. the inspection plan with verification, inspection plan check points, verification sketches, if used, and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.
- vi. sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- vii. all non-destructive examination result reports including radiography interpretation reports.
- viii. stress relief time temperature charts.
- ix. factory test results for testing required as per applicable codes and standard referred in the specifications.
- x. the engineer or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the contractor/his vendor's quality management and control activities.

12.0 ENGINEER'S SUPERVISION

- 12.1 To eliminate delays and avoid disputes and litigation it is agreed between the parties to the contract that all matters and questions shall be referred to the engineer and his decision shall be final.
- 12.2 The work shall be performed under the direction and supervision of the engineer. The scope of the duties of the engineer, pursuant to the contract, will include but not be limited to the following:
 - a. interpretation of all the terms and conditions of these documents and specification.
 - b. review and interpretation of all the contractor's drawings, engineering data etc.
 - c. witness or authorise his representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract.
 - d. inspect, accept or reject any equipment, material and work under the contract.
 - e. issue certificate of acceptance and/or progressive payment and final payment certificates.
 - f. review and suggest modifications and improvements in completion schedules from time to time.
 - g. supervise the quality assurance programme implementation at all stages of the works.
 - h. to receive and endorse the despatch documents enabling the contractor to clear the consignments.

13.0 INSPECTION, TESTING AND INSPECTION CERTIFICATE

- 13.1 The engineer, his duly authorised representative and/or outside inspection agency acting on behalf of the owner shall have at all reasonable times access to the contractor's premises or works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled at other premises or works, the contractor shall obtain for the engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the contractor's own premises or works.

- 13.2 The contractor shall give the Engineer/Inspector fifteen (15) days written notice of any material being ready for testing . Such tests shall be to the contractor's account except for the expenses of the Inspector. The Engineer/Inspector, unless witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is notified as being ready for test/inspection, failing which the contractor may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests in triplicate.
- 13.3 The Engineer or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the contract. The contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Engineer/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
- 13.4 When the factory tests have been completed at the contractor's or sub-contractor's works, the Engineer/Inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Engineer/Inspector, the certificate shall be issued within fifteen (15) days of the receipt of the contractor's test certificate by the Engineer/Inspector. Failure of the Engineer/Inspector to issue such a certificate shall not prevent the contractor from proceeding with the works. The completion of these tests or the issue of the certificate shall not bind the owner to accept the equipment should it, on further tests after erection, be found not to comply with the contract.
- 13.5 In all cases where the contract provides for tests whether at the premises or works of the contractor or of any sub-contractor, the contractor, except where otherwise specified, shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Engineer/Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the contract and shall given facilities to the Engineer/Inspector or to his authorised representative to accomplish testing.
- 13.6 The inspection by Engineer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the contractor in respect of the agreed quality assurance programme forming a part of the contract.

14.0 TEST

14.1 Start up

- 14.1.1 On completion of erection of the equipment and before start-up, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Engineer and the contractor for correctness and completeness of installation and acceptability of start-up, leading to initial pre-commissioning tests at site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the contractor's quality assurance programme.
- 14.1.2 The contractor's commissioning/start-up engineers specifically identified as far as possible shall be responsible for carrying out all the pre-commissioning tests. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the complete equipment shall be placed on initial operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant referred hereinafter as plant.

14.2 Trial Operation

14.2.1 The plant shall then be on trial operation during which period all necessary adjustments shall be made while operating over the full load-range enabling the plant to be made ready for performance and guarantee tests.

14.2.2 The duration of trial operation of the complete equipment shall be fourteen (14) days out of which at least seventy two (72) hours shall be continuous operation on full load or any other duration as may be agreed to, between the engineer and the contractor. The trial operation shall be considered successful, provided that each item of the equipment can operate continuously at the specified operating characteristics, for the period of trial operation.

14.2.3 For the period of trial operation, the time of operation with any load shall be counted. Minor interruptions not exceeding four (4) hours at a time, caused during the continuous operation shall not affect the total duration of trial operation. However, if in the opinion of the engineer, the interruption is long, the trial operation shall be prolonged for the period of interruption.

14.2.4 A trial operation report comprising of observations and recordings of various parameters to be measured in respect of the above trial operation shall be prepared by the contractor. This report, besides recording the details of the various observations during trial run, shall also include the dates of start and finish of the trial operations and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the trial operation. Based on the observations, necessary modifications/ repairs to the plant shall be carried out by the contractor to the full satisfaction of the engineer to enable the later to accord permission to carry out performance and guarantee tests on the plant. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with holding the aforesaid permission.

14.3 Performance and guarantee test

14.3.1 The final test as to the performance and guarantees shall be conducted at site, by the owner. Such tests will be commenced within a period of two (2) months after successful completion of trial operations. Any extension of time beyond the above two (2) months shall be mutually agreed upon.

14.3.2 These tests shall be binding on both the parties of the contract to determine compliance of the equipment with the performance guarantees.

14.3.3 The available instrumentation and control equipment will be used during such tests and the engineer will calibrate, all such measuring equipment and devices as far as practicable. However, unmeasurable parameters shall be taken into account in a reasonable manner by the engineer, for the equipment of these tests. The tests will be conducted at the specified load points and as near the specified cycle condition as practicable. The engineer will apply proper corrections in calculation, to take into account conditions which do not correspond to the specified conditions.

14.3.4 Any special equipment, tools and tackles required for the successful completion of the performance and guarantee tests shall be provided by the contractor, free of cost.

14.3.5 The guaranteed performance figures of the equipment shall be proved by the contractor during these performance and guarantee tests. Should the results of these tests show any decrease from the guaranteed values, the contractor shall

modify the equipment as required to enable it to meet the guarantees. In such case, performance and guarantee tests shall be repeated within one month, from the date the equipment is ready for re-tests and all cost for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne by the contractor. Duration of performance guarantee tests will be of one month of which 6 (six) days continuous on load operation is the minimum requirement and in case it fails , the process of performance guarantee tests will be repeated.

14.3.6 The specific tests to be conducted on equipment has been brought out in the technical specifications.

14.3.7 Performance and guarantee test shall make allowance for instrumentation errors as may be decided by the engineer-in-charge.

14.4 TEST CODES

The provisions outlined in the ASME performance test codes or other international and Indian approved equivalents shall generally be used as a guide for all the above test procedures unless otherwise specified in the technical specifications.

15.0 PACKING

15.1 All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitation from the point of view of availability of railway wagon sizes in India should be taken into account. The contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing.

16.0 PROTECTION

All coated surfaces shall be protected against abrasions, impact, discoloration and any other damages. All exposed threaded portions shall be suitable protected with either a metallic or a non-metallic protecting device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather, should also be properly treated and protected in a suitable manner.

17.0 PRESERVATIVE SHOP COATING

17.1 All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall before hand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scale, oxide and other coatings and prepared in the shop. The surfaces that are to be finish painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Transformers and other electrical equipment, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colours shall be as per manufacturer's standards, to be selected and specified by the engineering at a later date.

17.2 Shop primer for all steel surface which will be exposed to operating temperature below 95°C shall be selected by the contractor, after obtaining specific approval of the engineer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperatures higher than 95°C and such primers shall also be subject to the approval of the engineer.

- 17.3 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the engineer.

18.0 PROTECTIVE GUARDS

Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purposes.

19.0 DESIGN CO-ORDINATION

The contractor shall be responsible for the selection and design of appropriate equipment to provide the best co-ordinated performance of the entire system. The basic design requirements are detailed out in Technical Specifications. The design of various components, sub-assemblies and assemblies shall be so done, so that it facilitates easy field assembly and maintenance. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical at or close to the operating range of the unit.

20.0 DESIGN CO-ORDINATION MEETING

The contractor will be called upon to attend design co-ordination meetings with the engineer, other contractors and the consultants of the owner during the period of contract. The contractor shall attend such meetings at his own cost at the office of the General Manager(Washery), Washeries Construction Division, Level-6, BCCL, KoylaBhawan, Dhanbad-826005 or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during those discussions.

21.0 TOOLS AND TACKLES

The contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately packed and brought on to site.

22.0 NOISE LEVEL

The equivalent 'A' weighted sound level measured at a distance of 1.5 metres above floor level in elevation and one metre horizontally from the base of any equipment furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA.

23.0 TAKING OVER

Upon successful completion of all the tests to be performed at site on equipment furnished and erected by the contractor, the engineer shall issue to the contractor a taking over certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be withheld nor will the engineer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the contractor of any of his obligations which otherwise survive, by the terms and conditions of the contract after issuance of such certificate.

24.0 INDIAN STANDARDS

Normally Indian Standards as published by BUREAU OF INDIAN STANDARDS shall be followed. Wherever relevant Indian Standard is not published by the BIS, International Standards or American Standard or German Standard or British Standard, as decided by the Engineer in consultations with the Consultants employed by the Owner, shall be followed.

25.0 WELDING

If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipment to be procured by the owner under separate specifications, the requirements shall be submitted to the engineer in advance of commencement of erection work.

26.0 LUBRICATION

Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both stand-still and operating conditions.

27.0 EQUIPMENT BASES

A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete/structural steel base unless otherwise agreed to by the engineer. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.

28.0 RATING PLATES, NAME PLATES AND LABELS

- 28.1 Each main and auxiliary items of plant is to have permanently attached to it in a conspicuous position a rating plate of non corrosive material upon which is to be engraved the manufacturer's name, equipment, type or serial number, together with details of the loading conditions under which the item of plant in question have been designed to operate, and such diagram plates as may be required by the engineer.
- 28.2 Each item of plant is to be provided with a nameplate or label designating the service of the particular equipment. The inscriptions are to be approved by the engineer or shall be as detailed in the appropriate sections of the technical specifications.
- 28.3 Such nameplates or labels are to be of white non-hygroscopic material with engraved black lettering or, alternatively, in the case of indoor circuit breakers, starters etc. of transparent plastic material with suitably coloured lettering engraved on the back.
- 28.4 Items of plant such as valves, which are subject to handling, are to be provided with an engraved chromium plated nameplate or label with engraving filled with enamel.
- 28.5 All such name plates, instruction plates, lubrication charts etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

29.0 COLOUR CODE FOR PIPE SERVICES

All pipe services wherever applicable are to be painted in accordance with the owner's standard colour scheme, by the contractor.

30.0 SERVICE BY THE OWNER

- 30.1 The following services shall be provided by the owner :
- i. Construction/ drinking water at one point within 100 metres of the work site , charges to be decided by the company.
 - ii. Auxiliary power for construction at one point within 100 metres of the work site , charges to be decided by the company.
- 30.2 In the event of the contractor requiring these services at parameters other than those specified above, for any systems, equipment, instrument etc. he shall make the necessary arrangements himself.

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SUB-SECTION – 4.4

**ERECTION CONDITIONS OF
CONTRACT**

SUB-SECTION – 4.4**ERECTION CONDITIONS OF CONTRACT****1.0 GENERAL**

- 1.1 The following shall supplement the conditions already contained in the other parts of these specifications and documents and shall govern that portion of the work of this contract to be performed at site.
- 1.2 The contractor upon signing of the contract shall, in addition to a project co-ordinator, nominate another responsible officer as his representative at site suitably designated for the purpose of overall responsibility and co-ordination of the works to be performed at site. Such person shall function from the site office of the contractor during the pendency of contract.

2.0 REGULATION OF LOCAL AUTHORITIES AND STATUTES

- 2.1 The contractor shall comply with all the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the minimum wages act, 1948 and the payment of wages act (both of the Government of India and the local State Government) and the rules made there under in respect of any employee or workman employed or engaged by him or his sub-contractor. The contractor shall make all necessary payments of the Provident Fund for the workmen employed by him for the work as per the laws prevailing under provisions of CMPF and Allied Schemes and CMPF and Miscellaneous Provisions Act 1948.
- 2.2 All registration and statutory inspection fees, if any, in respect of his work pursuant to this contract shall be to the account of the contractor. However, any registration, statutory inspection fees lawfully payable under the provisions of the rules and regulations of the Government and any other statutory laws and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the owner, shall be to the account of the owner. Should any such inspection or registration need to be arranged due to the fault of the contractor or his sub-contractor, the additional fees for such inspection and/or registration shall be borne by the contractor.

3.0 OWNER'S LIEN ON EQUIPMENT

The owner shall have lien on all equipment including those of the contractor brought to the site for the purpose of erection, testing and commissioning of the plant. The owner shall continue to hold the lien on all such equipment throughout the period of contract. No material brought to the site shall be removed from the site by the contractor and/or his sub-contractors without the prior written approval of the engineer.

4.0 INSPECTION, TESTING AND INSPECTION CERTIFICATES

The provisions of the clause entitled inspection testing and inspection certificates under section GTC shall also be applicable to the erection portion of the works. The engineer shall have the right to re-inspect any equipment though previously inspected and approved by him, at the contractor's works, before and after the same are constructed and/or erected at site. If by the above inspection, the engineer rejects any work or equipment, the contractor shall make good for such rejection either by replacement or modifications/repairs as may be necessary, to the satisfaction of the engineer. Such replacement will also include the replacement or re-execution of such of those works of other contractors and/or agencies, which might have got damaged or affected by the replacements or re-work done to the contractor's work.

5.0 ACCESS TO SITE AND WORKS ON SITE

- 5.1 Suitable access to and possession of the site shall be accorded to the contractor by the owner in reasonable time.
- 5.2 The owner shall have the necessary foundations to be provided by him ready, as per the agreed schedule for the execution of the individual phases of works.
- 5.3 The works so far as it is carried out on the owner's premises, shall be carried out at such time as the owner may approve and the owner shall give the contractor reasonable facilities for carrying out the works.
- 5.4 In the execution of the works, no persons other than the contractor or his duly appointed representative, sub-contractor and workmen, shall be allowed to do work on the site, except by the special permission, in writing of the engineer or his representative.

6.0 CONTRACTOR'S SITE OFFICE ESTABLISHMENT

The contractor shall establish a site office at the site and keep posted an authorised representative for the purpose of the contract. Any written order or instruction of the engineer or his duly authorised representative, shall be communicated to the said authorised resident representing the contractor and the same shall be deemed to have been communicated to the contractor at his legal address.

7.0 CO-OPERATION WITH OTHER CONTRACTORS

- 7.1 The contractor shall co-operate with all other contractors or tradesmen of the owner, who may be performing other works on behalf of the owner and the workmen who may be employed by the owner and doing work in the vicinity of the works under the contract. The contractor shall also so arrange to perform his work as to minimise, to the maximum extent possible, interference with the work of other contractors and his workmen. Any injury or damage that may be sustained in the employees of the other contractors and the owner, due to the contractor's work shall promptly be made good at his own expense. The engineer shall determine the resolution of any difference or conflict that may arise between the contractor and other contractors or between the contractor and the workmen of the owner in regard to their work. If the works of the contractor is delayed because of any acts or omissions of another contractor, the contractor shall have no claim against the owner on that account other than an extension of time for completing his works.
- 7.2 The engineer shall be notified promptly by the contractor of any defects in the other contractor's works that could affect the contractor's works. The engineer shall determine the corrective measures if any, required to rectify this situation after inspection of the works and such decisions by the engineer shall be binding on the contractor.

8.0 DISCIPLINE OF WORKMEN

The contractor shall adhere to the disciplinary procedure set by the engineer in respect of his employees and workmen at site. The engineer shall be at liberty to object to the presence of any representative or employees of the contractor at the site, if in the opinion of the engineer such employee has mis-conducted himself or be incompetent or negligent or otherwise undesirable and then the contractor shall remove such a person objected to and provide in his place a competent replacement.

9.0 CONTRACTOR'S FIELD OPERATION

- 9.1 The contractor shall keep the engineer informed in advance regarding his field activity plans and schedules for carrying out each part of the works. Any review of such plan or schedule or method of work by the engineer shall not relieve the contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the engineer or the owner or any of his representatives and no claim of the contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.
- 9.2 The contractor shall have complete responsibility for the conditions of the work site including the safety of all persons employed by him or his sub-contractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of the contractor and shall not be limited to normal working hours. The construction review by the engineer is not intended to include review of contractor's safety measures in, on or near the work-site, and their adequacy or otherwise.

10.0 PHOTOGRAPHS AND PROGRESS REPORT

- 10.1 The contractor shall furnish three (3) prints each to the engineer of progress photographs of the work done at site. Photographs shall be taken as and when indicated by the engineer or his representative. Photographs shall be adequate in size and number to indicate various stages of erection. Each photograph shall contain the date, the name of the contractor and the title of the photograph.
- 10.2 The above photographs shall accompany the monthly progress report detailing out the progress achieved on all erection activities as compared to the schedules. The report shall also indicate the reasons for the variance between the scheduled and actual progress and the action proposed for corrective measures wherever necessary.

11.0 MAN-POWER REPORT

- 11.1 The contractor shall submit to the engineer, on the first day of every month, a man hour schedule for the month, detailing the man hours scheduled for the month, skill wise and area-wise.
- 11.2 The contractor shall also submit to the engineer on the first day of every month, a man power report of the previous months detailing the number of persons scheduled to have been employed and actually employed, skill-wise and areas of employment of such labour.

12.0 PROTECTION WORK

The contractor shall have total responsibility for protecting his works till it is finally taken over by the engineer. No claim will be entertained by the owner or the engineer for any damage or loss to the contractor's works and the contractor shall be responsible for the complete restoration of the damaged works to its original condition to comply with the specifications and drawings. Should any such damage to the contractor's works occur because of other party not under his supervision or control, the contractor shall make his claim directly with the party concerned. If disagreement or conflict or dispute develops between the contractor and the other party or parties concerned regarding the responsibility for damage to the contractor's works the same shall be resolved as per the provisions of the clause 7.0 above entitled co-operation with other contractors. The contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such disputes. The contractor shall proceed to repair the

work immediately and the cause thereof will be assigned pending resolution of such dispute.

13.0 EMPLOYMENT OF LABOUR

- 13.1 The contractor will be expected to employ on the work only his regular skilled employees with experience of his particular work. No female labour shall be employed after darkness no persons below the age of eighteen years shall be employed.
- 13.2 All traveling expenses including provisions of all necessary transport to and from site lodging allowances and other payments to the contractor's employees shall be the sole responsibility of the contractor.
- 13.3 The hour of work on the site shall be decided by the owner and the contractor shall adhere to it. Working hours will normally be eight (8) hours per day- Monday through Saturday.
- 13.4 Contractor's employees shall wear identification badges while on work on site.
- 13.5 In case the owner becomes liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen compensation Act, Contract Labour Regulation Abolition Act, CMPF Act or any other law due to act of omission of the contractor, the owner may make such payments and shall recover the same from the contractor's bills.

14.0 FACILITIES TO BE PROVIDED BY THE OWNER

14.1 SPACE :

The contractor shall advise the owner within thirty (30) days from the date of acceptance of the letter of award, about his exact requirement of space for his office, mess-rooms storage area, pre-assembly and fabrication areas, labour colony area, toilets, etc. The above requirement shall be reviewed by the engineer and space will be allotted to the contractor for construction of his temporary structures like office, storage sheds, labour and staff colony and other utilities etc. for his own as well as his sub-contractor's use.

14.2 ELECTRICITY

The contractor shall submit to the engineer within thirty (30) days from the date of acceptance of the award letter, his electrical power requirements, if any, to allow BCCL to plan for providing power temporarily. The contractor shall be provided with supply of electricity for the purposes of the contract, only at one point in the project site. The contractor shall make his own further distribution arrangement. All temporary wiring must comply with local regulations and will be subject to engineer's inspection and approval before connection to supply. Power supply for labour colonies shall also be provided at one point. The contractor shall be charged for the power supplied at work site and labour colonies at prevalent rate of power supplied by State Electricity Board. The electricity shall be supplied at one point at 6.6kV.

14.3 WATER

Supply of water will be made available for the construction purposes at an agreed single point within 100 metres of the work site. And further distribution will be the responsibility of the contractor. The contractor shall be charged for the water supplied at work site @ 1% of the value of civil works and shall be deducted from the contractor's running/final bills.

15.0 FACILITIES TO BE PROVIDED BY THE CONTRACTOR

15.1 Tools, tackles and scaffoldings

The contractor shall provide all the construction equipment, tools, tackles and scaffoldings required for pre-assembly, erection, testing and commissioning of the equipment covered under the contract. He shall submit a list of all such materials to the engineer before the commencement of pre-assembly at site. These tools and tackles shall not be removed from the site without the written permission of the engineer.

15.2 Communication

The owner will extend the telephone & telex facilities, if available at site, for purposes of contract. The contractor shall be charged at actuals for such facilities.

15.3 First – aid

15.3.1 The contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the site. Enough number of contractor's personnel shall be trained in administering first-aid.

15.3.2 The owner will provide the contractor, in case of an emergency, the services of an ambulance for transportation to the nearest hospital.

15.4 Cleanliness

15.4.1 The contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of contract. The contractor shall employ enough number of special personnel to thoroughly clean his work area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by the engineer. Materials and stores shall be so arranged to permit easy cleaning of the area in areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.

15.4.2 Similarly the labour colony, the offices and the residential areas of the contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of the engineer. Proper sanitary arrangement shall be provided by the contractor, in the work areas, office and residential areas of the contractor.

16.0 LINES AND GRADES

All the works shall be performed to the lines, grades and elevations indicated on the drawings. The contractor shall be responsible to locate and layout the works. Basic horizontal and vertical control points will be established and marked by the engineer at site at suitable points. These points shall be used as datum for the works under the contract. The contractor shall inform the engineer well in advance of the times and places at which he wishes to do work in the area allotted to him, so that suitable datum points may be established and checked by the engineer to enable the contractor to proceed with his works. Any work done without being properly located may be removed and/or dismantled by the engineer at contractor's expense.

17.0 FIRE PROTECTION

17.1 The work procedures that are to be used during the erection shall be those which minimise fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once each day.

Fuels, oils and volatile or flammable materials shall be stored away from the construction and equipment and materials storage areas in safe containers. Untreated canvas paper, plastic or other flammable flexible materials shall not at all be used at site for any other purpose unless otherwise specified. If any such materials are received with the equipment at the site, the same shall be removed and replaced with acceptable material before moving into the construction area or storage.

- 17.2 Similarly corrugated paper fabricated cartons etc. will not be permitted in the construction area either for storage or for handling of materials. All such materials used shall be water proof and flame resistant type. All the other materials such as working drawings, plants, etc. which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.
- 17.3 All the contractor's supervisory personnel and sufficient number of workers shall be trained for fire-fighting and shall be assigned specific fire protection duties. Enough of such trained personnel must be available at the site during the entire period of the contract.
- 17.4 The contractor shall provide enough fire protection equipment of the types and number for the ware-houses, office, temporary structures, labour colony area etc. Access to such fire protection equipment, shall be easy and kept open at all times.

18.0 SECURITY

The contractor shall have total responsibility for all equipment and materials in his custody stored, loose, semi-assembled and/or erected by him at site. The contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the contractor shall enter and leave the project site only with the written permission of the engineer in the prescribed manner.

19.0 CONTRACTOR'S AREA LIMITS

The engineer will mark-out the boundary limits of access roads, parking spaces, storage and construction areas for the contractor and the contractor shall not trespass the areas not so marked out for him. The contractor shall be responsible to ensure that none of his personnel move out of the areas marked out for his operations. In case of such a need for the contractor's personnel to work out of the areas marked out for him, the same shall be done only with the written permission of the engineer.

20.0 CONTRACTOR'S CO-OPERATION WITH THE OWNER

In cases where the performance of the erection work by the contractor affects the operation of the system facilities of the owner, such erection work of the contractor shall be scheduled to be performed only in the manner stipulated by the engineer and the same shall be acceptable at all times to the contractor. The engineer may impose such restrictions on the facilities provided to the contractor such as electricity, water, etc. as he may think fit in the interest of the owner and the contractor shall strictly adhere etc. such restrictions and co-operate with the engineer. It will be the responsibility of the contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems which are erected by him. The contractor shall also be responsible for flushing and initial filling of all the oil and lubricants required for the equipment furnished and erected by him, so as to make such equipment ready for operation. The contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these documents and specifications.

21.0 PRE-COMMISSIONING TRIALS AND INITIAL OPERATIONS

The pre-commissioning trials and initial operations of the equipment furnished and erected by the contractor shall be the responsibility of the contractor as detailed in relevant clauses in section GTC. The contractor shall provide, in addition, test instruments, calibrating devices, etc. and the labour required for the successful performance of these trials. It is anticipated that the above test may prolong for a long time, the contractor's workmen required for the above test shall always be present at site during such trials.

22.0 MATERIALS HANDLING AND STORAGE

- 22.1 All the equipment furnished under the contract and arriving at site shall be promptly received, unloaded and transported and stored in the storage spaces by the contractor.
- 22.2 Contractor shall be responsible for examining all the shipment and notify the engineer immediately or any damage, shortage, discrepancy, etc. for the purpose of engineer's information only. The contractor shall submit to the engineer every week a report detailing all the receipts during the week. However, the contractor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection of the equipment at the site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the contractor.
- 22.3 The contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
- 22.4 All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings, etc. shall be used for unloading and/or handling of the equipment without the specific written permission of the engineer. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
- 22.5 All electrical panels, control gear, motors and such other devices shall be properly dried by heating before they are installed and energised. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.
- 22.6 All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values maintained by the contractor. Such records shall be open for inspection by the engineer.
- 22.7 The contractor shall ensure that all the packing materials and protection devices used for the various equipment during transit and storage are removed before the equipment are installed.
- 22.8 The consumable and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.
- 22.9 All the materials stored in the open or duty location must be covered with suitable weather-proof and flameproof covering materials wherever applicable.

- 22.10 If the materials belonging to the contractor are stored in areas other than those earmarked for him, the engineer will have the right to get it moved to the area earmarked for the contractor at the contractor's cost.
- 22.11 The contractor shall be responsible for making suitable indoor storage facilities to store all equipment which require indoor storage. Normally, all the electrical equipment such as motors, control gear, generators, exciters and consumable like electrodes, lubricants etc. shall be stored in the closed storage space. The engineer, in addition, may direct the contractor to move certain other materials which in his opinion will require indoor storage, to indoor storage areas which the contractor shall strictly comply with.

23.0 CONSTRUCTION MANAGEMENT

- 23.1 The field activities of the contractors working at site, will be co-ordinated by the engineer and the engineer's decision shall be final in resolving any disputes or conflicts between the contractor and other contractors and tradesmen of the owner regarding scheduling and co-ordination of work. Such decision by the engineer shall not be a cause for extra compensation or extension of time for the contractor.
- 23.2 The engineer shall hold weekly meetings of all the contractors working at site, at a time and a place to be designated by the engineer. The contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the engineer and shall strictly adhere to those decisions in performing his works. In addition to the above weekly meetings, the engineer may call for other meetings either with individual contractors or with selected number of contractors and in such a case the contractor, if called will also attend such meetings.
- 23.3 Time is the essence of the contract and the contractor shall be responsible for performance this works in accordance with the specified construction schedule. If at any time, the contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the engineer, satisfying that his action will compensate for the delay. The contractor shall not be allowed any extra compensation for such action.
- 23.4 The engineer shall however not be responsible for provision of additional labour and/or materials or supply or any other services to the contractor except for the co-ordination work between various contractors as set out earlier.

24.0 FIELD OFFICE RECORDS

The contractor shall maintain at his site office up-to-date copies of all drawings, specifications and other contract documents and any other supplementary data complete with all the latest revisions thereto. The contractor shall also maintain in addition the continuous record of all changes to the above contract documents, drawings, specifications, supplementary data, etc. effected at the field and on completion of his total assignment under the contract shall incorporate all such changes on the drawings and other engineering data to indicate as installed condition of the equipment furnished and erected under the contract. Such drawings and engineering data shall be submitted to the engineer in required number of copies. Daily work programme with progress of the previous day and deployment of labour related to work programme and attendance of workmen deployed during the previous day shall be maintained in a register. This register shall be signed by authorised representative of the contractor which will then be checked and signed by the owner's representative. Every three months this register shall be deposited to the owner which shall then be owners property.

25.0 CONTRACTOR'S MATERIALS BROUGHT ON TO SITE

- 25.1 The contractor shall bring to site all equipment, parts, materials, including construction equipment, tools and tackles for the purpose of the works with intimation to the engineer. All such goods shall, from the time of their being brought vest in the owner, but may be used for the purpose of the works only and shall not on any account be removed or taken away by the contractor without the written permission of the engineer. The contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.
- 25.2 The owner shall have a lien on such goods for any sum or sums which may at any time be due or owing to him by the contractor, under, in respect of or by reasons of the contract. After giving a fifteen (15) days' notice in writing of his intention to do so, the owner shall be at liberty to sell and dispose of any such goods, in such manner as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfaction of such sum or sums due as aforesaid.
- 25.3 After the completion of the works, the contractor shall remove from the site under the direction of the engineer the materials such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission of the engineer. If the contractor fails to remove such materials, within fifteen (15) days of issue of a notice by the engineer to do so then the engineer shall have the liberty to dispose of such materials as detailed under clause 25.2 above and credit the proceeds thereto the account of the contractor.

26.0 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY

- 26.1 The contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the owner and the employees of other contractors and sub-contractors and all public and private property including structures, buildings, other plants and equipment and utilities either above or below the ground.
- 26.2 The contractor will ensure provision of necessary safety equipment such as barriers, sign-boards, warning lights and alarms, etc. to provide adequate protection to persons and property. The contractor shall be responsible to give reasonable notice to the engineer and the owners of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with such owners, related to removal and/or replacement or protection of such property and utilities.

27.0 PAINTING

All exposed metal parts of the equipment including pipings, structure railing etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scarping or sand blasting, and the same being inspected and approved by the engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints. The quality of the finish paint shall be as per the standards of ISI or equivalent and to be of the colour as approved by the engineer.

28.0 INSURANCE

28.1 In addition to the conditions covered under the clause entitled insurance in general terms and conditions of contract of this volume-1, the following provisions will also apply to the portion of the works to be done beyond the contractor's own or his sub-contractor's works.

28.2 Workmen's compensation insurance

This insurance shall protect the contractor against all claims applicable under the Workmen's Compensation Act 1948 (Government of India). This policy shall also cover the contractor against claims for injury, disability disease or death of his or his sub-contractor's employees, which for any reason are not covered under the Workmen's Compensation Act 1948. The liabilities shall not be less than

Workmen's compensation	As per statutory provisions
Employer's liability	As per statutory provisions

28.3 Comprehensive Automobile Insurance

This insurance shall be in such a form to protect the contractor against all claims for injuries, disability, disease and death to members of public including the owner's men and damage to the property of others arising from the use of motor vehicles during on or off the site operations, irrespective of the ownership of such vehicles.

28.4 Comprehensive General Liability Insurance

28.4.1 This insurance shall protect the contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others, due to any act or omission on the part of the contractor, his agents, his employees, his representatives and sub-contractors or from riots, strikes and civil commotion. The insurance shall also cover all the liabilities of the contractor arising out of the clause entitled defence of suits under General Terms and Conditions of contracts of this volume.1

28.4.2 The hazards to be covered will pertain to all the works which and areas where the contractor, his sub-contractors, his agents and his employees have to perform work pursuant to the contract.

28.5 The above are only illustrative list of insurance covers normally required and it will be the responsibility of the contractor to maintain all necessary insurance coverage to the extent both in time and amount to take care of all his liabilities either direct or indirect, in pursuance of the contract.

29.0 UN- FAVOURABLE WORKING CONDITIONS

The contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc. and during other unfavourable construction conditions. No field activities shall be performed by the contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of the engineer. Such unfavourable construction conditions will in no way relieve the contractor of his responsibility to perform the works as per the schedule.

30.0 PROTECTION OF MONUMENTS AND REFERENCE POINTS

The contractor shall ensure that any finds such as relic, antiquity, coins, fossils, etc. which he might come across during the course of performance of his works either during excavation or elsewhere, are properly protected and handed over to the engineer. Similarly the contractor shall ensure that the bench marks, reference points, etc., which are marked out either with the help of engineer or by the engineer shall not be disturbed in any way during the performance of his works. If any work is to be performed which disturb such references, the same shall be done only after these are transferred to other suitable locations under the direction of the engineer. The contractor shall provide all necessary materials and assistance for such relocation of reference points etc.

31.0 WORK AND SAFETY REGULATIONS

31.1 The contractor shall ensure proper safety of all the workmen, materials plant and equipment belonging to him or the Company or to others, working at or near the site. The contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and the engineer-in-charge as he may deem necessary.

31.2 The contractor will notify well in advance to the engineer-in-charge of his intention to bring to the site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. The engineer-in-charge shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the contractor shall strictly adhere to and comply with such instructions. The engineer-in-charge shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its' use. No claim due to such prohibition shall be entertained by the owner. Nor the owner shall entertain any claim of the contractor towards additional safety provisions/conditions to be provided for constructed as per engineer-in-charge's instructions.

Further any such decision of engineer-in-charge shall not, in any way, absolve the contractor of his responsibilities, and in case, use of such a container or entry there of into the site area is forbidden by engineer-in-charge, the contractor shall use alternative methods with the approval of engineer-in-charge without any cost implication to Company or extension of work schedule.

31.3 Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act 1948, and Petroleum and Carbide of Calcium Manual Published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the engineer-in-charge . In case, any approvals are necessary from the Chief Inspector (Explosive) or any statutory authorities, the contractor shall be responsible for obtaining the same.

31.4 All equipment used in construction and erection by contractor shall meet Indian, International Standards and where such standards do not exist, the contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation manual and safety instructions and per Guidelines/Rules of the Company in this regard.

31.5 Periodical Examinations and all tests for all lifting/hoisting equipment and tackles shall be carried out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated Laws/Rules enforced from time to time. A register of such examinations and tests shall be properly maintained by the contractor and will be

promptly produced as and when desired by engineer-in-charge or by the person authorised by him.

- 31.6 The contractor shall be fully responsible for the safe storage of his and his sub-contractors radio-active sources in accordance with BARC/DAE Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, storage and handling of such material will be taken by contractor.
- 31.7 The contractor shall provide suitable safety equipment of prescribed standard to all employee and workmen according to the need, as may be directed by engineer-in-charge who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability.
- 31.8 Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the code practices/rules framed under Indian Explosives Act pertaining to handling, storage and use of the explosives.
- 31.9 The contractor shall provide safe working conditions to all workmen and employees at the site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings, stairs, ladders etc. shall be erected under the control and supervision of an experienced and competent person. For erection, good and standard quality of material only shall be used by the contractor.
- 31.10 The contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the owner or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by the Company to handle such fuses, wiring or electrical equipment.
- 31.11 Before the contractor connects any electrical appliances to any plug or socket belonging to the other contractor or owner, he shall:
- a satisfy the engineer that the appliances is in good working condition
 - b inform the engineer of the maximum current rating, voltage and phases of the appliances.
 - c obtain permission of the engineer detailing the sockets to which the appliances may be connected.
- 31.12 The engineer will not grant permission to connect until he is satisfied that:
- a the appliance is in good condition and is fitted with a suitable plug.
 - b the appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
- 31.13 No electric cable is in use by the contractor/owner will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
- 31.14 No repair work shall be carried out on any live equipment. The equipment shall must be declared safe by engineer-in-charge and a permit to work shall be issued by engineer-in-charge before any repair work is carried out by the contractor. While working on electric lines/equipments whether alive or dead, suitable type and sufficient quantity of tools will have to be provided by contractor to electricians/workmen/officers.
- 31.15 The contractor shall employ necessary number of qualified, full time electricians/ electrical supervisors to maintain in his temporary electrical installations.

- 31.16 The contractor employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as safety officer to supervise safety aspects of the equipment and workmen who will co-ordinate with the project safety officer. In case of work being carried out through sub-contractor's, the sub-contractor's workmen/employees will also be considered as the contractor's employees/workmen for above purpose. The name and address of a such safety officer of contractor will be promptly informed in writing to engineer-in-charge with a copy to safety officer-in charge before he starts work or immediately after any change of the incumbent is made during currency of the contract.
- 31.17 In case any accident occurs during the construction/erection or other associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the contractor to promptly inform the same to the company's engineer-in-charge in prescribed form and also to all the authorities envisaged under the applicable laws.
- 31.18 The engineer-in-charge shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove short comings promptly. The contractor after stopping the specific work, can, if felt necessary, appeal against the order of stoppage of work to the General Manager of the project within 3 days of such stoppage of work and decision of the project G.M in this respect shall be conclusive and binding on the contractor.
- 31.19 The contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided in para 31.18 above and the period of such stoppage of work will not be taken as an extension of time for completion of work and will not be the ground for waiver of levy of liquidated damages.
- 31.20 The contractor shall follow and comply with all the Company safety rules relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without demur, protest or content or reservation. In case of any inconformity between statutory requirement and the Company safety rules referred above, the later shall be binding on the contractor unless the statutory provisions are more stringent.
- 31.21 If the contractor fails in providing safe working environment as per the Company safety rules or continues the work even after being instructed to stop work by engineer-in-charge as provided in para 31.18 above, the contractor shall promptly pay to the Company, on demand i.e. by the owner compensation at the rate of Rs. 5,000/- per day or part there of till the instructions are complied with and so certified by engineer-in-charge. However in case of accident taking place causing injury to any individual, the provisions contained in para 31.22 shall also apply in addition to compensation mentioned in this para.
- 31.22 If the contractor does not take all safety precautions and/or fails to comply with the safety rules as prescribed by the Company or under the applicable laws for the safety of the equipment and plant and for the safety of personnel and the contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other contractors, or the Company employees or any other person who are at site or adjacent thereto, the contractor shall be responsible for payment of compensation under the relevant provisions of the workmen's compensation act and rules framed thereunder or any other applicable laws as applicable from time to time.

Permanent disablement shall have same meaning as indicated in workmen's compensation act. The compensation mentioned above shall be in addition to the compensation payable to the workmen/employees under the relevant provisions of the workmen's compensation act and rules framed there under or any other applicable laws as applicable from time to time.

In case the owner is made to pay such compensation then the contractor is liable to reimburse the owner such amount.

32.0 CODE REQUIREMENTS

The erection requirements and procedures to be followed during the installation of the equipment shall be in accordance with the relevant Indian standards codes of practices or in their absence appropriate International standards, Indian Boiler Regulations, ASME codes and accepted good engineering practice, the engineer's drawings and other applicable Indian recognised codes and the laws and regulations of the Government of India.

33.0 FOUNDATION DRESSING AND GROUTING

33.1 The surfaces of foundations shall be dressed to bring the top surface of the foundations to the required level, prior to placement of equipment/equipment bases on the foundations.

33.2 All the equipment bases and structural steel base plates shall be grouted and finished as per these specifications unless otherwise recommended by the equipment manufacturer.

33.3 The concrete foundation surfaces shall be properly prepared by chipping, grinding as required to bring the type of such foundation to the required level, to provide the necessary roughness for bondage and to assure enough bearing strength. All laitance and surface film shall be removed and cleaned.

33.4 GROUTING MIX

The grouting mixtures shall be composed of Portland cement, sand and water. The Portland cement to be used shall conform to ISI No. 269 or equivalent, sand shall conform to ISI No.383/2386 or equivalent. The grout proportions for flat based where the grouting space does not exceed 35 mm shall be 50 Kg bag of cement to 75 Kg of sand. Only the required quantity of water shall be added so as to make the mix quaky and flowable and the mix shall not show excess water on top when it is being puddled in place. For thicker grout beds upto 65 mm, the amount of sand shall be increased to 105 Kg per bag of cement. Bases which are hollow and are to be filed full of grouting shall be filled to a level of 25 mm above the outside rim with a mortar mix in the volumetric proportions of one bag of cement and 1.5 bags sand and 1.5 part 6 mm granite gravel. An acceptable plasticiser may be added to the grout mixes in a proportion recommended by the plasticisers manufacturer . All such grouts shall be thoroughly mixed for not less than five minutes in an approved mechanical mixer and shall be used immediately after mixing.

33.5 PLACING OF GROUT

33.5.1 After the base has been prepared, its alignment and level has been checked and approved and before actually placing the grout a low dam shall be set around the base at a distance that will permit pouring and manipulation of the grout. The height of such dam shall be at least 25 mm above the bottom of the base. Suitable size and number of chains shall be introduced under the base before placing the grout, so that such chains

can be moved back and forth to push the grout into every part of the space under the base.

- 33.5.2 The grout shall be poured either through grout holes if provided or shall be poured at one side or at two adjacent sides giving it a pressure head to make the grout move in a solid mass under the base and out in the opposite side. Pouring shall be continued until the entire space below the base is thoroughly filled and the grout stands at least 25 mm higher all around than the bottom of the base. Enough care should be taken to avoid any air or water pockets beneath the bases.

33.6 FINISHING OF THE EDGES OF THE GROUT

The poured grout should be allowed to stand undisturbed until it is well set. Immediately thereafter, the dam shall be removed and grout which extends beyond the edges of the structural or equipment base plates shall be out off flush and removed. The edges of the grout shall then be pointed and finished with 1:2 cement mortar pressed firmly to bond with the body of the grout and smoothed with a tool to present a smooth vertical surface. The work shall be done in a clean and scientific manner and the adjacent floor spaces, exposed edges of the foundations, and structural steel and equipment base plates shall be thoroughly cleaned of any spillage of the grout.

33.7 CHECKING OF EQUIPMENT AFTER GROUTING

After the grout is set and cured, the contractor shall check and verify the alignment of equipment, alignment of shafts of rotating machinery, the slopes of all bearing pedestals, centring of rotors with respect to their sealing bores, couplings, etc. as applicable and the like items to ensure that no displacement had taken place during grouting. The values recorded prior to grouting shall be used during such post grouting check-up and verifications. Such pre and post grout records of alignment details shall be maintained by the contractor in a manner acceptable to the engineer.

34.0 SHAFT ALIGNMENTS

All the shafts of rotating equipment shall be properly aligned to those of the matching equipment to as perfect an accuracy as practicable. The equipment shall be free from excessive vibration so as to avoid over-heating of bearings or other conditions which may tend to shorten the life of the equipment. All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting. All alignment should be checked through alignment cheker or condition monitoring equipment in the presence of the engineer-in-charge.

35.0 DOWELING

All the motors and other equipment shall be suitably doweled after alignment of shafts with tapered machined dowels as per the direction of the engineer.

36.0 CHECK OUT OF CONTROL SYSTEMS / POWER SUPPLY

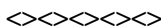
After completion of wiring, cabling furnished under separate specifications and laid and terminated by the owner, the contractor shall check out the operation of all control systems for the equipment furnished and installed under these specifications and documents. The contractor shall get the drawings pertaining to the control system, power supply etc. approved from Directorate General of Mine Safety (DGMS) or any other appropriate authority as necessary, wherever required as per the rules and regulations of the of Indian Mines Act governed by D.G.M.S.

37.0 COMMISSIONING SPARES

The contractor shall make arrangement for an adequate inventory at site of necessary commissioning spares prior to commissioning of the equipment furnished and erected so that any damage or loss during this commissioning activities necessitating the requirements of spares will not come in the way of timely completion of the works under the contract.

38.0 CABLING

- 38.1 All cables shall be supported by conduits or cable tray run in air or in cable channels. These shall be installed in exposed runs parallel or perpendicular to dominant surfaces with right angle turn made of symmetrical bends or fittings. When cables are run on cable trays, they shall be clamped at a minimum interval of 2000 mm or otherwise as directed by the engineer.
- 38.2 Each cable, whether power or control, shall be provided with a metallic or plastic of an approved type, bearing a cable reference number indicated in the cable and conduit list (prepared by the contractor), at every 5 metre run or part thereof and at both ends or the cable adjacent to the terminations. Cable routing is to be done in such a way that cables are accessible for any maintenance and for easy identification.
- 38.3 Sharp bending and kinking of cables shall be avoided. The minimum radii for PVC insulated cables 1100 V grade shall be $15D$, where D is the over all diameter of the cable. Installation of other cables like high voltage, coaxial, screened, compensating, mineral insulated shall be in accordance with the cable manufacturer's recommendations. Wherever cables cross roads and water, oil, sewage or gas lines, special care should be taken for the protection of the cables in designing the cable channels.
- 38.4 In each cable run some extra length shall be kept at a suitable point to enable one to two straight through joints to be made should the cable develop fault at a later date.
- 38.5 Control cable terminations shall be made in accordance with wiring diagrams, using identifying codes subject to engineer's approval. Multicore control cable jackets shall be removed as required to train and terminate the conductors. The cable jacket shall be left on the cable, as far as possible, to the point of the first conductor branch. The insulated conductors from which the jacket is removed shall be neatly twined in bundles and terminated. The bundles shall be firmly but not tightly tied utilising plastic or nylon ties or specially treated fungus protected cord made for this purpose. Control cable conductor insulation shall be securely and evenly cut.
- 38.6 The connectors for control cables shall be covered with a transparent insulating sleeve so as to prevent accidental contact with ground or adjacent terminals and shall preferably terminate Elmex terminals and washers. The insulating sleeve shall be fire resistant and shall be long enough to over-pass the conductor insulation. All control cables shall be fanned out and connection made to terminal blocks and test equipment for proper operation before cables are corded together.



SECTION – 5

PART-II

FORMAT FOR PRICE BID

**CGM(CMC)
BCCL**

SECTION - 5

PROFORMA FOR PRICE BID

PART-I: PRICE BREAK-UP OF DIFFERENT SUB HEADS FOR
TURN-KEY EXECUTION

A. SURVEY, SOIL TESTING & DESIGN ENGINEERING COST

Item No	Sub-heads/ Item description	Quantum of works	Unit price (Rs)	Amount (Rs)
1	Detailed survey of the area with in the battery limit & submission of reports	Complete works as per tender document		
2	Sub-soil exploration, field and laboratory testing of samples and submission of Report	Complete works as per Tender Document		
3	Design engineering cost			
a)	G.A & detailed engineering designs and drawings of all Civil and Structural included in system and scope of work			
b)	Preparation of system engineering	As per system requirement		
c)	G.A. & detailed engineering designs and drawings including working and maintenance manuals of i) All individual equipment (Mechanical & Electrical) ii)Dust suppression and pressurization system iii) Fire detection and fire fighting system iv) Plant cleaning system v) Communication system vi) Illumination system vii) Plant control system viii)			
4	Documentation as per tender specification			
5	Any other item	As per system requirement		
6	Taxes, if any (details to be given)			
	SUB TOTAL OF 'A'= 1+2+3+4+5			

B. PRICE BREAK UP FOR CIVIL AND STRUCTURAL WORKS (As applicable)

S N	SUB HEAD/ ITEM DESCRIPTION	Unit	Qty	Unit rate (Rs)	AMT (Rs)
a	DEVELOPMENT WORKS & INFRASTRUCTURE				
1	Site Development				
2	Sewerage				
3	Water supply & pipeline				
4	Pump House				
5	Sub-station building				
6	Lighting Tower				
7	Underground reservoir				
8	Drains for natural drainage as required				
b.	CIVIL & STRUCTURAL WORKS				
1	Earth work in cutting other items				
2	Earth work in filling				
	Sand filling				
3	PCC at all levels as per system requirement				
	a) Mix - 1:2 :4				
	b) Mix – 1:4:8				
4	RCC (excluding reinforcement)				
	a) M-25				
5	Supply, bending, binding and placing of Tor-steel				
6	Supply, fabrication and erection of structural steel at all levels and as per Bidding Documents				
7	22/24 gauge CGI sheeting at all levels including supply				
8	Stainless steel liner as per requirement				
9	Ironite liner with epoxy as per requirement				
10	Misc. Items such as dewatering, shoring, water proofing, rock cutting, brick work etc.				
c.	Any other item, if any				
1					
2					
d	Taxes, if any (Details to be given)				
	SUB-TOTAL OF 'B' = a+b+c+d				

C. PRICE BREAK UP OF PLANT & MACHINERY

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
C.1	SUPPLY											
C.1.1	MECHANICAL (List of equipment)											
i	Rapid loading system alongwith pre-weigh hopper, swing chute including air bluster and heat sensor	No	1									
ii	Lift	No	1									
iii	Dust suppression system/pollutio n control system	-	LS									
iv	Fire fighting & fire detection system	-	LS									
v	Plant cleaning system	-	LS									
vi	Misc. equipment, tools and tackles, safety items, accessories and facilities	-	lot									
vii	Any other item required for completion of the entire mechanical system but not specifically mentioned	-	lot									
	SUB TOTAL C.1.1											
C.1.2	ELECTRICAL (List of equipment)											
i	MCCB with necessary accessories for receiving power from the existing old loading point of Madhuband washery at 415 volts	No.	2									
ii	415 volts Motor Control Centre at the proposed plant for power	Set	1									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
	receipt and distribution to all electrical drives with all necessary control and protective devices											
iii	Control transformers of required capacity complete with voltage stabilizers , rectifier and all accessories	-	Lot									
iv	Illumination system complete with Lighting transformers , Lighting distribution boards , Lighting fixtures , luminaires , poles, masts etc. as required	-	Lot									
v	PLC , Microprocessor based Control system including control desk , sensors , Loading control console , push button stations etc.	-	Lot									
vi	UPS system with redundancy complete with batteries , protective and measuring devices and other accessories	Set	1									
vii	Power receptacles as required	-	Lot									
viii	Communication system as required	Set	1									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
ix	Welding system	-	Lot									
x	1.5 t Air conditioners with voltage stabilisers as required	-	Lot									
xi	Equipment and accessories for Pressurization	-	Lot									
xii	1.1 kV grade Power cables	-	Lot									
xiii	1.1 kV grade Lighting cables	-	Lot									
xiv	1.1/0.650 kV Control & signaling cables	-	Lot									
xv	Cable trays/cable racks, cable trenches & cable vaults etc	-	Lot									
xvi	Earthing system complete with earth pits , earthing strips , conductors etc.	-	Lot									
xvii	Lightning protection system for building and structures	-	Lot									
xviii	Exhaust and ceiling fans	-	Lot									
xix	Computer and printers , Laptop , UPS and software etc.	-	Lot									
xx	DG set of 100 kVA capacity for emergency lights	-	Lot									
xxi	Miscellaneous Equipment, e.g. insulating mats, Aluminium portable telescopic ladders, furniture etc.	-	Lot									
xxii	Capacitor bank 100 kVAr with APFC	set	2									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
xxiii	Any other item required for completion of the entire electrical system but not specifically mentioned.	-	Lot									
	SUB TOTAL C.1.2											
C.1.3	SPARE PARTS											
a	Mandatory spares for electrical											
b	Mandatory spares for mechanicals											
c	Recommended spares for electrical											
d	Recommended spares for mechanicals											
e	Any other spares/tools/ testing equipment reqd. but not specifically mentioned											
	Sub Total C.1.3											
	Sub-Total of C.1 = C.1.1+C.1.2+ C.1.3											
C.2	ERECTION, INSTALLATION & COMMISSIONING OF PLANT & MACHINERY											
C.2.1	MECHANICAL (List of equipment)											
i	Rapid loading system alongwith pre-weigh hopper, swing chute including air bluster and heat sensor	No	1									
ii	Lift	No	1									
iii	Dust suppression system/pollutio n control system	-	LS									
iv	Fire fighting & fire detection	-	LS									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
	system											
v	Plant cleaning system	-	LS									
vi	Misc. equipment, tools and tackles, safety items, accessories and facilities	-	lot									
vii	Any other item required for completion of the entire mechanical system but not specifically mentioned	-	lot									
	SUB TOTAL C.2.1											
C.2. 2	ELECTRICAL (List of equipment)											
i	MCCB with necessary accessories for receiving power from the existing old loading point of Madhuband washery at 415 volts	No.	2									
ii	415 volts Motor Control Centre at the proposed plant for power receipt and distribution to all electrical drives with all necessary control and protective devices	Set	1									
iii	Control transformers of required capacity complete with voltage stabilizers , rectifier and all accessories	-	Lot									
iv	Illumination system	-	Lot									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
	complete with Lighting transformers , Lighting distribution boards , Lighting fixtures , luminaires , poles, masts etc. as required											
v	PLC , Microprocessor based Control system including control desk , sensors , Loading control console , push button stations etc.	-	Lot									
vi	UPS system with redundancy complete with batteries , protective and measuring devices and other accessories	Set	1									
vii	Power receptacles as required	-	Lot									
viii	Communication system as required	Set	1									
ix	Welding system	-	Lot									
x	1.5 t Air conditioners with voltage stabilisers as required	-	Lot									
xi	Equipment and accessories for Pressurization	-	Lot									
xii	1.1 kV grade Power cables	-	Lot									
xiii	1.1 kV grade Lighting cables	-	Lot									
xiv	1.1/0.650 kV Control & signaling cables	-	Lot									
xv	Cable	-	Lot									

S. No.	Item description	Unit	Qty.	Unit price (Rs)	Exise Duty	Ed. cess	Higher ED. cess	C .S. Tax/ J VAT	Packing & Insurance	Trans portati on	Other	Sub Total (Rs)
	trays/cable racks, cable trenches & cable vaults etc											
xvi	Earthing system complete with earth pits , earthing strips , conductors etc.	-	Lot									
xvii	Lightning protection system for building and structures	-	Lot									
xviii	Exhaust and ceiling fans	-	Lot									
xix	Computer and printers , Laptop , UPS and software etc.	-	Lot									
xx	DG set of 100 kVA capacity for emergency lights	-	Lot									
xxi	Miscellaneous Equipment, e.g. insulating mats, Aluminium portable telescopic ladders, furniture etc.	-	Lot									
xxii	Capacitor bank 100 kVAr with APFC	set	2									
xxiii	Any other item required for completion of the entire electrical system but not specifically mentioned.	-	Lot									
	SUB TOTAL C.2.2											
	Sub total C.2 = C.2.1+C.2.2											

C.3 Training :

D. WEIGHT & VOLUME FOR CIVIL & STRUCTURAL WORKS

Item no	Sub head/item description	Quantity
D.1	Civil & Structural works (Broad quantities within a limit of ± 10% of actuals on completion)	
1	Earth work in cutting in all types of soil & rock	Cu.m
2	Earth work in filling i) Controlled filling ii) Un controlled filling	Cu.m Cu.m
3	P.C.C at all level and as per system requirement. i) In 1:2:4 ii) In 1:4:8	Cu.m Cu.m
4	R.C.C (Excluding reinforcement) i) M-25 at all level and as per system requirement	Cu.m
5	Reinforcing steel in all RCC in the system	M.Te
6	Structural steel works at all level and as per scope of work and system requirement excluding equipment frame work, chutes and liners	M.Te
7	22/24 Gauge C.G.I. Sheetting at all level	sq.m
8	Masonry works	Cu.m
9	Any other item	
D.2	Development Works and Infrastructure (Broad quantities within a limit of ± 10% of actuals on completion)	
1	Internal road of 3.75 m with	km
2	Different type of drains i) Type -A ii) Type -B iii) Type – C	km km km
3	Levelling and dressing of vacant area within battery limit	sq.m
4	Service building/Office buildings in floor area	sq.m
5	Loading complex area	sq.m
6	Any other item	

TOTAL BID PRICE

(Amount in Rs.)

Sl. No.	Description	Excl. tax.	Taxes		Incl. all taxes
			Type	Amount	
1	Sub-Total of "A"				
2	Sub-Total of "B"				
3	Sub-Total of "C ₁ "				
4	Sub-Total of "C ₂ "				
5	Sub-Total of "C ₁ "				
6	Sub-Total of "C ₃ "				
7	Sub-total of 'contingencies'				
GRAND TOTAL					

Instructions :

1.

Bidders are required to quote the quantity, unit price, amount and taxes etc. in the respective column. Unit price should be in word as well as in figure.
2.

Quantity should be as per scope defined in the tender document and should cover all the requirement of the system
3.

± 10% clause

Based on civil and structural quantities of works as given by the bidder in sub head A, B & C of this proforma, the shortfall in total quantity of all civil and structural works shall be allowed up to 10% only to every individual items. For shortfall of quantities exceeding 10%, there shall be proportional reduction in the price of the individual items resulting the reduction in the award value by the same amount. Contractor should absorb upward variation in quantity of individual items for civil and structural works unless specifically stated otherwise in the document.
4.

The above items of work are to be executed strictly as per IS provisions



SECTION – 6

MISCELLANEOUS FORMS

CONTENTS

- **BANK GUARANTEE PROFORMA FOR EARNEST MONEY DEPOSIT/BID SECURITY**
- **BANK GUARANTEE PROFORMA FOR PERFORMANCE SECURITY/GUARANTEE**
- **PROFORMA FOR APPLICATION FOR PAYMENT**
- **FORM OF ARTICLE OF AGREEMENT**
- **INTIGRITY PACT**

SECTION - 6
BANK GUARANTEE PROFORMA FOR
EARNEST MONEY DEPOSIT/BID SECURITY
(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT)

(TO BE ISSUED BY ANY NATIONALISED/ SCHEDULED BANK
AUTHORISED BY RBI TO ISSUE A BANK GUARANTEE)

To :

Bharat Coking Coal Ltd.,
Koyla Bhawan, P.O-BCCL Township
Koylanagar
Dist. : Dhanbad-826005 (Jharkhand)

WHEREAS _____ *[name and address of Bidder]* (hereinafter called "the Bidder") shall be submitting its Bid dated _____ *[date of the Bid]* for the work. _____ *[name of the work]* (hereinafter called "the Bid").

KNOW ALL MEN by these present that we, _____ *[name of the bank]* of _____ *[name of the country]* _____ having our registered office at *[address of the bank]* (hereinafter called "the bank"), are bound unto the Bharat Coking Coal Limited, P.O. BCCL Township, Dist. Dhanbad-826005 (Jharkhand) (hereinafter called "the Employer") for the sum of *[amount of the Guarantee in words and figures]* for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said bank this _____ day of _____ 2013.

THE CONDITION of this obligation are :

1. If the Bidder withdraws its Bid during the period of Bid Validity specified by the Employer on the bid form ; or
2. If the Bidder withdraws having been notified of the acceptance of its bid by the Employer during the period of Bid Validity :
 - (a) Fails or refuses to execute the Contract Agreement when required ; or
 - (b) Fails or refuses to furnish the Performance Security (if any) in accordance with the Bid conditions.

We, _____ *[name of the bank]* undertake to pay to the Employer up to the above amount upon receipt of its first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer will note that the amount claimed by it is due to it owing the occurrence of 1 or both of the 2 (a) or (b) specifying the occurred condition or conditions.

This guarantee will remain in full force up to and including the date _____ and any demand in respect thereof should reach the Bank not later than the date of expiry of this guarantee.

For and on behalf of the Bank.

Signature	_____
Name	_____
Designation	_____
Common Seal of Bank	_____

BANK GUARANTEE PROFORMA FOR PERFORMANCE SECURITY/GUARANTEE*(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT)**(TO BE ISSUED BY ANY NATIONALISED/ SCHEDULED BANK
AUTHORISED BY RBI TO ISSUE A BANK GUARANTEE)*

To:

Bharat Coking Coal Ltd.,
 KoylaBhawan, P.O-BCCL Township
 Koylanagar
Dist. : Dhanbad-826005 (Jharkhand)

In consideration of the Bharat Coking Coal Limited, P.O. BCCL Township, Dist. Dhanbad-826005 (Jharkhand) (hereinafter called to as the "Employer" which expression shall unless repugnant to the context or meaning thereof, include all successors, administrators and assigns) having awarded to _____ *[Name & Address of the Contractor]* (hereinafter called to as "Contractor" which expression shall unless repugnant to the context of meaning thereof include its successors, administrators, executors and assigns) the work _____ *[Name of the Work]* by issue of Letter of Award No. _____ *[Work Order/Letter of Intent No.]* and the same having been unequivocally accepted by the Contractor resulting into a Contract Agreement dated _____ valued at _____ *[value of Work Order]* (hereinafter called 'the Contract') and the Employer having agreed to accept Performance Bank Guarantee of ____ *[indicate figure]*% of the Contract Sum _____ *[amount in figures and words]* from a Nationalized/Scheduled Bank for due performance of the work executed by the Contractor as per the terms & conditions contained in the said Contract.

We, _____ *[name of the Bank]*, of _____ *[address of the Bank]* (hereinafter called to as "Bank" which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer immediately on demand and or, all money payable by the Contractor to the extent of _____ *[amount of guarantee in figures and words]*, at any time from _____ to _____ without any demur, reservation, recourse, contest or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the Guarantee herein contained shall be irrecoverable and shall continue to be enforceable as per the terms & conditions contained in the said Contract.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee, from time to time, to extend the validity of time of Performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this Guarantee, to postpone, from time to time, the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forebear or to enforce any covenants contained or implied in the Contract, between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to matter aforesaid or any of them or by reason of any other act of forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which

under law would, but for this provision, have the effect of relieving the Bank. The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a Principal Debtor in first instance, without proceeding against the Contractor and notwithstanding any security or other Guarantee that the Employer may have in relation to the Contractor's liabilities.

Dated this _____ day of _____ at _____

For and on behalf of the Bank.

Signature _____

Name _____

Designation _____

Common Seal of Bank _____

BHARAT COKING COAL LIMITED

PROFORMA FOR
APPLICATION FOR PAYMENT

UNIT ORIGINAL / DUPLICATE

1. On A/c or final :
2. Name of Work :
3. Estimate No. of Work :
4. Agreement Work Order No. & Date :
5. Name of Contractor :
6. Date of Commencement of the Work :
7. Date of completion of the work as per Agreement Work Order:
8. Extension of time granted, if any, with reference to the order. :

I)

II)
9. Actual date of completion of the work
10. Claims for work done from..... to

Description of work	QUANTITIES OF WORK			Rate & Unit	AMOUNTS			Remakrs
	Paid for as per last bill	Since last bill	Total Upto date		Paid for as per last bill	Since last bill	Total Upto date	
1	2	3	4	5	6	7	8	9
				TOTAL				

1	2	3	4	5	6	7	8	9
Brought forward	Total							
			Deduct amount of previous bill					
			Gross					

amount of the bill	-----
--------------------------	-------

Dated Signature of Contractor

Certified that the foregoing claims are correct and have been ascertained by actual measurement by

Sri On..... and recorded at page of Measurement Book No.and that no. contractor’s measurement has been accepted and that the work has been satisfactorily

Performed.

MEASUREMENT ACCEPTEED

Signature of	Signature of	Signature of	Signature of Engg. Asstt(C)
Contractor	Dy.Mgr.(C)/ Asst.Mgr.(C)	Sr.Officer (C)	Sr. Overseer (C)/ Overseer (C) Taking measurement

Received the sum of Rupees..... As per foregoing Details

Rs..... Witness..... Stamp

Contractor

Certified that there are no claims outstanding against the contractor for this work of on a.c. of Materials supply,. House Rent, Water Charges, Electric Energy supply etc.

Dy.Mgr.(C)/ Asst.Mgr.(C)	Sr.Officer (C)	Engg. Asstt(C)/ Overseer (C)	Sr. Overseer (C) /
-----------------------------	----------------	---------------------------------	--------------------

Certified that I have no claims outstanding against the department for this work and the claim preferred through this bill is in full and final settlement of my claim (*to be filled in case of final bills).

Contractor		
Amounts	Amounts	Certified for payment of Rs.....(Rupees.....)
		Sr. Manager (C)/ Manager(C)
ITS		Bill duly checked, audited and passed for payment of Rs..... (Rupees.....) only and necessary deductions have made.
Deposit		
		Sr. Officer (F)(CE Bills)

FORMAT FOR CONTRACT AGREEMENT
(On Non- Judicial Stamp Paper)

Agreement No.

Dated:

THIS ARTICLE OF AGREEMENT made on this _____ day of _____ 201_ between the Bharat Coking Coal Limited, a Employer registered under the Indian Companies Act. 1956 with its registered office at Dhanbad and a Subsidiary of Coal India Limited, Govt. of India Undertaking, P.O. BCCL Township (Pin-826005) Dist. : Dhanbad (Jharkhand), (hereinafter referred to as the Employer which expression where the context so admit shall include its successors in interest and assign) of the one Part and _____ (hereinafter referred to as “the Contractor” which expression where the context so admit shall include its heirs, executors, administrators legal representatives, successors in business and assign) of the other part.

WHEREAS, the Employer invited bid for the Work “_____” and the bid of the Contractor has been accepted by the Employer vide their Letter No _____ dt. _____ for a sum of _____ [Contract sum in figure & words]

WHEREAS the Contractor has agreed to execute the works on the terms & conditions as stipulated in the Bid and subsequent amendments thereto for a sum of _____ [Contract sum in figure & words] for successful completion of the work.

NOW THIS AGREEMENT WITNESSETH AND IT IS HEREBY AGREED AS FOLLOWS:

1. In pursuance of the Agreement aforesaid and in consideration for the payment of the sum of _____ [Contract sum in figure & words] and/or such sum as may be payable to the contractor, the Contractor shall upon and subject to the said terms & conditions execute and complete the work shown upon in the said drawings and described in the said scope of work as provided for in the said conditions.
2. The time shall be considered as one of the essence of the contract and time for completion of the contract shall be 24 (twenty-four) months from the date of commencement of work.
3. The parties hereto shall respectively and faithfully abide by and submit themselves to the terms & conditions and stipulations contained in this agreement and perform and discharge their part of contract accordingly.
4. This final Agreement has been arrived at between the parties after due consideration of the correspondences, documents, meetings and negotiations held from time to time. The following documents shall constitute the Contract between the Employer and the Contractor. And each shall be read and construed as an integral part of the Contract

<u>Part</u>	<u>Description of Documents</u>
01.	Article of Agreement.
02.	Detailed Bid Notice.
03.	Notification of Award
04.	The Bid and Prices Schedules submitted by the Contractor
05.	Conditions of Contract

- 06. Financial terms and conditions
- 07. Billing Schedule
- 08. Technical Specifications and drawings
- 09. Any Other Documents

5. The Contract shall be executed within the purview of the Indian Laws.

In witness whereof the parties hereto have hereunder affixed their signatures at Dhanbad on the day, month and year written as above.

SIGNED, SEALED AND DELIVERED

Signed on behalf of the Contractor

Signed on behalf of the Employer

Designation

Designation

Bharat Coking Coal Ltd.,
KoylaBhawan, P.O-BCCL Township
Koylanagar
Dist. : Dhanbad-826005 (Jharkhand)

In the presence of

WITNESS - 1

WITNESS - 1

(Signature)

(Signature)

(Name in Block Letters)

(Name in Block Letters)

Official Address:

Official Address:

WITNESS - 2

WITNESS - 2

(Signature)

(Signature)

(Name in Block Letters)

(Name in Block Letters)

Official Address:

Official Address:

(The latest format may be used during signing in consultation with BCCL)

(Refer to Clause 3.3(p) and 3.8 of Section-2)

[Instructions : Bidders are advised to submit the Integrity Pact document duly signed, stamped and accepted on each page mentioning the Tender No. and date.]

INTEGRITY PACT

Between

BHARAT COKING COAL LIMITED (BCCL) hereinafter referred to as “The Principal”

And

.....hereinafter referred to as “The Bidder/Contractor”

Preamble

The Principal intends to award, under laid down organizational procedures, contract/s for ----- . The Principal values full compliance with all relevant laws and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder/s and Contractor/s.

In order to achieve these goals, the Principal cooperates with the renowned international Non-Governmental Organisation “Transparency International” (TI). Following TI’s national and international experience, the Principal will appoint an external independent Monitor who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

- (1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-
 1. No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for him/herself or third person, any material or immaterial benefit which he/she is not legally entitled to.
 2. The Principal will, during the tender process treat all Bidders with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential/additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.
 3. The Principal will exclude from the process all known prejudiced persons.
- (2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the relevant Anti-Corruption Laws of India, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder/Contractor

- (1) The Bidder/Contractor commits itself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.
1. The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
 2. The Bidder/Contractor will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelisation in the bidding process.
 3. The Bidder/Contractor will not commit any offence under the relevant Anti-corruption Laws of India; further the Bidder/Contractor will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 4. The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- (2) The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder, before contract award has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or credibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

1. If the Bidder/Contractor has committed a transgression through a violation of Section 2 such as to put his reliability or credibility into question, the Principal is entitled also to exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressions within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.
2. The Bidder accepts and undertakes to respect and uphold the Principal's absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.
3. If the Bidder/Contractor can prove that he has restored/recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.
4. A transgression is considered to have occurred if in light of available evidence no reasonable doubt is possible.

Section 4 – Compensation for Damages

1. If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover from the Bidder liquidated damages equivalent to 3 % of the value of the offer

- or the amount equivalent to Earnest Money Deposit/Bid Security, whichever is higher.
2. If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.
 3. The bidder agrees and undertakes to pay the said amounts without protest or demur subject only to condition that if the Bidder/Contractor can prove and establish that the exclusion of the Bidder from the tender process or the termination of the contract after the contract award has caused no damage or less damage than the amount or the liquidated damages, the Bidder/Contractor shall compensate the Principal only to the extent of the damage in the amount proved.

Section 5 – Previous transgression

1. The Bidder declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the TI approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/Contractor/Subcontractors

1. The Bidder/Contractor undertakes to demand from all subcontractors a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.
2. The Principal will enter into agreements with identical conditions as this one with all Bidders, Contractors and Subcontractors.
3. The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

**Section 7 – Criminal charges against violating
Bidders/Contractors/Subcontractors**

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor, which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

**Section 8 – External Independent Monitor/Monitors
(three in number depending on the size of the contract)
(to be decided by the Chairperson of the Principal)**

1. The Principal appoints competent and credible external independent Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
2. The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairperson of the Board of the Principal.
3. The Contractor accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder/Contractor/Subcontractor with confidentiality.
4. The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
5. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or heal the violation, or to take other relevant action. The monitor can in this regard submit non-binding recommendations.

Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

6. The Monitor will submit a written report to the Chairperson of the Board of the Principal within 8 to 10 weeks from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.
7. Monitor shall be entitled to compensation on the same terms as being extended to/provided to Outside Expert Committee members/Chairman as prevailing with Principal.
8. If the Monitor has reported to the Chairperson of the Board a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Chairperson has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
9. The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded.

If any claim is made/ lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by Chairperson of the Principal.

Section 10 – Other provisions

1. This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. Dhanbad (Jharkhand)

- 2. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- 3. If the Contractor is a partnership or a consortium, this agreement must be, signed by all partners or consortium members.
- 4. Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 5. -----

For the Principal

Place.....

Date

For the Bidder/Contractor

Witness 1 :

Witness 2 :

Names and addresses of the Independent External Monitors for operation of the Integrity Pact with BCCL :

1. **Justice Ashok Kumar Chakraborty,(Retd.)**

BB-69,Sector-I,Salt Lake

Kolkata-700064

----- THE END OF VOLUME-I -----

BCCL



Bharat Coking Coal Limited
(A Subsidiary of Coal India Ltd)
Contract Management Cell
Koyla Bhawan:Koyla Nagar
Dhanbad-826 005 (India)
Tele-Fax: 0326-2230206
e-mail: cgmcmc@bccl.gov.in

PART- I (TECHNICAL) BID

1. Name of Work : Planning, Design, Engineering, Construction, Fabrication, Supply, Erection, Trial-run, Commissioning and Testing of Rapid Loading System on Existing Railway siding for Proposed 5.0 Mtpa capacity Madhuband Washery & comprising of all Civil, Structural, Electrical and Mechanical Works and all other accessories and facilities as required to make it complete in all respects, on turnkey basis.
2. Place of Work : Railway siding of existing Madhuband washery
3. Tender Notice No. & Date : BCCL/CGM(CMC)/RLS-MB/2013/ 452.
Date: 04.04.2013
4. Earnest Money : Rs.16,00,000 (Sixteen lacks) only
5. Date & Time of submission of tender : On 20.05.2013 upto 3.30 P.M.
6. Date & Time of Opening of Part-I Tender : On 21.05.2013 at 4.00 P.M.
7. Date & Time of opening of Price bid (Part-II) : Shall be communicated in due course after evaluation of Part – I tender
8. Date of Issue of Tender Document :
9. Money Receipt No/Bank draft no. towards cost of Tender Document. :
10. Tender Document sold to :

Sd/-
CGM (CMC)

TENDER DOCUMENT
FOR
DESIGN, SUPPLY, ERECTION, COMMISSIONING
AND TESTING
OF
RAPID LOADING SYSTEM
FOR
MADHUBAND NLW WASHERY (5 Mtpa)
AT
BHARAT COKING COAL LIMITED, DHANBAD

VOLUME - II : TECHNICAL



Bharat Coking Coal Limited
(A subsidiary of Coal India Ltd)
Contract Management Cell(CMC)
Koyla Bhawan, Koyla Nagar
Dhanbad-826005(Jharkhand)

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SUB-SECTION-7.1

PREAMBLE

1.0 LOCATION:

Madhuband Washery is situated in the Dhanbad District of BCCL(a subsidiary of Coal India Ltd). The Project lies between latitude $23^{\circ} 45' 46''$ N & $23^{\circ} 46' 54''$ N and longitude $86^{\circ} 11' 10''$ E & $86^{\circ} 13' 29''$ E in the district of Dhanbad of Jharkhand state. The new washery complex has been proposed in the west side and adjacent to the existing washery. Khanoodih Railway station on Adra – Gomoh section on South Eastern Railway is about 1.0 Km in the East. Co-ordinates of loading point E-69015 and N-107945 and Rail top level - 239.796 (Plate-2)

2.0 COMMUNICATION:

The area is bounded by Gomoh-Mohuda line of South Eastern Railway on the east. The Jamunia River is on the west. Main road constructed by Hirak from Dhanbad to Chandrapura is in the north. The district board road connecting Dhanbad and Chandrapura and Dhanbad- Chandrapura line of the East Central Railway are on the south. Ranchi airport is about 190 km from the site. The new washery is adjacent to old Madhuband washery which is about 40 km from Dhanbad town and falls under Block-II area of BCCL connected with metal road. The nearest railway station is "Khanoodih".

3.0 CLIMATE:

The climate of the area of proposed Madhuband washery is tropical with three season cycle. The lowest temperature recorded is 4°C in winter. During summer the temperature rises upto 50°C . Frequent thunderstorm is being observed during May. Highest recorded rainfall is 1851 mm recorded in the year 1997 and lowest recorded rainfall is 744.2 mm in 2004 and mean rainfall is 1358 mm. Non monsoon rainfall is 10.6% of total rainfall and 89.4% in rainy season and relative humidity upto 97%.

4.0 ABOUT THIS TENDER:

The Proposed 5 Mty Madhuband NLW washery has been designed to produce 2 Mtpa of clean coal, 1Mtpa Washed coal (power) and 2 Mtpa rejects. This tender document is for construction of dispatch system of Clean coal and Washed coal(Power) by rail on turnkey basis. The scope of this tender broadly includes construction of one 500 tonne concrete hopper fitted with rapid loading system including dust suppression, fire fighting, etc.

The clean coal and Washed coal(Power) produced from washery shall be delivered by means of 2000mm wide belt conveyor at the rate of 3600 TPH to 500 Te concrete hopper to be constructed over the railway lines.

Conveyor, loading chute, lifting arrangement of discharge drum/ assembly are not in the scope of tenderer.

Considering the fact that high tonnage of coal has to be dispatched within the stipulated time, a rapid loading system with 500 tonne concrete hopper for loading into railway wagons has been adopted.

The rapid loading system shall also be provided with suitable fire fighting and communication facilities.

Responsibility of matching despatch system (under this tender document) with in feed conveyor system of BOMO lies with the successful bidder of this tender. Any clarification, if required may be discussed by the successful bidder with BCCL and BOMO for finalisation.

5.0 GENERAL:

In case of any contradiction amongst these parts / sections of the Bidding Documents, the Owner should be contacted for clarification. Also where there are discrepancies in text and drawings, the data given in the text is to be followed. All the equipment and facilities are to be supplied by the successful bidder within the estimated time period. All equipment/ systems shall be designed, fabricated and selected as per relevant Indian standard/ international standards and up to date engineering practices and necessary inspections / test certificates shall be submitted along with equipment supply to certify the quality and genuineness of critical components and capacity and other technical parameters of the equipment/ systems.

SUB-SECTION-7.2

SYSTEM DESCRIPTION AND BASIC DATA

SUB-SECTION-7.2

SYSTEM DESCRIPTION AND BASIC DATA

1.0 System Capacity

The system capacity of the rapid loading system shall be designed in such a way so that it can cater 2.015 Mtpa Clean coal and 0.97 Mtpa Washed coal(Power) within an overall rated production of 5 Mtpa from the washery. 2.015 Mtpa rejects produced from the washery shall be handled separately and beyond the scope of this tender. The clean coal and Washed coal(Power) produced from washery shall be delivered by means of 2000mm wide belt conveyor at the rate of 3600 TPH to 500 Te concrete hopper to be constructed over the railway lines.

Considering the fact that high tonnage of coal has to be dispatched within the stipulated time, a rapid loading system with 500 tonne concrete hopper for loading into railway wagons has been adopted.

2.0 Description of CHP

2.1 Loading & Wagon Movement

The wagon loading hopper shall be equipped with one set of rapid loading gates and chute for loading into wagons. The system shall consist of one set of pre-weigh bin arrangement i.e. the required quantity of coal equivalent to the pay load capacity of the railway wagon will be discharged into the bin before it is discharged into the wagon. The weigh bins will be located below the 500 tonne capacity hopper. Rapid loading chutes will be placed below the weigh bin to regulate the flow of coal into wagons.

3.0 Dust Suppression

Necessary measures for dust suppression shall be provided to control the dust generated at hopper loading and wagon loading point. Plant safety and fire fighting equipment shall also be provided.

4.0 Brief description of works : The tender is for construction of rapid loading system. The brief description of works is as under:

- a) One 500 tonne capacity wagon loading concrete hopper with preweigh bin with high speed rapid loading system,.
- b) Safety and dust control system.
- c) Liners
- d) Lift, stairs
- e) 1 No. of Electrical sub-station & Control room located near 500 T hopper.
- f) Remote and sequential control .
- g) Local control stations for all drives
- h) Illumination system
- i) Communication system
- j) Necessary lifting tools and tackles and spot repair facilities
- k) Plant cleaning and drainage, fire fighting system
- l) Design and engineering, erection and commissioning and associated civil and structural works with site office and rest rooms.
- m) Drinking water and toilets and water supply system for fire fighting system.
- n) Interlocking of the system with the incoming conveyor of BOMO as required.

5.0 Basic Data

Washery capacity	5 Mtpa of raw coal feed
Clean coal production	2.015 Mtpa
Washed coal (Power) production	0.97 Mtpa
No. of working days considered/ year	330 days (However, the design should be suitable for continuous operation round the year.)
No. of working shifts/ day	3 shifts each of 8 hrs duration
No. of effective working hrs. per shift	5
Targetted ash% (monthly average basis) of washed coal	18%
Total moisture% of washed coal	Max. 9.5 %(apb)
Targetted ash% (monthly average basis) of Washed coal(Power)	Less than 40% (apb)
Total moisture% of Washed coal(Power)	Max.9% (apb)
Bulk density (t/m ³)	0.8 for volume calculation, 1.15 for load and power Calculation
Compressive strength of coal	800 kg/cm ² (For equipment design)
Final Product size of clean coal and Washed coal(Power)	(-) 13 mm
No. of product	Two

Consumer	Steel plant/ power plant
Mode of despatch	By rail through rapid loading system
No. of wagon loading point	One
Wagon marshalling	Creep controlled locomotive
Capacity of RLS	5500 tph
Type of capacity of wagons	Box 'N' type 58.8 t ; Box 'C' type 56.28 t ; Bottom discharge type 60 t
Rake size	59 boxes
Loading schedule	3 shifts, 7 days / week
Maximum temperature	50 deg C
Minimum temperature	4 deg C

SUB-SECTION-7.3

SCOPE OF SUPPLY AND WORKS

(MECHANICAL & ELECTRICAL)

SUB-SECTION-7.3

SCOPE OF SUPPLY AND WORKS

1.0 GENERAL

- 1.1 This tender document for Rapid loading system of Madhuband NLW Washery is for planning, design, engineering, manufacture, shop fabrication, assembly, testing, packing, transportation to site, insurance, delivery to site, receipt, unloading, handling, storage at site, fabrication at site, installation and erection, all civil & structural works and associated electrical & mechanical works and other allied auxiliary facilities such as dust suppression system, communication system, drinking water supply system, fire fighting etc.
- 1.2 The contract for the package will be split into two contracts - one covering the 'Supply' part and the other covering the 'Works & Services' part. Both the contracts will contain a cross fall breach clause specifying that breach of any one contract will also constitute breach of the other contract and the whole contract combined.
- 1.3 The equipment and works mentioned hereinafter to be read in conjunction with preamble (Sub-Section-7.1), system description and basic data sheet (Sub-Section-7.2), and technical specification (Sub-Section-7.4) are indicative and not limited to the description and/or list given.
- 1.4 All mechanical & electrical equipment and systems and civil works are within the scope of supply and works of contractor.

2.0 Scope of Supply

2.1 Equipment, Accessories, Facilities and Spare Parts

- 2.1.1 List of mechanical equipment, accessories & facilities is given in **Annexure-III.1**.
- 2.1.2 List of electrical equipment, accessories and testing equipment is given in **Annexure-III.2**
- 2.1.3 List of mandatory parts to be supplied by the contractor is given in **Annexure-III.3**.
- 2.1.4 List of tools and tackles is given in **Annexure-III.4**.

3.0 Scope of works and services

- 3.1 The scope of work covers all the related civil and structural works, transportation, insurance, storage at site, erection and commissioning, performance tests, detailed engineering, PAT & FAT and handing over of plant and includes but not limited to the following:
- I Design & engineering of all mechanical, electrical, civil and structural works of the plant.
 - II. Erection and commissioning of all the plant and equipment. Supervision at site and inspection and testing.
 - III. Performance and guarantee tests , final acceptance
 - IV. Training of Plant personnel as detailed elsewhere

- V. Any other works/services not mentioned but required for the completion and commissioning of the plant.
- 3.2 All the items and works specified in this document and any other equipment and work found necessary but omitted is deemed to have been covered in the scope of supply and works in the tender without any increase in the contract price.
- 3.3 Obtaining approvals from Weights and Measure Department is the responsibility of the bidder.
- 3.4 Air, water and noise levels shall be within the permissive limits as per the CPCB norms specified in the bid document. Additional requirement and stipulation by State/ Central Pollution Control Board, if any, on the subject shall also be applicable and shall be the responsibility of the bidder.
- 3.5 **Adherence to Indian Standards**
- All the works including designs, drawings, construction, fabrication, testing, erection, etc. shall be done strictly as per Indian Standards. In absence of Indian standards, International standards like British, American, German or Russian may be used. A copy of the standard used shall be furnished along with the concerned drawing /document during approval.
- 3.6 The equipment list indicates only broad parameters and the accessories required for successful commissioning / operation of Rapid loading system shall be considered to be part of the total works. The other terms and conditions of works including technical, commercial, etc shall be governed by the clauses of the bid and contract.
- 3.7 The technical parameters to be furnished are subject to scrutiny/ approval at the detailed design stage which may undergo minor changes keeping in view the system requirement and various codes of practices/regulation by the statutory bodies. This shall be applicable for drawings also. The parameters not specifically mentioned in the bid document shall be decided at the time of finalisation of contract document on mutually agreed by the selected bidder and BCCL and at the time of detailed engineering subject to owner's approval. The successful tenderer shall supply and / or erect any addition and modification as will be agreed upon in writing after mutual discussion.
- 4.0 **Details of works and services**
- 4.1 **Design Engineering**
- i) Elaboration and furnishing of system design/ drawing, based on actual parameters of equipment to be supplied. The system design as proposed in the plant description shall form the basis of this elaboration.
 - ii) Preparation and furnishing of all relevant detailed engineering drawings based on elaborated system design drawing duly approved by consultant in writing. This includes fabrication, assembly, installation and erection drawings.
 - iii) Furnishing of detail design calculations in support of different design and

equipment parameters.

- iv) Furnishing of equipment specification supported by manufacturer's illustrative pamphlets and literature.
- v) Furnishing of operational, maintenance and spare parts manual supported by the illustrative pamphlet and literature of manufacturers.
- VI) All approved drawings and documents shall be supplied in six copies in addition to one copy in ink on polyester tracing paper of approved quality and one copy on CD. Final drawing/literature shall be presented in the form of document.
- vii) All drawings shall comply with current Indian Standard specifications and shall be sufficiently detailed with dimensions and shall be clear and legible.
- viii) The bidder shall submit detailed time schedule in the form of PERT NETWORK for complete plant and subsequently for each major activity for monitoring purpose. The same shall be updated from time to time. This is essential in view of maintaining time schedule. The successful bidder shall have to submit monthly/quarterly progress report of the various works being carried out.

4.2 Erection and Commissioning

4.2.1 Erection & commissioning of Rapid loading system, chain pulley block, fire fighting system along with associated accessories and condition monitoring equipment .Erection and commissioning of dust suppression equipment at different locations.

4.2.2 One no. 500 te Wagon loading hopper with pre weigh-hopper consisting of hydraulic power pack, cylinders, guillotine type gates for high speed load out, load cells, wagon loading swing chute.

A 2000mm wide belt conveyor (NOT IN THE SCOPE OF THIS TENDER) shall feed the 500 tonne concrete hopper at the rate of 3600 TPH. Adequate design provisions shall be made considering the thrust/forces arising out of running of belt conveyor system.

4.2.3 Rapid loading system

The loading will be done through Rapid loading system on an average one wagon per minute. The loading shall be controlled from control room located at first floor of the hopper. The average rate of loading shall match the creep speed of locomotive (0.8 to 1.2km/hr).

The rakes will be hauled by a creep controlled locomotive at 0.8 km/hr. Level indicators will be provided in the loading hopper to show the coal level position. The system shall have the switches for emergency stop of feed conveyor in case of over filling of hopper. A lift of suitable capacity has also been envisaged.

To ensure better loading and weighing accuracy pre-weigh loading system shall have to be adopted. There shall be one loading pocket over the rail track.

4.2.4 Pollution control Dust suppression

Proper water supply arrangement for dust suppression will be made at dust generating points so that all working space remains free of dust. At Wagon loading hopper top and wagon loading point fog type dust suppression system has been envisaged as detailed elsewhere. All civil works pertaining to dust suppression shall be as per system requirement. Dust suppression system should be suitable for water which is available at existing Madhuband Washery. The pumping sets for the dust suppression / control should have 100% stand-by at each location.

Necessary measures shall also be taken for noise and vibration control.

4.2.5 Repair facilities

Necessary spot repair facilities shall be provided for plant and equipment including lifting tools and tackles. Provision for site storage of spares and tools shall also be made. All lubrication charging points shall be dust free.

4.2.6 Drinking water and other facilities

Facilities for distribution of drinking water shall be provided along the plant with provision of toilet facilities at suitable points as detailed in civil section.

4.2.7 Liners

Liners shall be provided inside the hopper for smooth flow of coal as detailed elsewhere.

4.2.8 Plant cleaning and drainage

4.2.8.1 Suitable arrangements shall be made for cleaning of plant especially at the spillage point with the help of water hydrants and vacuum cleaners in case of electrical panels and plant equipment.

Plant cleaning points shall be provided at loading point. The effluent shall be discharged into a suitable location. Compressed air points should be provided in the different floors for cleaning. These shall be served by portable compressors as envisaged in the bid document.

Water and compressed air pipe line net work along with connection /tapping points with control valves at suitable intervals shall be provided in the Wagon loading complex, sub-stations, etc. for pressure cleaning of floor, chutes, etc. Proper drainage arrangement will have to be made along the plant so that water or slush accumulation is avoided. At every probable spillage point suitable arrangement will have to be made for cleaning.

4.2.9 Fire fighting at Wagon loading complex

Fire fighting system shall comprise of (a) hydrant system, (b) mobile fire extinguishers as detailed elsewhere. Fire detection and alarm system shall also be provided.

Fire fighting system shall be designed to meet the various requirements laid down in the fire protection manual by the Tariff Advisory Committee (TAC), India and National Fire Alarm Code by NFPA (USA). Components of the fire fighting system shall be as per the relevant Indian/International (FM/UL) standards, as applicable.

Hydrant system: The fire hydrant system shall be designed considering the generally as ordinary hazard as per TAC manual and shall consists of a net work of over ground piping feeding pressurised water to a number of double headed hydrant valves located at wagon loading complex.

Portable & Mobile Extinguishers: Portable extinguishers of carbon dioxide type, dry powder type & soda acid/ DCP type shall be installed at suitable locations as per TAC manual. Mobile extinguishers of required number shall be provided. Different types, as described above, shall conform to the latest BIS standards.

Fire detection and alarm annunciation system : The fire detection system shall be "Conventional wired type". Adequate numbers and type of detectors manual call point and sounders shall be provided in strategic location.

4.3 ELECTRICAL

The scope of work shall include design of electrical , control and communication systems for the entire plant , supply of equipment , erection , testing , commissioning and finally handing over the plant after commissioning satisfactorily .

The scope of work for the bidder shall start from receiving power from the existing MCC of existing sub-station at two-way transfer station of Madhuband old washery with supply and installation of all necessary switches and accessories therein as required with metering arrangement .

Entire electrical system shall be supplied in complete to run the plant satisfactorily . They shall be conforming to Indian Electricity Rules (revised) and latest version of all relevant Indian standards . Approval of Electrical inspection of state Government shall be obtained by the contractor along with submission of necessary test certificates / drawings / circuit diagrams etc.

The equipment shall be supplied as per the scope defined below and the Annexures ES-1 to ES-14 .

The proposed Loading point shall be located (as specified elsewhere in this document) near the existing old loading point of Madhuband washery and shall receive power at 415 volts from the existing old sub-station situated around 350 metres away.

A new sub-station with control room is to be built near the proposed loading point to cater power to all the electrical drives , illumination and control systems for the proposed plant . This sub-station shall receive power at 415 volts from the MCC (Motor Control Centre) of existing old Madhuband washery as detailed above. Power shall be received from the existing Madhuband washery by adding two Nos. MCCBs (to be supplied and installed by the bidder in the existing MCC of old sub-station with its extension as required) and two nos. of cable feeders (to be supplied and installed by the bidder) from there. One of these two

feeders shall have the capacity to supply entire power required for the proposed plant .

The new sub-station of the proposed loading point shall have separate MCC (Motor Control Centre) for distribution of power to all the electrical drives and illumination system of the proposed plant .

The control room of this proposed loading point shall be so constructed to have full view of the loading operation.

The scope of the system referred above shall broadly cover the following :

4.3.1 Power Receiving Arrangement

Power shall be received at 415 volts from existing old Madhuband washery sub-station around 350 meters away from the proposed plant , by installing two nos. 415 Volts MCCBs with required accessories there (in the existing old sub-station MCC with its extension as required) and two nos. 1100 volts grade cable feeders (of sufficient capacity) from existing old Madhuband washery sub-station to the proposed site with all accessories and protective devices. Each of these two cable feeders shall have the capacity to supply entire power required for the proposed plant .

4.3.2 Power Distribution in the Plant

Supply and installation of LT Power Distribution Board / Motor Control Centre (MCC) shall be done at the sub-station to be built in the proposed site . From this sub-station power shall be distributed to all required equipment at 415 volts and illumination system with all necessary accessories and protective devices . Necessary power factor correction shall be made by providing capacitor banks of suitable rating with automatic power factor control panel . The Motor Control Centre (MCC) shall comprise the following :

Sl. No.	Description of MCC Modules	Feeder Type	Qty.
1.	415 V, MCCB cubicle	Incoming Feeder and Bus coupler Cubicle	3 nos.
2.	415 V, MCCB cubicle	Outgoing feeder cubicle for control of Lighting transformer	2 nos.
3.	415 V , MCCB cubicle	Outgoing feeder cubicle for control of capacitor bank	2 nos.
4.	415 V, LT motor controlling cubicle comprising MCCBs , Isolator, HRC Fuses, Contactor, thermal Overload Relay with built in Single Phasing prevention.	Outgoing feeders for control of LT motors as indicated in the drawings	As required
5.	415 V, LT motor controlling cubicle comprising Isolator, HRC Fuses, Contactor, thermal Overload Relay with built in Single Phasing prevention	Spare Feeders	As required

Incoming and bus coupler MCCBs shall be interlocked in such manner that the coupler MCCB shall remain "OFF" when both the incoming MCCBs will be "ON" and in the event of one of the incoming MCCB in "OFF" position, the coupler MCCB will be "ON".

Power Factor Improvement

For the purpose of improving power Factor to 0.98 (approx) lagging and maintaining the same, suitably rated Capacitor Banks will be provided at 415 V. The capacitor banks will be complete with automatic power factor correction and switching devices which will facilitate for automatic selection and switching ON/OFF of the capacitor banks according to the load connected.

4.3.3 Illumination

Supply and installation of Lighting transformers and illumination system shall be done for the proposed plant, Railway siding and general area complete with all distribution boards, luminaries and fittings, poles, cables etc. with proper protective and control devices. The different areas of the proposed site shall be illuminated by sufficient nos. of proper lighting fixtures to have illumination levels as indicated below :

Area / Place	Illumination Level (Lux)	Types of lights
Area around hopper etc.	70	HPSV
Conveyor drive and discharge house, transfer points, maintenance bay, etc.	150	HPSV
Substation / MCC / Rear of control Panel / switch room / Office	150-300	Fluorescent/ CFL
Control Room	250-300	Fluorescent/ CFL
Area lighting (Lighting Mast)	50	HPSV / Metal Halide

High mast lighting with HPSV / metal halide flood light fixture shall be provided on both sides of the railway track at loading point to obtain the required level of illumination there .

Two Nos. 100 kVA 415V / 230 V (L-L) lighting transformers shall be installed in the sub-station for the purpose of illumination . The distribution of power for illumination system shall be made through Lighting Distribution Boards located at strategic places as required . The two transformers shall remain so connected as to ensure reliability of lighting system and uninterrupted power supply to lighting load during outage of one transformer.

Emergency Illumination :

One No. DG set of 100 kVA capacity with automatic ON / OFF arrangement will be provided to facilitate power at strategic locations control rooms, different floors of loading point, staircases etc. at the time of power failure. For this, separate wiring with separate luminaries shall be provided. The emergency light points shall be provided at all strategic points .

In addition, inverter emergency light shall be provided in the switch room, control room and loading point .

4.3.4 Power and Control Cables

Supply and laying of power and control cables , cable trays and accessories shall be made as required and as per Indian standards . Cables shall be laid underground wherever required following IE rules (Latest) , Indian standard code of practice .

4.3.5 Power Points

Supply and installation of power points shall be made at different locations for the purpose of utilisation of hand lamps , machine tools etc. for maintenance work at site.

4.3.6 Welding Sockets

For easy maintenance of entire plant centralised welding circuit shall be provided. In such system, there shall be provision for installation of welding machine (welding transformer) for all area of the plant . For supply of power to welding machines, necessary circuit with plug and socket system of suitable capacity at an interval of not exceeding 50 m shall be laid by the bidder. This system shall facilitate connecting of welding lead at any point of plant for welding / repair of steel structures. Welding sockets shall be provided at convenient places as required . Supply of two numbers of portable welding transformers with all accessories as required shall be in the scope of work of bidder .

4.3.7 Communication system

The following communication system shall be provided for effective communication within the plant and also with BCCL authority .

Suitable nos. of automatic dial type telephone sets shall be provided at various locations of the plant. These telephone sets shall be wired and brought to common junction box in the plant and will be connected to the main auto exchange of the Owner / BCCL to make it an integrated communication system. Automatic dial type telephone sets shall be located in the following places:

- a) Sub-station / MCC room - 1 no.
- b) Room of Engineer In-charge - 1 no
- c) Control room - 1 no.
- d) Maintenance - testing room - 1 no.
- e) Near Hopper - 1 no.
- f) Site office - 1 no.
- g) Loading control room - 1 no.
- h) Additional telephone sets, if required shall be provided to meet the operational requirement.

Industrial type duplex loud hailing plant inter-communication system shall also be provided in addition . Each loud hailer shall also have a hand set to facilitate private conversation. When hand set shall be used for communication, the loud speakers shall be disabled. Loud hailing system shall be provided at following locations:

- i) Hopper complex
- ii) Lift.
- iii) Substation & control room.
- iv) Engineer In-charge room and supervisor's room.

- v) Maintenance cum test room.
- vi) Store rooms.
- vii) Site office.
- viii) Fire fighting pump house.

4.3.8 Earthing system

The earthing system shall strictly conform to the Indian Electricity Rules 1956 as amended up-to-date and IS-3043 . Earth pits shall be constructed as per requirement. Main earthing grid shall be provided around the periphery of substation and loading system for interconnection of grids of the buildings as well as to earth all the electrical equipment .

Each motor, transformer, 415V MCC, control and relay panels, lighting panels, receptacles, push button stations, junction boxes and other electrical equipment should be earthed by two separate earthing strips. In addition all the motors will be earthed through the armouring of the connecting cable. Size of earthing strip and electrodes shall be as per requirement of relevant IS. Main earth grid shall be of 40mm dia MS rods and bus strips of not be less than 65 mm x 8 mm whereas that of the connecting earthing strip shall not be less than 25 mm x 6 mm.

Hopper structure, cable tray supports, cable trays etc. shall not be considered as earthing conductors. Metallic sheath, screens / shields and armour of all cables shall be earthed at both the ends at the equipment where the cables are terminated. Suitable earthing clips shall be provided as required.

Cable trays shall be earthed at every 10 m intervals. Adequate care shall be taken towards earthing of light-fittings, welding sockets etc.

Separate earth pits for earthing of neutral of transformers and lightning arrestors shall be provided. All joints and connections of earth lead shall be welded / bolted securely.

The resistance to earth as measured shall not exceed 1 ohm. Test pits shall be provided at all interconnecting grid connections. Interconnection with employer's earth grid if any shall be made at least at two points by using test electrodes.

4.3.9 Lightning Protection system

Lightning protection against direct strokes shall be provided for all structures, buildings, Hopper , Lift etc. having a height of 15 m or more. The lightning protection shall conform to IS 2309. Earthing system for lightning protection shall be independent of the earthing system for electrical equipment. It may be noted that the area designated for the plant including the neighbouring area of the site is heavily lightning prone zone.

4.3.10 Plant Monitoring and Control system

In order to have better supervision, operation and control of the plant , microprocessor based programmable logic controllers (PLC) with back-up , one for normal operation and one as standby suitable for industrial control system shall be envisaged. Automatic change over between main and standby PLCs

shall be envisaged . The PLCs shall have the facilities for remote monitoring and sequential control, including local operation of individual equipment, audio and visual fault annunciation, normal status display, signalling, data logging, data display and printing etc.

General system requirement

The system / equipment shall be capable of working satisfactorily to the guaranteed performance under dust laden atmospheric conditions having an ambient temperature of surrounding up to 50 ° C and relative humidity up to 97%. The system design shall be such that in case of addition / modification of various equipment in the plant , the system can be extended easily for monitoring and control of additional equipment. The software shall be such that by reconfiguration at site the system shall be able to accommodate the modification .

Any equipment / sub-system specifically not covered in this document shall be deemed to be included to make system reliable , safe and complete for satisfactory operation and compliances of all Indian electricity rules / Indian standards .

The system shall have the following facilities:

- a) Real time automatic centralised control from control room for all the equipment for normal operation of the plant so as to ensure safe and efficient operation of entire plant.
- b) Stopping of any equipment from the control station located near the drive of respective equipment under all conditions including emergency .
- c) Starting and stopping of any desired equipment independently from local control stations located near the respective motors / drives for maintenance / repair / testing by selecting remote / local mode of operation from the control room through a suitable command wherever required .
- d) Sounding audio alarm / warning system prior to starting of the plant for information to plant personnel / maintenance staff to keep a safe distance from equipment under operation.
- e) Continuous status monitoring of all equipment in addition to status monitoring, monitoring of parameters like overload, single phasing, earth leakage, lubrication system, noise level, vibrations level of loading system, etc.
- f) Colour visual display units with functional key boards to allow the operator in control room to observe status of operation of various equipment, alarms, fault annunciation mimic display on VDUs and to select the various displays on VDUs pertaining to inspection of state of readiness of control circuits prior to equipment to be started. Besides VDU hardware mimic panel and annunciation panel shall also be envisaged in the control room along with the control desk.
- g) Dedicated keys on key board to select Remote / Local modes of operation and issue commands for starting / stopping drives in sequential / individual mode.
- h) Management information reports.
- i) Starting / stopping of Equipment which is not under sequence control from the site.
- j) Interlocking between infeed conveyor of the hopper and level indicator in hopper for automatic ON / OFF of infeed conveyor.

Remote & Sequence Control :

Following operations shall be envisaged for remote and sequence control :

a) Inspection :

In case of sequence operation an inspection facility shall be provided in the circuit to check before actual starting that all the technological mechanisms are interlocked at the starting moment. This can be ascertained by key-board function which affects the pilot display in the circuit (to be displayed in VDU).

b) Signalling :

The strategic points of the plant shall be equipped with two way Audio-visual signalling. This will ensure rapid and reliable communication between the strategic points and the operator in the control room for safe working as well as during emergency. Signal lamps and alarm bells for the operation of signal circuit are to be installed at the control room at all the strategic points. There shall be bidirectional audio visual signalling system between train loading system and washery output conveyor with complete interlocking .

c) Ready : The plant shall be ready to start by a key-board function with luminous head starts blinking indicating that the system is ready for starting**d) Alarm :** When blinking of luminous head becomes steady, the operation of alarm system starts. The hooters connected with the Alarm system shall be suitably located in the plant to provide adequate warning to all the persons around the site.

The hooters keep on running until the whole plant comes into operation. The hooters in the alarm circuit shall be situated at all the strategic points and shall be controlled from the control room .

e) Start :

After actual time of starting the hooters, the start function will commence blinking for the specified time. The operator shall operate the start function within the specific time, so that the plant may start, otherwise the cycle will have to be repeated. Gradually, all the indications of individual drives shall start glowing on the mimic one by one showing that the plant is running.

f) Stop :**Normal stop :**

Under normal conditions of sequence control , the stopping of the plant shall be affected from the control desk at control Room by a key board function. The stopping shall be made in sequence with a definite time lag in the direction of coal flow.

Emergency Stop :

Emergency stoppage may be caused by :

- i) The depression of emergency stop key on the key-board in the control desk in the control room .
- ii) The depression of emergency push button from any of local control stations at site and at some additional locations as required .

Any emergency cut out of any of the drives in a flow will cause an immediate switching off all the drives in the flow line.

In the event of emergency stoppage a siren will start giving warning distress sound to attract the attention of personnel working in the plant. The siren shall keep on blowing till acknowledged from respective control room.

g) Automatic stop on fault :

In the event of stoppage of an equipment due to electrical fault such as over load, single phasing and mechanical fault , all the equipment in the stream will stop immediately.

h) Local Control :

The local control system shall have the facility to remote operation and interlocking of a particular flow from the respective control desk so that individual equipment in a flow can be operated from the site by means of Local Control Station (LCS) installed near the respective equipment. This provision shall facilitate inspection, maintenance and test run of the equipment whenever required

A key board function shall be provided on respective key-boards with suitable locking arrangement for transfer of operation in local mode. Similarly, in each LCS a two position remote-local rotary switch (lockable in both positions) shall be provided. This selector switch on each LCS shall be interlocked with the keyboard function in such a way that –

- a) Unless all the selector switches of LCS in a particular flow line and selector switch on particular CCD are not on 'Remote' mode, the remote and sequence operations from control room is not possible and
- b) Unless the selector switch of the particular equipment in a flow is not in local mode and local operation function is not effected from control room, the local operation of individual equipment from site is not possible.

A yellow indicating lamp shall be there with each LCS which shall glow when the local operation function is effected from respective control room.

Supply and installation of PLC based necessary automatic control system with all accessories for remote sequential and also Local Control stations for manual operation of the plant as mentioned below :

1. Flood Loading of UNIT TRAIN WAGONS :

For operation of wagon loading chute gate and guillotine type gates of the pre weigh hopper, loading control console (LCC) shall be provided at suitable location so that the wagon loading operation can be viewed simultaneously while loading operations is in progress.

Loading of Unit train rakes shall be done from the flood loading chute along with its associated gates system through LCC . To warn the engine driver and concerned loading operator for loading of the unit train , necessary visual indication shall also be provided for the flood loading chute (at suitable

locations) and on the loading control console (LCC) . The loading chute will be also interlocked with flood loading gate for its logical operation.

2. Control System for Flood Loading of UNIT TRAIN WAGONS :

Control system for flood loading system will be micro processor based. This will include weigh sensing elements with associated power supply / amplifier, loading control console (LCC) display with key board and a printer. The system shall be used to enter set point for weigh hoppers, wagon identification numbers and weight of each car of unit train for visual check for correct feed into the system. In addition, it shall give the operator a visual indication of what is happening during loading operation.

3. Operation of Hopper Outlet Gates and Flood Loading Chute :

Operation of the chutes shall be hydraulic controlled from the loading control console (LCC) located in the control room.

All equipment shall be electrically / mechanically interlocked to ensure starting and stopping of their drives in a sequence or as required for logical operation of the system and adequate time lag will be provided to avoid overloading of the electric/hydraulic system.

The control console (LCC) with VDU display and Laser printer shall be designed to mount in front of the control room windows so that the operator can have full view of the loading operation. These shall have all pertinent control devices and visual indicators.

The console shall generally house the following switches / push buttons required for complete loading operation :-

- i) Auto manual-Emergency Manual mode selector switch for selecting types of loading systems.
- ii) Close-hold –open control switch for Hopper outlet gates.
- iii) Flood loading chute- loading and retracted position control switch.
- iv) Flood loading chute Raise-Hold-Low-swing position control switch
- v) Open-Hold-Closed control switch for flood loading gate for Manual operation.
- vi) Automatic feed cut-off control with weigh hopper weight set point adjustment selector switch.
- vii) Weigh cycle start push button.
- viii) Weigh cycle stop push button.
- ix) Test weight Raise-Hold-Lower position selector switch.
- x) Control power ON / OFF switch
- xi) Hydraulic power start push button
- xii) Hydraulic power stop push button
- xiii) Alarm push button
- xiv) Skip next wagon push button

In addition to the above mentioned switches / push buttons the control console

shall also house visual indicators / lamps to show the following :

- i) Hopper outlet gates 100% open, 75% open, 50%, 25% open and closed for precision feed cut-off
- ii) Hopper out let gates open and closed for the other pair of gates.
- iii) Control supply on.
- iv) High- Intermediate- Low level of coal in the Hopper.
- v) Weight of coal in weigh hopper has reached the pre-set value.
- vi) Flood loading gates open and closed.
- vii) Flood loading chutes in loading position.
- viii) Flood loading chutes in retracted / swung position.
- ix) Flood loading chutes in extended position.
- x) Test weights on.
- xi) Unit train in.
- xii) Wagon in position
- xiii) Panel clock with date.
- xiv) Net weight of coal loaded .

Traffic Control Consoles (TCC)

Microprocessor based Traffic Control Console (TCC) along with photo sensing devices (at required points) shall be provided in Traffic Control Operator's room (TCO) for controlling the movement of trains .

The Master Signal Post (MSP) shall be located at the traffic entry point, and its display shall be automatically controlled. There shall be provision so that automatic signalling may be over ridden by manual operation initiated by the traffic control operator (TCO) from his room. The incoming train shall be clearly visible from TCO's room.

Display of MSP shall be repeated in TCO's control console in traffic control room.

4.3.11 UPS System

Supply and installation of UPSs of sufficient capacity with redundancy shall be made for necessary back up power supply to the plant .

Battery powered back up shall be provided for the system to enable the control system, microprocessor etc. to operate even during the power failure.

4.3.12 CONTROL CIRCUITS / CONTROL VOLTAGES :

Supply voltage of Auxiliary Control circuit & Contactor Coil of MCC shall be 110 V AC. 110 V AC shall be made available from control Transformer (1 operating and 1 standby) of required capacity to be installed in the MCC by the bidder.

For PLC based control system, power supply to PLC unit including relays shall be provided from 415 V / 110V transformer , 415 V / 220 V transformer and

inverter unit as required . Power supply to PLC shall also be made available from the UPS provided .

Supply voltage of Programmable Logic Control Circuit shall be 24 V DC.

24 V DC shall be made available from UPS system.

4.3.13 COMPUTER FOR THE OFFICE OF ENGINEER IN-CHARGE :

2 Nos. PCs of latest model with Laser printers shall be provided for the office of Officer / Engineer In-charge and control room . In addition a laptop shall be provided . The computers shall be complete with necessary software packages for operation of PLC .

Desktop PCs should be complete with UPS of minimum 30 minute back up.

4.3.14 AIR CONDITIONING AND PRESSURISATION SYSTEM

Supply and installation of Air conditioning system will be made in the control room .

Split type air conditioners of 1.5 Te capacity as per requirement should be provided at engineer-in-charge's rooms , maintenance cum testing room, Control room, PLC room.

Switch room shall be pressurised with conditioning of inlet air and control of humidity for proper operation of equipment and comfortable working of personnel inside the room. The number of air changes shall not be less than 15 per hour. The room shall have double door .

The design and construction of all rooms of sub-station shall be such that it shall be possible to prevent entry of dust and at the same time maintaining the proper temperature inside for proper working of the equipment and the personnel.

Sufficient numbers of ceiling fans and exhaust fans shall be provided wherever required.

4.3.15 SELECTION OF EQUIPMENT

All electrical equipment design , supply , installation , testing and commissioning shall conform to Indian Electricity Rules and all relevant Indian Standard specifications and enclosed Annexures ES-1 to ES-14 .

The equipment shall be rated for continuous operation and suitable for heavy coal dust laden atmosphere with an ambient temperature of 50⁰ C and 97 %

humidity . The equipment shall be suitable for operation with the following system particulars :

Utilisation voltage :	415 volts for motors 230 volts (L-L) for illumination
Frequency :	50 Hz
Phase :	3 (Three)
Neutral :	Solidly earthed
Fault level :	31 MVA at 415 V for 1 sec.
Voltage variation :	$\pm 10 \%$
Frequency variation :	$\pm 3 \%$
Control voltage :	110 Volts AC and 220 V DC 24 V DC for PLC

4.3.16 List of equipment (Tentative) : Refer Annexure-III.2

4.3.17 Completeness of Offer:

The details given in the write-up / specifications (including drawings) in respect of electrical system / equipment are indicative only , not exhaustive. The electrical system / equipment shall co-ordinate with mechanical system / equipment of the plant.

If any electrical component or equipment with associated system is considered necessary and desirable as per Indian Electricity Rules amended up to date, or if the same is considered necessary and desirable to comply with the up-to-date engineering practices or with various Indian codes of Practices issued by the I.S.I. New Delhi from time to time the same shall be deemed to be a requirement of this tender specifications and same should consequently be included in the offer not-with-standing the fact that such requirements are not clearly or specifically indicated in these specifications along with the associated drawings.

All the equipment attachments, required for the execution of works as per scope of work as envisaged in the document shall be designed, fabricated erected and maintained for efficient and satisfactory performance, and the bidder shall be solely responsible for the same and the same shall be deemed to be within the scope of the offer / work whether specifically mentioned or not in these documents and the bidder shall not be eligible for any extra claim on this issue.

E. APPROVED VENDORS

Plant and Equipment supplied within the country shall be from approved vendors as listed in "Approved Vendor List" in Appendix-D.

Annexure-III.1**LIST OF MECHANICAL EQUIPMENT AND ACCESSORIES****A: LIST OF EQUIPMENT**

Sl. No	Particulars	Capacity	Quantity (nos.)
1	Pre weigh Hopper	72 T	1
2	Rapid loading System	5500 tph	1 (refer specification)
3	Lift	1000 kg	1 (refer specification)
4	Chain pulley block		lot
5	Dust Suppression /pollution control system		lot
6	Fire fighting & fire detection system		lot
7	Miscellaneous equipment & facilities		
8	Safety equipment		
9	Plant cleaning system		lot
10	Spare parts		

B: LIST OF ACCESSORIES AND FACILITIES

Sl No.	Particulars	Quantity (nos.)
1	Continuous bin level indicator	1 in loading hopper
2	Gas cutting set	1
3	Portable welding set	1
4	Portable compressor for plant cleaning 30 cfm capacity 6 kg/cm ² Pressure	1
5	Special tools and tackles	As received along with the equipment supplied and as required
6	Consumables for start up including first and second fill of lubricants	As required
7	Noise abatement measures to reduce noise level	As required
8	Measures to control vibration so as to keep its level within ISO limits	As required
9	Items /accessories not specifically mentioned but needed for successful commissioning/operation of the plant.	As required

Note : The above quantity are minimum. If required to be increased/decreased during detail design stage, it has to be increased/decreased to suit the system requirement.

The capacity of Chain Pulley Block shall be at least 25% more than the heaviest assembly/ component to be lifted. At the same time, the rating of Chain pulley block shall be standardized to minimize inventory for maintenance and interchangeability.

A: LIST OF ELECTRICAL EQUIPMENT AND ACCESSORIES**Annexure-III.2**

S.N.	Particulars	Qty.
1	MCCB with necessary accessories for tapping power from the existing old sub-station of Madhuband washery at 415 volts including energy meter	2 sets.
2	415 volts Motor Control Centre at the proposed plant for power receipt and distribution to all electrical drives with all necessary control and protective devices	1 set
3	Control transformers of required capacity complete with voltage stabilisers , rectifier and all accessories	1 Lot
4	Illumination system complete with two nos. 100 kVA 415 / 230 volts (L-L) Lighting transformers, Lighting distribution boards , Lighting fixtures , lamps , poles, masts etc. as required	1 Lot
5	PLC , Microprocessor based Control system including control desk , sensors , Local control stations , push button stations , Fault annunciation system , VDUs etc. Dovetailing of hopper in-feed conveyor with level indicators shall be included .	1 Lot
6	UPS system with redundancy complete with batteries , protective and measuring devices and other accessories	1 set
7	Power receptacles as required	1 Lot
8	Communication system as required	1 set
9	Welding system	1 Lot
10	Air conditioners with voltage stabilisers as required	1 Lot
11	Equipment and accessories for Pressurization	1 Lot
12	Power cables of various sizes and grades as required (with laying as per requirement)	1 Lot
13	Lighting cables	1 Lot
14	Control and signalling cables	1 lot
15	Cable trays / racks , cable trenches etc.	1 Lot
16	Earthing system complete with earth pits , earthing strips , conductors etc.	1 Lot
17	Lightning protection system for building and structures	1 Lot
18	Ceiling fans / Exhaust fans as required	1 Lot
19	Computers with printers . Laptop , UPS etc. complete with necessary software packages as required	1 Lot
20	DG set of 100 kVA capacity for emergency lights	1 set
21	Miscellaneous items required for safety and maintenance works , insulating mats , gloves , portable telescopic ladder, furniture etc.	1 Lot
22	Capacitor bank 100 kVAr with APFC	2 sets
23	Testing equipment	1 Lot
24	Any other item required for completion of entire electrical system but not specifically mentioned	1 Lot

Annexure-III.3**Provision of Recommended Spare Parts**

Within the Contract Price, the Employer shall agree to purchase operational, maintenance and standby/contingency spare parts, consumable items, wear materials, maintenance tools and special tools (hereinafter collectively referred to as "Spare Parts" unless the context requires otherwise) in accordance with the Contractor's recommendations for twelve (12) months from the date of issue of the Operational Acceptance Certificate. Similarly within the Contract Price, the Employer shall also agree to purchase consumable items (hereinafter referred to as "Consumables") in accordance with the Contractor's recommendations for twelve (12) months from the date of issue of the Operational Acceptance Certificate. In addition the Contractor shall provide Spare Parts and Consumables for Commissioning and Guarantee Tests as prescribed in the Contract Documents.

Consumables shall not include oils, lubricants, and fluids for the purposes of this Guarantee but the Contractor shall provide all necessary oils, lubricants and fluids for the purposes of Commissioning and Guarantee Tests in accordance with the Contract.

In the event that the Spare Parts and Consumables, as recommended by the Contractor, in any way fall short of actual requirements during the period for which they are said to be adequate, the Contractor shall provide such additional Spare Parts and Consumables as are necessary at the final destination. Such additional Spare Parts and Consumables shall be provided by the Contractor to the Employer free of all cost and shall be transported to Site by air freight internationally and by air, rail or fast road transport within India.

In the event that the Spare Parts and Consumables, as recommended by the Contractor, are in excess of actual requirements. The Employer may at its option :

- (a) Retain such excess Spare Parts and Consumables as, in its discretion, it may elect to do so ;
- (b) Require the Contractor to repossess or repatriate or otherwise dispose of such excess Spare Parts in exchange for payment to the Employer of the Contract Price of the Spare Parts and Consumables concerned : and

the Employer shall notify the Contractor, in writing of its requirements under this Clause within thirty (30) days of completion of the period referred to above.

In the event that operation of the Facilities is inhibited or frustrated as a direct result of lack of Spare Parts and Consumables then the period referred to above shall be extended by a period of not less than the period during which operation as aforesaid was inhibited or frustrated.

The Contractor shall not be liable for the supply of additional Spare Parts or Consumables, nor to extend the period referred to above, if and to the extent that, additional Spare Parts and Consumables are required by reason of unforeseen accidents, negligence or misuse on the part of the Employer.

The assessment of the Bidder of the spare parts requirements shall be based upon the maximum number of working hours per year as defined in the Technical Specifications.

The assessment of the Bidder of the spare parts requirements shall not consider the Mandatory Spare Parts called for by the Employer.

The Contractor may, subject to the prior written consent of the Project Manager, access the recommended spare parts for the purposes of effecting repairs/replacements to the Facilities under the Defect Liability of the Contractor provided always that any item of these Spare Parts and Consumables so used are replaced in the most expeditious manner by the Contractor and at no cost to the Employer. If the Contractor does not replace items in a timely manner then the Employer may procure such items independently of the Contractor and charge the Contractor with all costs associated therewith.

Annexure-III.3**LIST OF MANDATORY SPARE PARTS****A: MECHANICAL**

Sl. No.	Description of spare parts	Quantity
1.	Motors (LT)	1 each of every type for RLS
2	Load cells for pre weigh hopper	One set for each hopper
3	Bearings of gates	1set for each type
4	Cylinders	1set for each type

LIST OF MANDATORY SPARE PARTS**B: ELECTRICAL**

Sl.no.	Item	Quantity
1.0	415 volts Motor	
1.1	One complete spare motor for each type and size	As required
1.2	One set of bearing for each type of motor	As required
2.0	LT switch Gear	
2.1	Ammeter selector switch	1 set
2.2	Voltmeter selector switch	1 set
2.3	Over current relay	1 set
2.4	Under voltage relay	1 set
2.5	Over voltage relay	1 set
2.6	Pilot lamp (Red)	2 sets
2.7	Pilot lamp (Green)	2 sets
2.8	Pilot lamp (White)	2 sets
2.9	Pilot lamp (Orange)	2 sets
2.10	Control fuse 2A,4A,10A	30 sets each
2.11	CT	1 set
2.12	PT	1 set

Sl.no.	Item	Quantity
2.13	Auxiliary relay	5 sets
3.0	Transformer	
3.1	Silica gel	1 set
3.2	All sizes of gasket	1 set
4.0	Illumination	
4.1	40 W Fluorescent lamp / CFL	10 Nos.
4.2	HPSV / Metal Halide lamp of each size	10 each

Anexure-III.4**LIST OF TOOLS AND TACKLES****A. Mechanical**

Tools and tackles required for day to day maintenance and repair shall be provided.

LIST OF TOOLS AND TACKLES**B. ELECTRICAL**

Sl. No.	Nomenclature	Quantity
1.	Bridge megger	
1.1	1000 volt	1 No.
1.2	5000 volt	1 No.
2.	Tong Tester - LT	3 Nos.
3.	Relay testing equipment with electronic timer	1 No.
4.	Testing board for different equipment with digital ammeters and voltmeters	1 No.
5.	Earth tester	1 No.
6.	AVO meter	2 Nos.
7.	Rubber insulating mat	1 Set
8.	Lux meter	2 Nos.
9.	Tacho-meter	2 Nos.
10.	Cable fault detector digital type	1 No.
11.	Contact pressure testing and adjusting for relays	1 No.
12.	Tools and testing equipment for programmable logic controller system	1 Set
13.	Soldering Iron kit	1 Set
14.	IC soldering kit	1 Set
15.	Oscillograph	1 Set
16.	On line IC Checker	1 Set
17.	Set of special tools including tools for overhauling and adjusting peripheral devices	1 Set
18.	Rubber Hand gloves having insulation level 15 KV	8 Pairs
19.	Self supported trolley mounted telescopic ladder	1 Set
20.	Crimping tool with dies, hydraulically operated	1 Set
21.	Vibration meter	1 No.
22.	Sound level meter	1 No.
23.	Portable temperature recorder with thermostat	2 Nos.
24.	Portable bearing condition monitor	2 Nos.
25.	Any other standard testing equipment	1 Set

APPENDIX-DAPPROVED VENDORS LIST FOR MECHANICAL AND ELECTRICAL EQUIPMENT

The makes of various equipment are listed out hereunder. It is essential that bidder/ contractor shall source its equipment from any of the makes listed against that particular equipment in the list. In case the bidder/ contractor intends to add any particular make of equipment by a make other than that listed hereunder, the same shall be done during the execution of the work after getting competent approval from the employer.

SL.N O.	ITEM DESCRIPTION	NAME OF APPROVED MANUFACTURERS
1.	ACTUATORS	: TECHNO-MECH. ENGINEER/ ACTUATORS INDIA / INDIAN ENGG. WORKS
2.	AIR BLASTER	: TECHNOFAB/ LINEMANN HALFLO, U.K. / DSI/ TEGA / MM FABRICATOR / Kavary Ultra Polymers
3.	BUNKER LEVEL INDICATOR	: UPTRON / ENDRESS & HOUSER/ NIVO CONTROLS / AUTO MEASUREMATIC / MONITOR CONTROLS / EPI INSTRUMENTS / HEIN-LEHMANN/ EIP BULK CONTROLS/ KISTLERMORSE
4.	CHUTE LINER	: TEGA / KAVERI /DEVI-RUBBER / WEAR RESISTANT TECHNOLOGIST / DURAWELD WEARPLATES.
5.	CHAIN PULLEY BLOCK	: INDEF / TRACTEL TIRFOR / GREAVES COTTON / BATLIBOI / TURBO FURGUSON / ELEMECH HOIST / GRIP ENGINEERS / REVA ENGG./ KANUBHAI // SUREKA/ ARMSEL
6.	DUST SUPPRESSION	: BATLIBOI/ F. HARLEY/ GEC/ VENDON INDIA LTD. / THERMAX / ANDREW YULE/APC/ PROJECTS AND CONTROL/ Kavary Ultra Polymers
7.	DUST EXTRACTION	: FLAKT INDIA / ANDREW YULE / GEC / THERMAX/ DUVANT/ ABB INDIA / DUST VAN/ PROJECTS AND CONTROL/ INDVENT FANS / ARGOSY INCORPORATED / ALSTOM/ APC / NELSON
8.	ELECTRIC HOIST	: HOIST-O-MECH/ GREAVES COTTON/ ELEMECH HOIST/POWER BUILD/ KANUBHAI/ INDEF/ BATLIBOI/ BRADY/ TRACTEL TRIFOR / HITECH/ TURBO-FURGUSON/ GRIP ENGG./ SWIFT (GREAVES)/ KM ENGG./ SUREKA/ ELITE STEELS/ ELECTROMECH MHS.
9.	E.O.T. CRANES	: HOIST-O-MECH / ELEMECH HOIST / GARLIC / TURBO FERGUSON / GRSE / JESSOP & CO. / KANUBHAI / WMI CRANES LTD. / HEC / HYD. IND. LTD./ UNIQUE/ ANUPAM INDUSTRIES LTD./ELITE STEELS/ ELECTROMECH MHS.
10.	FREIGHT-CUM-PASSENGER LIFT	: OTIS /MITSUBISHI, JAPAN /KONE/ THYSSEN-KRUPP
11.	FIRE FIGHTING SYSTEM	: MINI-MAX/ THERMAX/ VIJAY/ F.HARLEY/ APC/ TECHNOFAB/ STEELAGE/ TECHNO INDIA/ PROJECTS & CONTROL/ HD Fire Protect Pvt. Ltd.
12.	MOTORISED FLAP GATE	: TECHNO-MECH/ ACTUATORS INDIA/ PRECISION/ MERIT TECHNOLOGIES.
13.	PUMPS	: MATHER & PLATT/ KIRLOSKAR/ GREAVES COTTON / JYOTI / MAMC /HUMBOLDG WEDAG / DORR-OLIVER / HYD. IND. / KSB/ BEACONWEIR
14.	RAPID LOADING OUTFITS	: STRATEGIC WEIGHING SYSTEMS/ MERIT TECHNOLOGIES/

SL.N O.	ITEM DESCRIPTION	NAME OF APPROVED MANUFACTURERS
		RAMSEY/ Schenck Process India Ltd./ Essae Digitronics(Kanawha RLS)
15.	VENTILATION SYSTEM	: FLAKT INDIA/ C.DOCTOR & CO./ MAMC/ VOLTAS / BATLIBOI / ABB INDIA / ANDREW YULE/ DUST VAN/ PROJECTS AND CONTROL/ INDVENT FANS/ ARGOSY INCORPORATED / ALSTOM/ APC/ NELSON

APPROVED VENDORS LIST FOR ELECTRICAL EQUIPMENT

1	MOTOR (L.T.)	: KIRLOSKAR/ BHEL/ SIEMENS/ MARATHON ELECTRIC MOTORS/ JYOTI/ NGEF/ ABB/ CROMPTON GREAVES/ BHARAT BIJLEE/ INTEGRATED ELECTRIC COMPANY LTD/ LAXMI HYDRAULICS PVT. LTD./ BALDOR ELECTRIC
2	LIGHTING TRANSFORMER	: KIRLOSKAR/ BHEL/ BHARAT BIJLEE/ GE INDUSTRIAL/ CROMPTON GREAVES/ ANDREW YULE/ SIEMENS/VOLTAS/ ABB/ NGEF/ L & T / POWER MASTER ELECTRICAL PVT. LTD/ Transformers & Electricals/ Tesla Transformers Ltd./ ELECTRO TEKNICA
3	CONTROL TRANSFORMER	: L&T/ SIEMENS/ JYOTI/ GE INDUSTRIAL/ NGEF/ KIRLOSKAR/ BHARAT CUTLER HAMMER
4	LT SWITCH BOARD PANEL/ MOTOR CONTROL CENTRE/ AIR CIRCUIT BREAKER / MCCB / MCB / RCCB	: NGEF/ L&T/ ANDREW YULE/ GE INDUSTRIAL / JYOTI/ SIEMENS/ BHARATIA INDUSTRIES LTD./ ABB/ EASUN ENGG/ CROMPTON GREAVES/ KIRLOSKAR/ SYSTEMS / SCHNEIDER/ CONTROL & SWITCHGEAR COMPANY/ MINILEC(INDIA) PVT LTD/ STANDARD/ ELECTRICALS LTD/ JOLLY ENGG./ TRANSGIETZ/ MEGAWIN SWITCHGEAR/ MEDITRON/ Amiya Industries/ ZENITH CONTROLS/ HPL India./PRAYAS AUTOMATION/ AC Power System/ ELECTRO TEKNICA/Voltech Controls and Automation Pvt Ltd./ OPG Power Systems
5	P.F.CORRECTION EQUIPMENT	: ABB/ MADHAV CAPACITOR/ GE INDUSTRIAL / VOLTAS/ YESHA/ KHATAU JUNKER/ BHEL/ UNISTAR/ NGEF/ BHARATIA INDUSTRIES LTD./ EPCOS.
6	POWER CABLES & CONDUCTORS	: CABLE CORPORATION/ FORT GLOSTER/ UNIVERSAL CABLES/ NICCO/ PREMIER CABLES/ HINDUSTAN CABLES/ INCAB/ ASEAN / HAVELLS/ RADIANT/ LASER CABLES/ SKYTONE/ LUMINO/ SIECHEM / Ravin Cables Ltd./KEI INDUSTRIES
7	CONTROL CABLES	: CABLE CORPORATION/ FORT GLOSTER/ NICCO/ ASEAN/ UNISTAR/ HINDUSTAN CABLES/ K.D.K./ RAJNIGANDHA CABLES/ HAVELLS/ RADIANT/ LASER CABLES/ SKYTONE/ SIECHEM/ Ravin Cables Ltd./ KEI INDUSTRIES
8	COMMUNICATION CABLES	: HINDUSTAN CABLES/ DELTRON/ TOSHNIWAL/ INCAB / VINDHYA TELELINK LTD/ SIECHEM.
9	COMMUNICATION SYSTEM/ EQUIPMENT	: ITI/ PHILIPS / MOTWANE/ TATA TELECOM / UPTRON/ GE INDUSTRIAL / ECIL/ CROMPTON GREAVES
10	LIGHT FITTINGS	: PHILIPS/ CROMPTONS/ GE INDUSTRIAL / BAJAJ/ ECE / GLOLITE /ANCHOR

11	RELAYS / Control and relay panel	: GEC ALSTOM/ L&T/ UNIVERSAL ELECTRIC/ SIEMENS/ KIRLOSKAR SYSTEMS/ A.V.K.-S.E.G. CONTROLS LTD./ BCH / EASUN REYROLL / ABB /ANDREW YULE/ TELEMECANIQUE/ / BHARATIA INDUSTRIES LTD. / CONTROL & SWITCHGEAR COMPANY LTD/ MINILEC(INDIA) PVT LTD / SAIT Mine Line. / MEGAWIN SWITCHGEAR/ Amiya Industries / Voltech Control and Automation/ JOLLY ENGINEERING
12	PLC	: L&T/ SIEMENS/ ALLEN BRADLEY/ KELTRON/ UPTRON/ TTS SYSTEMATIC PVT. LTD./ ABB/ MITSUBISI/ SCHNEIDER/ GE FANUC/ BHARATIA INDUSTRIES LTD/ MINILEC(INDIA) PVT LTD/ HONEYWELL/PRAYAS AUTOMATION
13	CT'S & PT'S	: ELECTRIC POWER EQPT./ EASTERN SWITCHGEAR/ AUTOMATIC ELECTRIC/ POLYCRETE LTD. / KAPPA/ ABB /CONTROL & SWITCHGEAR COMPANY LTD. / MAX ENERGY PVT. LTD./ APE POWER PVT. LTD./ MEGAWIN SWITCHGEAR/ Electroteknica switchgears.
14	L.T. CONTACTOR	: SIEMENS/ L & T/ BHARATIA INDUSTRIES LTD./ GE INDUSTRIAL / ANDREW YULE/ JYOTI / HAVELL'S/ KIRLOSKAR SYSTEMS / ABB / TELEMECANIQUE
15	PUSH BUTTON; INDICATING LAMP	: L&T/ SIEMENS/ ESSEN/ BCH/ BHARATIA INDUSTRIES LTD/ RASS CONTROLS/ Hotline Switchgears & Control.
16	CONTROL SWITCHES	: L&T/ KAYCEE/ JYOTI/ ESSEN/ SIEMENS /HAVELL'S
17	ISOLATING SWITCHES	: SIEMENS/ L&T/ BHARATIA INDUSTRIES LTD./ ANDREW YULE/ GE INDUSTRIAL/ JYOTI/ CROMPTON GREAVES/ HAVELL'S/ TELEMCHANIQUE / ABB/ CONTROL & SWITCHGEAR COMPANY / MINILEC (INDIA) PVT LTD /STANDARD ELECTRICALS LTD
18	CONTROL CONSOLE WITH COMPONENT	: L&T/ SIEMENS/ JYOTI/ NGEF/ GE INDUSTRIAL/ KIRLOSKAR SYSTEM/ ANDREW YULE/ APLAB/ ABB/ ALLEN BRADLEY/ BHARTIA INDUSTRIES LTD/ MINILEC (INDIA) PVT LTD/ SKYTONE/ ZENITH CONTROLS
19	BATTERY & BATTERY CHARGER, LOAD BANK, ANNUNCIATOR	: CHLORIDE/ STANDARD/ AMCO / INSTANT SOLUTIONS
20	(a) LIGHTENING ARRESTER	: ICE/ OBLUM/ IGE (I) LTD./ WS INSULATORS/CROMPTON GREAVES/ SATCOM ELECTRONICS
	(b) EARTHING SYSTEM/ SURGE PROTECTION SYSTEM	: SATCOM ELECTRONICS / M/s Jef Techno Solutions Pvt Ltd.
21	WELDING TRANSFORMER/ MG WELDING SET	: ADVANI OERLICON/ INDIAN OXYGEN/ PHILIPS/ ESAB
22	DG SET	: KIRLOSKAR ELECTRIC/ CUMMINS/ LEYLAND / JYOTI/ SRI RAM HONDA/ YAMAHA
23	TIMER	: BCH/ TELEMECANIQUE/ L&T/ SIEMENS/ GE INDUSTRIAL / ABB/ MINILEC(INDIA) PVT LTD.
24	ELECTRO MAGNETIC BRAKE	: ELECTROMAG/ PBL/ Industries syndicate / BCH
25	METERS	: AEP/ IMP/ HPL INDIA/ Hotline Switchgears & Control
26	SELECTOR SWITCH	: L&T/ SIEMENS/CROMPTON/ BHARTIA INDUSTRIES LTD/ RASS CONTROLS.
27	HRC FUSE	: GE INDUSTRIAL / L&T/ SIEMENS/ STANDARD/ ABB/ CONTROL & SWITCHGEAR COMPANY LTD/ STANDARD ELECTRICALS LTD./ MEGAWIN SWITCHGEAR.

28	HOOTERS	:	TULLU/ NATIONAL/ Hotline Switchgears & Control
29	AIR CONDITIONER	:	ACCAIRE/ BLUE STAR/ VOLTAS/ GODREJ/ CARRIER
30	DCS, SCADA, CCTV and RTU for Sub-station automation and Electrical SCADA	:	HONEYWELL
31	Automatic Voltage Regulator	:	Transformers & Electricals
32	Level Switches, Chute Block Detector, Level Detector, Level Transmitter	:	Protocontrol Instruments.
33	Proximity Switches (Inductive, Capacitative, Optical, Magnetic, Ultrasonic)	:	Protocontrol Instruments.
34	C.I. Earthing Pipes-ELECTRODE	:	Kapilansh Dhatu Udyog
35	Terminal Blocks / Interface Modules	:	Elmex Controls Pvt Ltd
36	SOFT STARTERS/VARIABLE FREQUENCY DRIVE PANEL	:	Danfoss Industries Pvt Ltd./PRAYAS AUTOMATION/ Parker Hannifin India Pvt Ltd.

SUB-SECTION : 7.3

S C O P E O F W O R K S
(CIVIL)

7.3 CIVIL AND STRUCTURAL WORKS

7.3.1 GENERAL

The scope of work under this contract shall include design, construction and successfully commissioning of all civil and structural works, supply of detailed survey drawing showing contour, geo-technical investigation including the supply of geo-technical report, supply of detailed design, working drawings including all relevant calculations and all necessary works as may be needed for testing and commissioning, elimination of all teething trouble, performance test and handing over of the plant as envisaged in detailed scope of work and system description. The necessary construction, erection, commissioning equipment related to civil engineering works shall be provided and transported to the site of work by the contractor. Due consideration shall be given for economy, architecture and functional utilities. This is a contract for purchase of complete installation including planning and design, manufacture, execution, supply, erection of civil & structural work. Accordingly, all works needed for successful completion and operation of the plant shall be covered in the Scope of work whether specifically mentioned here or not.

Adherence to Indian Standards

All the works including designs, drawings, construction, fabrication, testing, erection, etc. shall be done strictly as per relevant BIS Code of Practices. Wherever no Indian Standard is available, British, American, German, Soviet or other international standards may be used only as per its applicability and justification.

7.3.2 Basic scope

The scope of work covers all the related civil and structural works, detail designing of the same and successfully commissioning of the civil and structural works for handing over the plant. This shall inter-alia, include the following:

7.3.2.1 Design & engineering of all civil and structural works of the plant.

7.3.2.2 Execution of all civil/structural works consisting of the following:

- a) Detailed survey of site including contour map preparation.
- b) All the geo-technical investigation required for the work including furnishing the geo-technical report, Collection of hydrological, blasting and rainfall data including any other data related to design and execution.
- c) Preparation of construction site.
- d) Supply of fabricated structural steelwork and shaped re-bars as required.
- e) Supply of all civil construction materials and other materials required.
- f) Execution of all civil works.
- g) Fabrication/erection of structural.
- h) All civil and structural works required for housing and installation of equipment and accessories under supply.
- i) Excavation/ construction/ erection/ installation and commissioning of all auxiliary services such as sanitary, drainage, roads, retaining walls, pavements, office and service buildings, lighting towers, landscaping/ grading/ levelling/fencing/site clearing as detailed elsewhere.
- j) Transportation of all construction materials to site, whether procured within the country or from other countries.
- k) Water supply arrangement for potable, industrial and fire fighting purposes.

- l) Drainage and sewage treatment (for domestic and industrial sewage) including its dovetailing with the existing system.
- m) Fire fighting arrangement.
- n) Roads, pavements, retaining walls, culverts, etc.
- o) All the protective measures for proper drainage for safety of structures, against ingress of water / seepage due to seasonal nallahs and its tributaries which are flowing through the construction site area as per actual site conditions and requirement.
- p) All the protective measures for safety of men and materials during construction against rail/dumper movements on existing railway tracks/haul roads.

7.3.2.3 Erection and commissioning of all the plants and equipments.

7.3.2.4 Inspection and testing.

7.3.2.5 Performance guarantee.

7.3.2.6 Perception and remedial measures for the safety of entire CHP area under the scope keeping in view the adjoining natural and artificial features such as hill slopes, nallah, buildings, etc.

7.3.2.7 Any other works/services not mentioned but required for the completion and commissioning of the plant.

7.3.3 DESIGN /ENGINEERING

7.3.3.1 Design Criteria

All detailed design and working drawings will be developed with proper co-ordination and inter-relation with mechanical and electrical equipment. The design of RCC structure shall be carried out in general as per code of practice of plain and reinforced concrete for general buildings construction BIS 456-2000 and other relevant standards including up-to-date amendments. The steel structure shall be designed and fabricated as per Code of practice for use of structural steel in general building construction BIS 800 (latest edition) with up to date amendments and other relevant IS standards. The building/structure shall conform to local by-laws, rules and regulations for industrial buildings and as per relevant Indian Standards. Latest codes of practice with amendments up to date shall be strictly followed. In the absence of BIS codes, British standards Institution or the approved international codes could be considered for design as per its applicability and justification.

The bidder shall be responsible for and shall pay for any alterations of the work due to any discrepancies, errors or omissions in the design and drawings or other particulars supplied by him, whether such design, drawings or other particulars have been approved by customer or not.

7.3.3.2 Load consideration

Loads to be considered in design shall be as per relevant BIS codes of practices. Generally, in design the effect of dead loads, live loads, load due to impact, vibration, erection, wind load, seismic loads, dust load and load due to surcharge and moving vehicles, effect of blasting etc. wherever applicable shall be considered. The loads due to equipment shall be supplied by the bidders. In general, live load, wind loads, etc shall be as per BIS-875 (latest edition). Seismic loads to be considered in design shall be as per BIS 1893 (latest edition). The maximum bulk density of coal will be taken as 1.15 Te/m³ for load design

calculation in respect of coal retaining structures. Effect due to blasting is to be considered while designing the structures, as per the provision of BIS: 6922 with latest revision:

7.3.3.3 The topography factor for the calculation of design wind pressure shall be calculated as per BIS 875 read with the latest amendment.

7.3.3.4 Analysis & Design

All RCC and steel structure shall be designed in accordance with relevant IS Codes of practice of latest revision. In the analysis of structures, the worst loading combination of belt pulls, equipment loads, their impact, wind/seismic loads/blasting effect, coal and other loads as envisaged shall be considered.

7.3.3.5 Design drawing & detailed engineering

Broadly all the dimensions as given in NIT drawings are to be followed for bidding purpose. These dimensions are indicative & may require changes during detail design.

Preparation

All the drawings shall be prepared in accordance with the provision of latest Indian Standards. All drawings shall be sufficiently detailed and dimensioned to help in speedy construction, fabrication and erection of structures. Wherever, any structure is presented in more than one sheet of drawings, same scale and notations shall be used in all the sheets for linking the drawings with each other. All modifications made in structure during various stages of construction should be duly incorporated in working drawings.

Bar bending schedule, detailed material list and specification of works shall be prepared / detailed. Working drawing shall also include general arrangement drawings showing plans at different levels with sectional elevations. Separate detailed drawing shall be prepared for inserts and anchor bolts including their fixing details. The design drawings associated with steel structure should show the force in the members, complete details of all members, joints, gusset plates, welding, riveting, bolting, etc. The drawings should also show the weight of each assembly/sub-assembly as far as possible. In addition to design drawings, fabrication drawings shall also to be prepared, showing item-wise details, erection units, materials list, details of fasteners with assembly, etc.

7.3.3.6 Submission of Design/Drawings

The contractor shall submit Geo-technical report, all the relevant detail design calculations, general arrangement/detail drawings, bar bending schedule, detailed material lists, specification of works including contour plan for approval of owner / consultant on standard size sheet.

Scrutiny and approval of drawings may be carried out through the consultant engaged by owner. All design details and drawings shall be submitted for approval of the following:

General Arrangement Drawings

Detail design calculations

All detail civil/structural/fabrication drawings

Any other drawings relevant for execution/fabrication of civil/structural works

Contractor shall submit for approval six sets of drawings along with detailed design calculations including analysis of force/stress in the structure along with the source from where data, except BIS codes, have been taken. Photocopies of such data should be submitted along with the design.

7.3.3.7 Procedure of Approval of drawings

The Owner shall have the final say in the approval of drawings. Drawings so submitted will become the property of the Owner. The approval of the drawings does not absolve the Contractor from the overall responsibility of the plant for its successful operation. The Contractor shall be responsible for and shall pay for any alterations of the work due to any discrepancy, errors or omissions in the drawings or particulars supplied by him, whether Owner has approved such drawings or other particulars.

Approval by Owner / Consultant

Design & drawing, submitted by the contractor, shall be scrutinised by owner/consult. Out of six sets of drawing submitted to the owner, one copy will be sent to contractor after scrutiny with comments, modification or approval as the case may be. The contractor shall carry out the necessary rectification in drawings after discussion with owner in a reasonable time as agreed upon mutually and re-submit six copies of such revised drawings for approval of owner. Revised drawings shall then be scrutinised and approved if the comments made by the Owner are incorporated / taken care of. One copy of such drawing will be sent to the Contractor after approval.

7.3.3.8 As Built Drawings

Contractor shall make necessary correction / modification in the drawing as per actual work and shall prepare as built drawing. The Contractor shall supply such 8 (eight) sets of prints of as built drawing to the Owner along with one set of reproducible drawings on polyester paper in ink. The same will hold good for other documents also to be supplied by the Contractor under the heading of basic scope. All drawings should be prepared on AutoCAD in standard format and CD containing such drawing shall also be supplied along with hard prints.

7.3.4 Pert Network

After the issue of letter of Intent, the bidder will prepare a master plan PERT NETWORK incorporating all the major activities for the successful installation and commissioning of plant on turn key basis and submit it to customer for his approval and comments.

The detailed PERT NETWORK will be prepared for all major activities enlisted in the master PERT NETWORK. The detailed PERT NETWORK will be further discussed with customer and form the basis of monitoring of the project as a whole or activity wise. Necessary corrections will be carried out from time to time by the

bidder in consultation with the representative of customer but within the overall limit of time as described in master NETWORK. All the activities of the contract will proceed on the line of approved PERT NETWORK.

7.3.5 Technical specifications

7.3.5.1 Technical specifications of civil works

All workmanship, materials and work items shall confirm to relevant IS / BIS / MORTH / NBC STANDARDS. In case of items not adequately covered by above mentioned Indian Standards, the CPWD / NBO practices shall be followed:

7.3.5.2 Safety Measures for civil works

In respect of safety, Part – 7 Constructional Practices & Safety of National Building Code – 2005 shall be followed. All necessary safety measures to be adopted as recommended by relevant IS / BIS code to protect adjunct / nearby structure, workmen etc.

All works shall be carried out as per the item description and design & drawing supplied by the company, as per the relevant IS / BIS / NBC – 05 as per direction of the Engineer-in-Charge.

7.3.6 DETAILED SCOPE

7.3.6.1 General

The civil and structural work under, its scope shall cover all aspects of work, including soil and hydrological investigation, collection of rainfall data, detailed survey, preparation of preliminary drawings with proper co-ordination and inter relation with equipment, detailed design and preparation of the complete civil and structural working drawings, execution and erection of the complete civil and structural works, including roads and pavements, sanitation, water supply for industrial, drinking and fire fighting purpose besides water supply to various buildings and structure for dust suppression and extraction and cleaning as per system requirement and land development.

The execution of civil and structural work consist of providing all labour, supervision, materials, scaffolding, construction equipment, tools and plants, supply, transportation, and all incidental items not specified but implied for successful completion of the works in accordance with drawing and specification including any fee, tax, royalty as may be applicable in the work zone.

The nature of work shall generally involve chemical testing of construction water for corrosive action of chemical and other deleterious materials, earth work in filling and excavation in all types of soil and rock, dewatering, shoring, back filling around completed structures, disposal and form work, brick work fabrication and erection of structural/miscellaneous steel, inserts, anchor bolts, RCC/chequered plates trench covers, laying of water pipe lines, sewerage system, roads, surface and storm water drainage, ventilation related to the coal handling plant, damp proofing and other ancillary items.

The drawings as mentioned elsewhere in this contract documents give a general idea about the work to be performed.

These are preliminary drawings for bidding purpose only and are by no means the final drawings showing the full range of the work under the scope. Work has to be executed according to approved working drawings, fabrications drawings with additions, alterations and modification made from time to time as required or approved by the customer.

7.3.6.2 Main components of loading point structure

The civil and structural works are related mainly to the following areas.

7.3.6.2.1 Loading hopper

Loading Hopper (RCC) shall consist with all provision of civil and structural work for accommodating i) Control Room ii) Lift & Stair This shall be designed and constructed as per system drawing.

7.3.6.2.2 Loading complex

Loading complex with concrete hopper of 500 tonne with 72 tonne pre weigh hopper attachment with suitable chute for discharging coal to the wagon, elevator, staircase etc. shall be designed and constructed as per system requirement as shown (E&M) system drawing. Lift and staircase structure shall be constructed adjacent to the loading hopper structure as per the (E&M) system drawing.

7.3.6.2.3 One sub-station to be constructed of RCC structure with the requisite area near loading point.

7.3.6.2.4 Service Buildings

- | | | |
|-----|---|--|
| a) | Service building such as Control Room adjacent to loading point (Refer Plate-3) | Plinth area 32 m ² (minimum) |
| (b) | Sub-Station –One no. to be made | Plinth area 176 m ² (minimum) |
| (c) | Lift & Stair Room –one (Refer Plate-3) | Plinth area 36 m ² (minimum) |

However, the area and height of the buildings / rooms shall be sufficient to accommodate the equipment proposed to be installed there following IE rules and Indian standard code of practice.

7.3.6.2.5 Road, Pavement should be made near the bunker structure as per I.S. Standard at the site as per requirement.

7.3.6.2.6 Drainage, sewerage system to be provided at the site as per requirement

7.3.6.2.7 Water supply arrangement including receiving, storage and distribution of water for fire fighting and dust suppression purposes - As per requirement. (Potable and industrial water shall be made available from the existing installation). One ground sump of 350 cum capacity shall be provided with necessary pump and pump house for this purpose.

7.3.6.2.8 Other Works and requirements

- i) Development works such as grading/levelling/dressing of the site etc.

- ii) Architectural requirements
- iii) Fire fighting
- iv) Dust suppression
- v) Plant cleaning
- vi) Survey, Soil investigation and collection of rainfall and hydrological data
- vii) Earthwork in excavation
- viii) Construction, Fabrication, Erection and Commissioning
- ix) Inspection and testing
- x) Perception and remedial measures for safety and successful operation
- xi) Other miscellaneous works/services/requirements etc. as may be necessary for successful commissioning of the plant.

7.3.7 DETAILS OF MAIN COMPONENTS AND OTHER MISCELLANEOUS WORKS

7.3.7.1 Loading complex

The loading complex shall be as per E&M system drawing and shall include concrete hopper of 500 tonne capacity with 72 tonne pre weigh hopper attachment with suitable chute for discharging coal to the wagon, lift staircase etc. The loading point structure shall be of reinforced cement concrete construction with concrete 500 tonne hoppers with 72 tonne pre weigh hopper attachment, with suitable chute for discharging coal to the wagon,, control room staircase and lift.

The Bunker shall be designed on mass flow condition so as to achieve the required loading rate without bridging, arching and rat holing inside the bunker.

Internal lining of the Bunker/Hopper shall be as given below :

a)	Hopper Wall portion (Conical Inside Wall)	-	8 mm thick stainless steel plate liners with 409 M grade steel.
b)	Hopper Wall (Vertical wall)	-	25 mm thick ferrosite lining

The plate liner shall be provided / fixed in such a way as to enable its replacement in case of wear.

Arrangements for installation of one number of pre-weigh hopper of 72 tonne capacity with suitable chute for discharging coal to the wagon has to be made. There shall be sufficient areas of platforms and floors below hopper with proper accessibility and head room for inspection and maintenance of pre weigh hopper gates and its allied equipments.

The Hopper top platform shall be of RCC slab with necessary openings for the inflow of coal. Structures above this platform shall be of structural steel and will house the head drum, drive units etc. as elaborated in the system drawing.

There shall be sufficient areas of platforms and floors below the Bunker hopper with proper accessibility and head room for inspection and maintenance of pre-weigh hopper gates and its allied equipments.

The connection between 500 tonne. concrete hopper openings and pre weigh hopper shall be adequately designed to avoid any slippage. Stainless steel or non corrosive bolts with nuts and washers shall be provided to connect the pre weigh hopper with bunker.

All the facilities of maintenance, hoist, monorails etc. shall be provided as per system drawing. All the necessary inserts shall have to be provided for fixing cables etc

Scope of this work includes the complete design and construction concrete hopper of 500 tonne with 72 tonne pre weigh hopper attachment with suitable chute for discharging coal to the wagon up to top cover level and associated structures at the top . In this context, the tenderer shall investigate the soil condition at site of construction in detail at their own cost at the time of design/construction.

Control room will house electrical and control equipment including mimic panels for entire loading system including control console, CRT display and printer etc. It shall be provided with air conditioning facilities with provision of fully glazed aluminium double door and false ceiling. Fully glazed fixed panels in aluminium frame with toughened glass sheet shall be provided on the loading chute side for clear visibility of loading operations from control panel. All the internal surfaces of control rooms shall be finished with plastic emulsion paint of approved quality and shade or any other finish depending upon functional need. Suitable PVC flooring shall be provided.

7.3.7.3 Service Buildings

7.3.7.3.1 General

All the buildings except otherwise mentioned below shall be of RCC framed structure construction plastered and finished with cement based paint outside. However, lighting tower may be of structural steel. The areas for the various service buildings to be provided shall be as given earlier. Plinth level of service buildings shall be 450 mm (minimum) above final accepted graded level around the buildings or as specified elsewhere in this document. Steel doors, rolling shutters, collapsible gates and steel windows are to be fitted as per requirement. Steel windows shall be glazed with wired glass and suitable grills of square bar. All the buildings shall be given pre-construction anti-termite treatment. The floor shall be of terrazzo type or any other type depending on the functional requirement. The internal surfaces shall be finished with plastic emulsion paint of approved shade or any other finish depending on functional need.

7.3.7.3.2 Toilet

Toilets shall be provided as per requirement. The facilities shall include water closet, urinals, wash basin looking mirror, cistern, towel rail, glass shelf, flush doors etc. The skirting up to a height of 1.5 m shall be of glazed tiles. The floorings shall be mosaic.

7.3.7.3.3 Substation

A new sub-station with control room is to be built up near the proposed loading point to cater power to all the electrical drives , illumination and control systems for the proposed plant . This sub-station shall receive power at 415 volts from the MCC (Motor Control Centre) of existing old Madhuband washery sub-station through two nos. of cable feeders burried underground .

The substation will have transformer rooms, MCC rooms, tool room, generator room, control room, Engineer-in-charge room, electrician room, etc. with toilet facilities. The flooring of the building will be as per the functional/safety requirement. The details of plastering, brick work, RCC work will be as per technical specification which has been mentioned elsewhere in this document. The details of equipment have been mentioned in the electrical sections of the document. The layout of the cable trench will be as per system requirement. The invert level of the cable trench shall be kept minimum 0.5 m above finished ground levels and the plinth of the building shall be fixed accordingly. The building shall be provided with RCC roof. There will be suitable arrangement for lifting the transformer in case of breakdown/maintenance for which suitable RCC paved platform shall be constructed at same level out side the substation building to facilitate handling of the transformer and other equipment. The scope covers construction of complete building with cable trench and foundation of the equipment in all respect.

Pressurisation in MCC rooms of sub-station shall be done. Air conditioning facilities shall be provided in all control rooms of sub-station. The entrance to both the MCC room, control room shall have double doors suitably designed to prevent sudden pressure loss. The flooring in MCC room and switchgear room shall be of IPS with insulating rubber matting. Air required for pressurisation of MCC room shall be free of dust. For this, adequate arrangements for cleaning, filtering and treatment of air to maintain the desired humidity shall be included with scope of work. In case of Control and MCC rooms, the sound level within the rooms should be kept below 60dB.

7.3.7.3.4 Drainage and Sewerage Arrangements

7.3.7.3.4.1 Drainage Arrangements

Proper surface drainage facilities of adequate dimensions, specifications and slope shall be provided for the entire proposed area to take care of all the storm water which is likely to be encountered considering the topography and the natural drainage of the construction sites and the adjoining area. Dimensions and specification of drains and cross drainage works shall be so engineered and constructed so as to receive and discharge all the storm water entering into the proposed plant area including run off from the area outside the proposed construction site which is likely to enter the proposed plant area. The storm water shall be disposed off to the nearest nallah or shall be taken to a suitable distance where it can be properly disposed. Drain shall be provided with suitably designed pre cast RCC covers/ culverts wherever necessary. All the drains shall be pucca drains.

7.3.7.3.5 Services

7.3.7.3.5.1 Industrial / fire fighting water

Water supply lines and arrangements shall be provided for fire fighting and dust suppression as explained elsewhere. Necessary pumping facilities with pump house for fire fighting and dust suppression facilities shall also be provided.

All piping and pumping arrangement for drinking and including pump house for this purpose shall not be in the scope of this contract.

7.3.7.3.6 Other works/requirements

7.3.7.3.6.1 Survey, Soil investigation and Collection of rainfall and hydrological data

No data regarding above are made available in this tender document. The bidder is required to inspect and examine the site and its surroundings and satisfy himself as to the nature of ground, rainfall and the soil, the availability and suitability of other requirements, as required for fair bidding purposes. The successful bidder shall have to undertake detailed survey, detailed soil investigation and collection of hydrological data, rainfall data, prepare and submit a comprehensive soil report with recommendations for type of foundation, bearing capacities, method of deep excavation, probable settlement for foundations etc. for approval of the owner/consultant. Reports approved by the owner/consultant shall be finally adopted for design and engineering. Soil investigation should be done in the presence of the owner/consultant. No extra claim shall be made over contract price for variation in soil, rainfall and hydrological investigation reports which may result in change of design and type of foundation unless otherwise stated. All works related to site survey shall be conducted as per standard practice and also as per system requirement.

7.3.7.3.6.2 Earthwork in excavation

Excavation of earth for all types of soil for construction of all the civil structures is covered in the scope of this contract. Final dressing of ground in and around the proposed area is under the scope of this contract for drainage will be done by the contractor as per technical and functional requirement. After completion of work ground will be provided in as it is condition. Excavation for proper drainage of rain/subsoil water around the service buildings, Hopper site, control room, Lift & Stair houses substations etc. is covered under the scope of this tender. The depth and size of the excavation will be as per approved system requirement and as per detail design drawings. All cuttings and fillings as per required level and profile including transportation/ disposal of soil within a distance of 2 km is included in the scope of this bid. If Blasting is required, the contractor has to prepare the site and carry out blast hole drilling as per the requirement. The contractor will be responsible for drilling in all gradients/ terrain as per requirement of the work. Blasting will be done departmentally by BCCL. However, the drilling pattern and blast design parameters are to be decided mutually by the technical representative of the contractor and the project officials on day-to-day basis so as to avoid any dispute on fragmentation of rock and powder factor.

7.3.7.3.6.3 Development works such as Grading/levelling/dressing of site, etc

Site grading/levelling shall be done by the bidder within boundary limit of the proposed area under the scope of this contract based on detailed survey to be done by the bidder as per technical/functional and drainage requirement.

The HFL, Bed level, water flow, etc. of the existing water courses, sub-soil water table shall be taken into consideration while designing the structures. Bidder shall undertake various remedial measures for protection of the proposed Site of Hopper area from streams/water courses as per requirement.

7.3.7.3.6.4 Architectural requirements

The structures in the whole complex (under the scope of this contract) shall have appropriate industrial architectural look, with appropriate colour, shades and structural networks. All the structures should portray architectural excellence with due care to better utilisation of space, service requirements etc. and also

encompass concerns as varied as contemporary design, area conservation and environmental issues. The buildings with brick work, concrete and plaster faces shall have cement based paints in aesthetically sound shades as approved and all steel structures shall have oil based paints with louvers and openings for ventilation and better use.

7.3.7.3.6.5 Fire Fighting

Whole of the site shall be protected against fire. Automatic fire fighting facilities shall be provided as per relevant IS codes and TAC norms as discussed in Electrical and Mechanical chapter. Main protection system against fire shall be fire Hydrant/spray nozzle system and fire detection system. The mains shall be laid in rings wherever necessary. The type of pipe to be used for fire fighting and location of hydrants shall be as per IS 9668-1980. (latest revision). Hydrants/spray nozzle shall be provided at suitable intervals all along the proposed site as per technical requirement. Water tanks and pump house shall be included in the scope of work.

Fire fighting points/hydrants shall be provided for entire proposed site Bunker, sub-stations and service buildings etc. Fire hydrants shall be provided at an interval of 30m in the entire plant. Necessary landing valves at all the floor of receiving pits, Hopper, sub-stations and at other places wherever necessary shall be provided.

The pressure of each hydrant shall be not less than $3.5/\text{kg cm}^2$ when up to four hydrants are used simultaneously.

7.3.7.3.6.6 Dust Suppression

Proper water supply arrangement for dust suppression will be made at dust generating points so that all working space remain free of dust. For dust suppression water jets will have to be provided in Hopper. All civil works pertaining to dust suppression shall be as per system requirement. The pumping sets for the dust suppression/control should have 100% stand by at each location.

7.3.7.3.6.7 Plant Cleaning

Water and compressed air pipe line net work along with connection/tapping points with control valves at suitable intervals shall be provided in the sub-stations, Hopper etc. for pressure cleaning of floor chutes, walkways etc. Proper drainage arrangement will have to be made all along the plant so that water or slush accumulation is avoided. At every probable spillage point suitable arrangement will have to be made for a mechanised or manual cleaning.

7.3.7.3.7 Construction, Fabrication, Erection and Commissioning, overheads and supervision

7.3.7.3.8 Clearance of site before start of work

Site will be handed over to the contractor in 'as it is' condition. Any site preparation work including cleaning, cutting, filling, levelling, grading, removal, etc. before start of the actual work shall be done by the contractor to the full satisfaction of Engineer-in-charge.

7.3.7.3.9 Site Clearance after completion of work

After the completion of work the contractor shall remove scaffolding, sheds rubbish and surplus materials except which are required for rectification of defects. Contractor shall hand over the site in clean and tidy condition after cleaning the total area including floor, drains etc. fit for the use by the owner.

7.3.7.3.10 Layout and Levels

The layout and levels of all structures, etc. shall be laid by the contractor at his own cost from the general grid of the plot and bench marks given by the Engineer-in-charge for checking the detailed layout and correctness of the layout and levels. But the contractor shall be solely responsible for correctness of layout and levels.

7.3.7.3.11 Specifications

The work shall be executed according to the relevant Indian Standard codes of practices or to the recommendations of relevant American and British Standard in cases where Indian Standard codes are not available for such works.

7.3.7.3.12 Construction method and equipment

The Contractor shall submit drawings and write ups indicating a broad outline of how he intends to execute the work.

7.3.7.3.13 Installation/erection and supervision

It will be the contractor's responsibility to bring, receive and keep the materials in safe custody in proper condition. Responsibility of handling the materials during manufacturing, transit and handling at site rests with the contractor. All the equipment will have to be installed and fitted with accessories as per approved drawing. Entire tools and tackles, manpower and any other material required for successful installation will be supplied by the contractor. The contractor shall furnish the list of requirement of engineers, supervisors and other skilled personnel to carry out the job properly.

7.3.7.3.14 Commissioning

After installation, including electrical civil/structural items, the individual equipment will be commissioned and put on no load trial run. Any defect noticed will have to be rectified/replaced at contractors cost. After commissioning all the equipment in the circuit individually on no load and having satisfied the consultant/customer, the entire circuit shall have to be put on load test and performance of individual equipments or its accessories or the circuit as whole will be observed closely by a joint team of engineer, drawn from consultant's side, customer's side and contractor's side. This test run on load will continue till the representatives of consultant or customer is fully satisfied with the performance. The entire arrangement of the trial run shall have to be made by the contractor at his own cost. The contractor has to give a sufficiently advanced intimation in this regard to the owner.

7.3.7.3.15 Performance gurantee

Performance Guarantee consultant/customers, so that run of mine coal can be supplied to plant for load test. Any excuse on the part of the contractor will not relieve him from the responsibilities of successful commissioning of plant to the best

satisfaction of consultant/customer. To carry out the job of commissioning in the best possible way, the contractor shall have to co-ordinate with all concerned agencies such as designer, equipment manufacturers, consultant, customer, statutory bodies and other government or local bodies as per requirement.

7.3.7.3.16 Inspection and testing

All tests required for materials, quality of work and any other tests as required/desired by the Engineer-in-charge shall be at Contractor's cost. The frequency and mode of testing shall be as per latest relevant BIS codes.

The contractor will give a performance guarantee covering any loss due to faulty design, manufacturer, workmanship rated performance etc., including for bought out items at suite for a period of one year from the date of successful commissioning of the plant. The contractor shall replace all such defective equipment or part of the concerned installation free of cost. The loss of time on this account will automatically extend the performance guarantee period and same will be dealt as per the relevant clause of conditions of contract.

7.3.7.3.17 Perception and remedial measures

Perception and remedial measures for the entire area is under the scope keeping in view the adjoining natural and artificial features such as hill slopes, nallah, buildings, silos etc.

7.3.7.3.18 Miscellaneous works

All brick work, doors, windows, finishes including architectural treatment, plinth protection, water proofing, damp proofing, glazing etc.

1. All brickwork shall be carried out as per relevant IS codes and shall be plastered on both faces with 15mm thick cement mortar 1:6 (cement/sand). All external walls shall be of minimum 250 mm thick. RCC ceiling shall be plastered with 6 mm thick plaster. The scope also includes providing and fixing all doors, windows, rolling shutters, finishes, damp proofing, inserts, anchor bolts, embedments, stairs nosing, railings ladders, edge protection angle, etc. Doors and windows shall be of steel frames and suitably glazed. Openings on external walls of the buildings shall be provided with sunshades.

2. All equipment foundations.

3. All inserts, anchor bolts and embedment.

4. All railings, ladders and platforms.

5. All necessary wind ties

6. Cable trenches shall be provided with chequered plate or with pre-cast RCC covers. Cable trenches as well as pre-cast cover shall be provided with edge protection angles. All embedment/block cuts as required elsewhere in these specifications shall be provided, or cable tray can also be provided.

7. All external surface of underground concrete structure shall be given a bitumen coat. 600 mm thick boulder packing shall be provided on the outside face of earth retaining structures. Weep holes shall be provided at suitable spacing in all earth retaining structures as per design requirement.

8. All corners and edges in openings shall be protected with angle of minimum size 75 mm x 75 mm x 8 mm with suitable lugs embedded in concrete. Similarly all

edges of concrete members coming in contact with flow of coal or any other moving material shall be provided with similar edging for protection.

9. Floodlight tower shall be provided wherever required. Monorail girders and fixtures shall be provided for monorails at locations required and described elsewhere in these specifications or drawings.

All RCC work to be done under this specification unless specified, otherwise, shall be of controlled concrete of grade not less than M-25 of IS 456 (Latest) and shall be made with fresh cement.

10. All structural steel work shall have one shop coat and one site coat of red oxide zinc chromate and two field coats of synthetic enamel paints as specified elsewhere. However, bidders are to mention the thickness of painting in microns.
11. Gradient of the staircase should not exceed 40 degree and there should not be monkey ladders.
14. Any other works/services/requirements whether specifically indicated or not and found necessary to be incorporated on later date for safety and efficient operation of the plant shall also be deemed to have been covered within the scope of work of this tender.

7.3.8 Safety

7.3.8.1 Safety Code for Work in Hopper:

In addition to the general safety codes set out before special measures, methods of working and equipment shall be used in silo. In particular the silo shall be kept well ventilated and protective covers shall be placed over roof openings (other than those left open for properly installed and protected hoists) wherever work is in progress inside the silo.

Only skilled and reliable workmen connected with the internal operations shall be allowed on the silo roof while internal work is in progress. No other personnel work whatsoever shall be allowed on the roof or the sides of the Hopper at these items.

The contractor is to prepare a safety code of practice for these operation for approval by the purchaser

7.3.8.2 Safety Code – General

- i) Suitable scaffolds shall be provided for workmen for work that cannot safely be done from the ground or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable foot holds and hand holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 horizontal to 1 vertical.
- ii) Scaffolding or staging more than 3.25 metres above the ground or floor, slung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from

the building or structures.

- iii) Working platform, gangways and stairways shall be so constructed that they do not suddenly or unequally change level, and if height of a platform or gangway or stairway is more than 1.25 metre above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced, as described above.
- iv) Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 metre.
- v) Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 metres in length. Width between side rails in a rung ladder shall in no case be less than 30 cm for ladders up to and including 3 metres in length. For longer ladders this width shall be increased at least 6 mm for each additional 30 cm of length. Uniform step spacing shall not exceed 30 cm. All scaffolding, ladders and other safety devices mentioned or described herein, shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use.
- vi) Adequate precautions shall be taken to prevent danger from electrical equipment. When workers are employed on electrical installations which are already energised, insulating mats, working apparel such as gloves, sleeves and boots, as may be necessary shall be provided. Workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.
- vii) No materials on any of the sites shall be so stacked or placed as to cause danger of inconvenience to any person or the public.
- viii) The contractor shall provide all necessary fencing and lights to protect public from accident and shall be bound to bear expenses of defence of every suit action or other proceedings at law that neglect of the above precautions and so pay any damages and costs which may be awarded in any such suit, action or proceeding in such persons or which may with the consent of the contractor be paid to compromise any claim by any such person.
- ix) Excavation and Trenching - All trenches, 1.6 metres or more in depth, shall at all times be supplied with at least one ladder for each 20 metres in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 metre above surface of the ground. Sides of a trench which is 1.5 metres or more in depth shall be stepped to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. Excavated materials shall not be placed within 1.5 metre of edge of trench or half of depth of trench, whichever is more. Cutting shall be done from top to bottom. Under no circumstances shall undermining or undercutting be done.
- x) Demolition - Before any demolition work is commenced and also during the process of the work:
 - a) All roads and open areas adjacent to the work-site shall either be closed or suitably protected.
 - b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by operator shall remain electrically charged.

- c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion, or flooding. No floor, roof or other part of a building shall be so overloaded with debris or materials as to render it unsafe.
- xi) All necessary personnel safety equipment as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use, and the contractor shall take adequate steps to ensure proper use of equipment by these concerned.
 - a) Workers employed on mixing asphaltic materials, cement and lime mortar / concrete shall be provided with protective gloves.
 - b) Those engaged in handling any materials which is injurious to eyes shall be provided with protective goggles.
 - c) Those engaged in welding works shall be provided with welder's protective eyes shield.
 - d) When workers are employed in sewers and manholes which are in use, the contractor shall ensure that manhole covers are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened are cordoned off with suitable railing and provided with warning signal or boards to prevent accident to public.
 - e) Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- xii) The contractor shall not employ man below the age of 18 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following precautions shall be taken:
 - a) No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
 - b) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or when a surface having lead paint is being dry rubbed and scraped.
 - c) Overalls shall be supplied by the contractor to workmen and adequate facilities shall be provided to enable working painters to wash during and on recession of work.
- xiii) Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:
 - a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept in good repair and in good working order. They shall be regularly tested and certified as appropriate.
 - b) Every rope used in hoisting or lowering material or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.
 - c) Every crane driver of hoisting appliance/ operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold, winch or give signals to operator.

- d) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of sub-tension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.
- e) In case of departmental machine, safe working load shall be notified by Engineer-in-charge. As regards contractor's machine, the contractor shall notify safe working load of each machine to the Engineer-in-charge wherever he brings it to site of work, and shall get it verified by the Engineer-in-charge.
- f) Motors, gearing, transmission, electric wiring and at near dangerous parts of hoisting appliance shall be provided with efficient safeguards.
- g) Hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental descent of load. Adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced.
- h) Adequate washing facilities shall be provided at or near places of work.

7.3.9 Application

These safety provisions shall be brought to the notice of all concerned by display on notice board at a permanent place at the work spot. Persons responsible for ensuring compliance with the safety code shall be named by the contractor. To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the contractor shall be open to inspection by the Engineer-in-charge or his representatives and the Inspecting Officers as defined in the contractor's Labour Regulations.

When work is done near any place where there is risk of drowning, all necessary safety and rescue equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment for all injuries likely to be sustained during the course of the work. Notwithstanding the above conditions i to xv the contractor is not exempted from the operation of any other Act or Rules in force.

7.3.10 General requirements

- a) Any other requirement whether specifically indicated or not, but found necessary to be incorporated at a later date for safe and efficient operation of the plant shall also be deemed to have been covered within the scope of work of this tender.
- b) Wherever required dewatering shall be done by the contractor to avoid damage of equipment, structural, etc. and timely completion of work.
- c) If any certification or approvals are to be taken from electrical inspector/statutory bodies, DGMS, the same shall be the responsibility of the contractor.
- d) As per system requirement envisaged in the NIT documents, various parameters, specifications may undergo changes during detail engineering stage. This shall be carried out by the contractor without any increase in cost.

- e) All safety regulations, code of practices for power supply, manufacturer, installation, erection, commissioning etc. envisaged by the State Govt./Central Govt. or any authorities/bodies shall be strictly complied without any increase in cost.
- f) All Mines Acts and regulations will be followed during construction stage.

SUB-SECTION – 7.4.1

MECHANICAL

RAPID LOAD OUT SYSTEM

1. BASIC PARAMETERS

- | | | | |
|----|---------------------------------------|---|---|
| a) | Number of Hopper | : | 1 (One) hopper for Clean coal & Washed coal(Power) (either clean coal or washed coal(power) shall be loaded at a time) complete with all fittings and fixtures (Maintenance gates, Charging/ flood loading gates, Pre-weigh hopper, Flow control / loading gate, hydraulics, power pack, compressor, Air blaster etc) |
| b) | Hopper capacity | : | 500 T |
| c) | Loading capacity | : | Avg. 5500 TPH |
| d) | Hopper feed conveyor | : | 2000 mm wide |
| e) | Infeed conveyor rate | : | 3600 TPH |
| f) | Creep speed | : | 0.8 km/hr |
| g) | Total moisture% of washed coal | : | Max. 9.5%(app.) |
| h) | Total moisture% of Washed coal(Power) | : | Max. 9%(app.) |
| i) | Hopper side slopes | : | Minimum valley angle 67 deg. |

2. SYSTEM DESCRIPTION

The rapid load out system is a facility for flood loading of wagons. The loading station shall be located over rail track for transportation of coal. The train/ rake consists of 59 wagons (maximum) of 60 t capacity each (as per railway norms) and will be loaded at the average rate of approximately 5500 TPH. The train will run under the loading point at a steady speed of 0.8 km/hour. Each wagon will take one minute to pass under the loading point. The system envisages loading of 60 t capacity wagon in about one minute. System consists of a 500 T capacity hopper having four opening for loading. Each opening is provided with one charging gate below the hopper over one pre weigh hopper assembly. Hydraulic system is envisaged for the operation of maintenance gates, charging/ Flood loading gates and swing chutes. The entire swing chute arrangement shall be made in such a way so that if in future the handling of rake is done by electric engine, the unwired zone of electric traction should not be more than 6.5 m including all clearance and clear head room of swing chutes under raised condition should be more than 5.45 m from rail top for adoption of swing OHE.

The chute will be capable of handling semi solid / slurry material in rainy season. The equipment will be required to operate 18 hours a day and 330 days a year, but the design will be such that it can be operated 24 hours a day and 365 days a year. The surrounding may be quite dusty and surface temperature may vary from 4⁰C to 50⁰C and relative humidity up to 97%.

The rapid load out system as envisaged in this proposal shall have arrangement such that pre-weighed quantity of coal is discharged into each wagon and the individual weighment is recorded automatically when the weigh system is put in auto mode. Adequate no. of heat sensors shall be provided.

3. OPERATION

When the presence of rake is detected near hopper, the swing chute is in position and permissive signal is given to the system for loading, the hopper charging/flood loading gate shall open and then pre-weigh hopper will start filling. As the weight in the pre weigh hopper shall reach near to pay load of wagon/ 60 t, two gates will close while remaining two will close partially for trimming the hopper to the desired weight. When set point is reached the partially opened hopper outlet gates shall close and weigh hopper ready light will come on. As soon as the first wagon comes under loading gate, the swing chute shall be lowered automatically and the flow control gate shall open. The material is loaded into the wagon and the flow control gate closes automatically as soon as weigh hopper is empty . Now the charging gates will open suitably for filling the pre weigh hopper. As the 2nd wagon approaches the charging gates shall start closing and by the time they are closed, full 60 t of material is discharged into the pre weigh hopper and is ready for filling the second wagon. In this manner the weigh cycle continues automatically until the full train/ all wagons are loaded.

After the loading operation is completed the chute shall go up after a pre set time. The weighing system shall also incorporate digital display system with suitable printer for printing of date, time weight of each weighment and net weight of coal weighment per operation of rake loading.

The hoppers are provided with load cells to weigh the material loaded in the hopper while gate is opened and the guillotine gates are closed immediately after filling of pre weighed quantity in the hopper this is done automatically.

4 OPERATION OF CHUTE GATE

Pre weigh hopper along with chute is provided with high speed load out to load wagons. The facility has following functions:

- 4.1 The loading chute comes down from the clear position to the load position under the load out weigh bin.

- 4.2. The opening and closing of the nominal 1525 mm x 1525 mm size gate at the bottom of the weigh bin.
- 4.3 There shall be a flow control gate. The material is loaded into the wagon and the flow control gate closes automatically as soon as weigh hopper is empty .

5.0 OVERHEAD HOPPER

5.1 GENERAL FEATURES:

The hopper shall be of RCC and designed to take all the loading as required for the system. Necessary structural work shall also be provided to house the lift, stairs, necessary platforms, etc.

The hopper shall be designed on the basis of "Mass Flow" concept, so that chances of bridging, arching, rat-holing at hopper outlet is minimised. The sloping sides of the hopper shall be provided as per test report for free flow. The hopper shall be lined with 10 mm thick stainless steel of 409M grade liner up to the top of the conical portion of the hopper from the bottom openings. The width of the SS Liner shall not be more than 1000mm at top end of cone and the gap between the liner and concrete shell shall be filled with lean concrete. Sufficient weldments shall be provided at the joints so that liner does not come out. Vertical portion of the hopper wall shall have ferrosite lining of 25 mm minimum thickness up to one (1) metre above the highest surface of vertical wall coming in contact with coal.

However, because of wide fluctuations in the condition of the run of mine coal being fed into the hopper, due to seasonal impurities etc. there may be possibility of arching or bridging. To overcome the situation a pneumatic arch breaking device (as elaborated elsewhere) shall also be included.

5.2 LEVEL INDICATION INSIDE HOPPER

The level indicators provided shall monitor –

- i) Continuous level of coal in the hopper
- ii) Pre determined high coal level in the hopper which will automatically stop the hopper in feed conveyor.
- iii) Pre-determined high level.
- iv) Pre-determined low level in the hopper, which will automatically close the hopper outlet gates. This is to prevent damage to the hopper outlet gates. The gates shall remain closed and inoperable until a pre determined intermediate level is reached. This shall be preferably Ultrasonic/ Radar type complete with sensor,

transmitter and limit controllers, etc and audio visual signalling system for different levels.

5.3 LOAD OUT SYSTEM

5.3.1 HOPPER OUTLET GATES

Hopper bottom shall have four number of openings for discharge of coal into one number of pre- weigh hopper. Each opening will be fitted with two number of gates, one maintenance gate below which one hopper discharge gate. Below hopper there shall be one pre-weigh hopper. For discharging coal into the pre-weigh hopper, hopper opening shall be fitted with four (4) quick acting hydraulically operated guillotine type double blade knife edged hopper discharge gates and four (4) number of hydraulically operated maintenance gates. The gates shall preferably be mounted on rollers or slide bar for easy movement. The gate support system shall be of sturdy construction and designed to take impact during quick discharging operation. The gates while opening shall discharge coal into the pre-weigh hopper.

The operation cylinders shall also be provided with positioners to provide a reduced feed rate at near balanced condition at the end of the operation to achieve a precise cut off at the desired weight.

As the loading of pre-weigh hopper up to 60 t is complete, the hopper outlet gates will close. The hopper outlet gates shall automatically repeat operation (i.e. quickly close and open) to clear any trapped material between gates.

6.0 PRE-WEIGH HOPPER

There shall be one (1) pre-weigh hopper of 72te capacity installed at bottom opening of hopper having about 1.2 times the wagon payload capacity. The pre weigh hopper shall be of mild steel construction and designed to take shock and impact loads during filling and discharging operation.

The inside of the pre-weigh hopper shall be lined with stainless steel liners of 409M grade. The slopping sides of the hopper shall be 72 degree or as per test report for free flowing and lined with 409M grade stainless steel. The hopper shall have large gate area to ensure maximum discharge rate for clearing of the weigh bin on each operation cycle and matching with the train speed and size of the individual unit train bottom discharge wagons.

The pre-weigh hopper shall be supported on high quality strain gauge dual bridge load cell assemblies forming into a weigh bridge system with twin connectors.

The load cells shall have an overload protection of at least 150% or more of rated

capacity and structurally safe to 300% of rated capacity. The load cells shall be housed in temperature control shrouded complete with insulation. They shall have all necessary assembly, hardware for smooth operation of the load out system. There shall also be an arrangement for setting the weight in pre weigh hopper from 55 to 62t.

6.1 PRE WEIGH SYSTEM – TEST WEIGHTS AND ACCURACY

- i) For testing and calibrating the pre weight hopper system, test weights shall be supplied with the system. These test weights shall be approved by the Weights and Measures Department.
- ii) The test weights may be integral with the weigh system and shall provide for easy calibration of the weigh system in shortest possible time after each rake loading.
- iii) The weigh hopper system shall be capable of pre weighing coal for each wagon to an accuracy of ± 0.1 % of the set point.
- iv) The weigh bridge for the pre-weigh hopper system shall have check rods and brackets of suitable design.

6.2 FLOW CONTROL GATE

This gate will be located at the bottom of the chute and will have a nominal 1525 mm x 1525 mm internal opening and will be of curved blade non jamming type design. It will have the following specific features.

- i) The gate wall will be of 12 mm mild steel plates with 10 mm abrasion resistant steel liner (SAILHARD) to 220-240 BHN plug welded.
- ii) The curved blade will be 25 mm mild steel plate with 8 mm type 304 stainless steel top liner.
- ii) The blade will pivot on a shaft supported by two flange bearings with external lubrication fittings.
- iii) Actuation will be by two hydraulic cylinders.
- iv) The gate opening can be varied between fully close and fully open position, if required. The gate position feed back will open position, if required. The gate position feed back will be provided by position indicator connected to the gate blade pivot shaft.

7. SWING CHUTE

The swing chute arrangement with bottom discharge gate should have nominal 1525 x 1525 mm opening and have the following specific features :

- i) Chutes wall constructed of 12 mm mild steel plate with abrasion resistant lining steel plates provided at places where coal flow is expected.
- ii) The Chutes should pivot in the direction of train travel. The pivoting action will be such that positive control over positioning of chute with respect to the wagon is possible, so offering quicker, safer response in emergency conditions requiring chute retraction to its storage position.
- iii) Chutes should have necessary replaceable urethane seal system to minimise dust.
- iv) Necessary arrangement will be provided to give automatic retraction of chute if contact with forward moving wagon or locomotive is made.
- v) The chute will have shear section such that in the event of a roll back by the locomotive or a wagon and the chute not retracting in time, the shear bolts would be cut and the lower gate section will merely drop into the wagon safely without any damage to other parts of the chute gate system.
- vi) A crushable section will be provided at the lower most section of the chute so that any wagon hitting this section will crush it without crushing any other damage to the chute. This crushable section will be replaceable.
- vii) The chute will be actuated by heavy-duty hydraulic cylinder cushioned at both ends.
- viii) The chute will be capable of being raised to clear position in fully loaded condition also.
- ix) The entire swing chute arrangement shall be made in such a way so that if in future the handling of rake is done by electric engine, the unwired zone of electric traction should not be more than 6.5 m including all clearance and clear head room of swing chutes under raised condition shall be more than 5.45 m from rail top for adoption of swing OHE.

8.0 HYDRAULIC SYSTEM

8.1 HYDRAULIC POWER PACK

One hydraulic system shall be supplied for operation of each of the hopper outlet gates, the flood loading gates and the chute system. The system shall be identical to maximise reliability and inter-changeability. The rating of all hydraulic equipment /component shall be well above the duty for which it is required and shall be suitable for operation in tropical climate and dusty atmosphere.

The Hydraulic Power pack shall incorporate hydraulic pump (which will provide immediate back up in the event of pump failure) with electric motor, fluid supply tank fitted with necessary pressure and control equipment, filters, gauges, pipe/ high pressure hose work etc.

There shall be a complete standby power pack arrangement consisting of electric motor, pump, pressure regulating section to provide the backup in the event of failure of the system.

The Fluid supply tank shall have ample capacity appropriate to its duty. It shall be

fabricated in mild steel and provided with flanged connections for the supply and return pipes. Provision for complete drainage shall be made and flanged apertures for sludge removal shall be incorporated. All pipes returning fluid to the tank shall

terminate at a level sufficiently below the fluid surface to prevent aeration. Each suction pipe shall be fitted with a high efficiency filter positioned well below the fluid surface to prevent vortex formation. Preferably the pump may be provided with positive suction head by elevating the tanks above the pumps. The tank shall be equipped with the following gauges etc:-

- a) Sight glass giving clear visual indication of fluid level
- b) Low fluid level device with visual and audible alarms.
- c) Temperature sensing device with visual and audible alarms.
- d) Pressure gauges.

All hydraulic pipe/hose work shall follow the shortest practicable route in neat, straight runs, readily accessible for maintenance yet sited in a position which presents least risk of mechanical damage. Pipe work in unavoidable exposed position shall be effectively protected and all pipe work shall be adequately supported. Electric motor shall be squirrel cage induction motor suitable for $415 \pm 10\%$.

The electric motor operated oil filling section also to be included in the system design and suitable provision to be made. The hydraulic power pack shall be a complete closed and enclosed unit to protect the system from the coal dust. The complete enclosure shall be suitably designed by keeping the maintenance aspects in consideration. All the valves to be suitably protected against the dust accumulation.

8.2 HYDRAULIC ACCUMULATOR

Each of the hydraulic system shall also incorporate back up protection in the form of hydraulic accumulator, so that in the event of power failure, or pressure failure closing of the gates can be achieved. The accumulator shall have sufficient capacity for a normal open /close of hopper outlet emergency or flood loading gate. The accumulator system shall also include necessary hydraulic/ electric control with audio visual alarms. Hydraulic accumulator control should have pressure release valve to be controlled from console.

8.3 HYDRAULIC CYLINDERS

These shall be of suitable bore and stroke double acting cylinders with cushioned ends. Hydraulic seals shall be suitably selected to prevent ingress of dust and

moisture and to provide for longer life..

9.0 DUST CONTROL BETWEEN HOPPER OUTLET GATES AND PRE-WEIGH HOPPER

The loading rate at this zone being tremendously high may generate lot of dust. Suitable flexible dust cover may be provided between the hopper outlet gates and pre-weigh hopper for air vent without release of dust. If required the coal dust may be extracted to finally discharge the clean air into the atmosphere.

9.1 DUST CONTROL DURING WAGON LOADING

A sufficient number of precision and anti clog nozzles made of stainless steel shall be fitted at suitable places at the loading point for suppression of dust during loading operation. The nozzles shall provide high pressure atomised sprays of water or/water mixed with suppressant for effective suppression of coal dust.

The dust suppression system shall be so interlocked that it operates only when the loading operation is on. The suppression system shall be complete with necessary piping, pumps, fittings and fixtures etc. The system may be part of the total dust suppression system as per scope of this tender with one standby pump. The pumps shall be located at the base of hopper with all piping connections to dust suppression system. The pumps shall be connected to main water supply pipeline.

10.0 CHAIN PULLEY BLOCKS

Necessary Chain Pulley blocks of adequate capacity at suitable points shall be provided in respective floors and intermediate floors for hoisting and lowering of equipment/components.

11.0 LUBRICATION SYSTEM

Automatic lubrication shall be provided to all required locations. Necessary facilities for lubrication system shall be provided.

12.0 FIRE FIGHTING SYSTEM

In addition to provision of hydrants at hopper loading complex, an additional hydrant pipe shall be laid from ground level to the top of hopper. This pipe shall be connected to a pipe laid along the perimeter at hopper top with two outlets to flood the hopper inside in case of fire in stored coal. The control valve of this pipe shall be at ground level.

13.0 PNEUMATIC ARCH BREAKER

The Arch Breaker of suitable capacity in adequate numbers shall be compressed Air operated. A separate air compressor shall be supplied for operation of the Arch

Breaker.

The Arch Breaker shall be designed to suit the duty requirement and shall discharge air into the coal with sufficient energy to break the arch. The arch breaker shall be complete with compressed Air Cylinder, quick release valve etc.

Adequate number of holes around the hopper at suitable locations with cast in tubes/pipes with blind flanges shall be provided to facilitate connection to the arch breaker installed at suitable location. These holes shall also be utilised for injecting inert gas inside hopper for fire fighting purposes.

AIR COMPRESSOR

One working and one standby compressor of suitable capacity shall be offered

This shall be electrically driven, compact preferably horizontal air receiver mounted. The compressor shall have sufficient piston displacement and operating pressure to suit the duty requirement of the arch breaker.

The compressor shall be complete with pressure gauge, safety valve, pressure switch, non-return valve, air piping/hoses for connection to arch breaker, drives etc. The operation of the compressor to charge the Arch Breaker shall be from the main control room only.

FREIGHT CUM PASSENGER LIFT

1.0 GENERAL REQUIREMENT

The industrial duty lift will serve the various levels at ground, different working floor levels of the hopper and any other levels as may be felt necessarily during detail engineering stage for efficient plant maintenance and operation. The lift will have the following operating parameters as per IS.

The lift shall have following operating parameters:

- | | | | |
|------|--------------|---|----------------------------|
| i) | Type | - | Freight-cum-passenger lift |
| ii) | Capacity | - | 1000 kg |
| iii) | Speed | - | As per requirement |
| iv) | Lift size | - | As per relevant IS |
| v) | No. of steps | - | As required |
| vi) | Quantity | - | 1 |

The lift shall be of sheet steel (16 SWG MS Sheet) construction with 5 mm thick heavy duty chequered floor and automatic stainless steel doors and shall be complete with UP/DOWN ARROWS at all landings and with semi-dual (with/without attendant) operation position indicator and battery operated alarm bell, necessary switches, brakes, push button, limit switches, safety gears etc. The design, supply and installation shall conform to the relevant Indian Standards and Codes of Practices. The machine room shall be located at the top of the lift shaft and the lift shall travel from ground to Hopper top with steps at intermediate floors as required and designed, constructed and installed in accordance with the latest version of the following standards:

- | | | |
|----|----------------------------------|---|
| 1. | IS: 14665 (Part-1):2000 | : Guidelines for
Outline Dimensions |
| 2. | IS: 14665 (Part-2,Sec-1&2) | : Code of Practice for Installation,
Operation & Maintenance |
| 3. | IS: 14665 (Part-3,Sec1&2):2000 | : Safety Rules |
| 4. | IS: 14665 (Part-4,Sec-1to9):2001 | : Components |
| 5. | IS: 14665 (Part-50):1999 | : Specification, Inspection Manual |
| 6. | IS: 7754-1975 | : Design, Installation, Testing &
Operation |
| 7. | IS: 732 | : Code of practice for electrical
wiring installations |
| 8. | IS: 2365 | : Steel wire suspension ropes for
lifts, elevator & hoists |
| 9. | IS: 8216 | : Guide for inspection of lift wire
ropes |

Besides the above, other internationally acceptable Standards, which ensure equal and higher performance & safety than those specified above, shall also be acceptable.

Indian Electricity Act 2003, Indian Electricity Rules 1956

For lift, installation, operation and maintenance should be carried out in conformity with lift acts and rules in force.

Conformity with Fire/Indian standard Specifications/ Regulations

The installations shall be carried out in conformity with local fire regulations and rules in force. All materials, fittings, appliances etc. used in electrical installations shall conform to Indian Standard Specifications.

2.0 TECHNICAL PARTICULARS OF PASSENGER LIFTS

Sr. No.	Particulars	
1	Type	Freight-cum-passenger lift
2	Number of lifts required	1
3	Load -Kgs.	1000 kg
4	Speed – m/sec	As per requirement
5	Travel – mtrs	(i) from ground to top of Hopper
6	Stops & Openings	As per requirement of design (All openings on the same side)
7	Power Supply	415 Volts 3 phase, 50 Hz. Alternating Current
8	Control	PLC Control
9	Operation	Simplex. Full collective (with/ without Attendant)
10	Machine	Geared traction machine placed directly above hoist way in machine room
11	Car Size (W X D) – mm	As per Requirement
12	Hoist way required	As per Requirement
13	Car Panels	All plain powder painted panels
14	Handrails on 3 sides	M. S. Powder Painted - Black Matt
15	False Ceiling	To be provided
16	Flooring	As per requirement
17	Car Entrance	Protected by centre opening sliding steel door in plain powder painted finish
18	Hoistway Entrances	Protected by centre opening sliding steel doors in plain powder painted finish
19	Door operation	Automatic
20	Signal details	1) Combined luminous hall button and digital hall position indicator 2) Integral full height car operating panel with luminous buttons digital car position indicator combined with direction arrows overload warning indicator and service cabinet 3) Battery Operated Alarm Bell & Emergency Light 4) Fireman's switch at main lobby 5) Automatic Rescue Device

2.1 Automatic Rescue Device:

- (i) ARD is to be provided with battery back-up.

The Automatic Rescue Device should operate automatically without any human intervention within a period of one minute, when the running lift suddenly stops due to power failure or system failure of the lift.

- (ii) It should move the halted lift slowly and safely in upward or downward direction to reach the nearest floor/landing door and then to open the door automatically as well as to park the lift there with door open enabling the trapped passengers to exit.
- (iii) Whenever the Power supply resumes during the running of the lift in ARD mode operation the lift should continue to run in the ARD mode until it reaches the nearest landing and the door are fully opened.
- (iv) If the normal power supply resumes when the lift is at the landing , it should automatically be switched over to the normal power operation mode.
- (v) All the safety devices of the lift should remain active during the ARD mode operation.
- (vi) The device should have batteries for power back-up during the period of power failures. The back-up time should be enough to provide at least 6(six) rescue operations within a period of 1(one)hour.

Sealed maintenance free batteries should be used.

2.2 Safety:

Full-length multi-ray (infra light curtain)

Electronic door detector system

The car shall be equipped with an electronic door sensor which can detect an obstruction at the car entrances and control the closing of the doors. This prevents the passenger, wheeled stretcher and wheeled chair from getting bumped by the closing doors and relieves the user from holding down the OPEN button. The sensor shall scan for any object across the full height of the car entrance. The doors shall reverse immediately if the sensor detects any obstruction at the car entrances.

3.0 CAR

The car shall be enclosed on all sides by means of car body with centre opening sliding type door sliding horizontally and consisting of two panels with vision panel opening from the centre and so inter connected that they move simultaneously with provision of power operated device for opening and closing of doors. The enclosure shall be of sufficient strength to withstand thrust forces. The sides of car shall be lined with heavy gauge sheet panels properly braced and reinforced. The enclosure shall be flushed on the inside and securely fastened to the platform. The roof shall be covered with sheet metal. The construction of roof should be strong enough to be capable of supporting at least two persons. The car shall be equipped with fan with grills and suitable lighting complete with fittings and shall be provided with separate switches for fan and light.

Provision shall be made for car door electrical contact, electrical and mechanical interlock, electro mechanical lock, emergency stop push button, floor selector and floor stopping switch.

4.0 HOIST WAY DOORS

The hoist way doors shall be horizontally centre opening steel sliding door with wide vision panel at each landing of dimension matching with car door.

5.0 DOOR HANGERS AND TRACK

Hangers and tracks for car door and each hoist way door shall be furnished. Suitable material shall be used to minimize noise. Rollers or equal arrangement shall be provided to take upward thrust of the doors. All required materials for landing entrance shall be provided.

6.0 OPERATIONS FOR CAR DOORS AND HOIST DOOR

The car door and the hoist way door shall open automatically when the car stops at landing. In case of power failure, the door operations shall be so designed that it can be opened manually from inside the car. The hoist way door shall not open automatically before the car reaches at landing level.

7.0 CONTROL, OPERATION & INTERLOCK

The control system governing, starting, stopping, direction of motion, acceleration, speed and retardation and accessories required for satisfactory and trouble free operation, protection and control of the lift shall be provided.

The lift shall be suitable for automatic operation by a momentary pressure of a button such that the lift car is set in motion and caused to stop automatically at any required landing.

The lift operation shall conform to the following requirements:

The operation of the lift shall be through a push button station located inside the car

- a) The lift shall not move unless the car door, landing door and all other protected openings connected with control circuit are closed
- b) The push buttons, one for upward movement and the other for downward movement, at each terminal landing shall be provided in order to call the car
- c) The landing doors shall be inter-locked so that the landing door of any floor shall not open when the lift is not on that floor
- d) Push button shall be fixed in the car for holding the doors open for any length of time

Provision shall be made for safety gear, terminal slow down switch, terminal stopping switch-normal, terminal stopping device-final.

8.0 CAR OPERATING PANEL

In the car, there shall be an operating panel containing push buttons, elevations of the landings served; two-position key-operated switch, marked to indicate "with attendant" and "without attendant"; an emergency stop switch; a buzzer; an emergency call button connected to a bell to serve as an emergency signal;; push button or switches for lighting and fan; other push buttons; switches, etc. as required.

9.0 INDICATOR

The lift shall be provided with position indicator and call indicators inside the lift car to show the position of the lift car with reference to the floor numbers and the landing from which the call is being received. Up and down travel direction and position indicating signals shall be provided on each landing for the lift. Various indicators shall be of standard construction.

10.0 TERMINAL BUFFERS

The terminal buffers shall be provided for stopping the car and the counter-weight at the extreme ends of travel. Buffer support channels required to install the buffers shall be supplied.

11.0 LOAD PLATE

A load plate giving rated payload of the lift shall be fitted in the car in a conspicuous position. The rated load shall be given in kilograms and also in number of persons.

12.0 COUNTER WEIGHT AND COUNTER WEIGHT FRAMES

Counter-weight sections shall be mounted on structural metal frames so designed to retain the weight securely in its place.

Counter-weight frames shall be guided on each rail guide by upper and lower guiding members attached to the frame. A substantial metal counter-weight guard of required length shall be provided at the bottom of the hoist way.

13.0 GUIDES FOR CAR & COUNTER WEIGHT

Car and counter-weight guides shall be of rigid steel and shall be continuous throughout the entire lengths and shall be provided with adequate steel bracings and stiffeners. Guides for both car and counter-weight shall meet with the requirements of IS:4666. Necessary lubrication device for guide rail shall be provided.

Normal Terminal Limit Switch shall be provided to slowdown and stop the car automatically at terminal landings and final limit switches shall be provided to automatically cut-off the power and apply the brake, to stop the car travel beyond the terminal landings.

14.0 DRIVE MOTORS

The design ambient temperature for the equipment shall be taken as 50 deg. C. The insulation shall be Class 'E'. Necessary brakes shall be provided in the traction machine. Protective devices shall be provided on the controller to protect against phase reversal, low voltage and phase failure. Overload and other protective relays shall also be provided.

Drive shall be AC Variable voltage, variable frequency (V3F) with closed loop

The lift shall be driven by a squirrel cage TEFC induction motor to IP 55 protection and suitable for 120 Starts/hr. Motor and all electricals should have a dust proof sealing arrangement.

The kW rating of main drive motor shall be selected keeping a minimum margin of 15% over maximum power requirement.

The operation shall be Simplex Full collective control with/without attendant

15.0 OTHER ACCESSORIES

All other accessories like switches, fuses, contactors, cables, etc shall be provided as per requirement.

SPECIFICATION FOR FIRE FIGHTING SYSTEM

1.0 INTRODUCTION

Despatch system consists of hopper with rapid loading system.

2.0 FIRE PROTECTION

Fire fighting system shall be provided to protect the despatch system from fire hazards. The design and installation of the system shall comply with the regulations of the Tariff Advisory Committee (TAC) of India/ National Fire Protection Association (NFPA), USA, Codes.

The various fire fighting systems & facilities and the areas protected thereby shall be as under :

Fire Fighting System :

- | | |
|---|--|
| i) High pressure Hydrant system | Hopper complex (Upto conveyor discharge level) |
| ii) Mobile/ portable fire extinguishers | Hopper complex, Substation & Control room |
| iii) Fire detection | Substation and Control room |

2.1 High Pressure Hydrant System

Water from the reservoir shall be pumped by adequate number of electric motor driven centrifugal pumps for the hydrant system. One diesel engine driven pump shall be provided as a standby for the hydrant system. The fire pumps shall be of the same capacity and suitable for parallel operation.

The hydrant system shall consist of a large network of pipes both underground and over-ground which shall feed pressurised water obtained from fire water pumps to a number of indoor and outdoor hydrant valves.

The hydrant main shall remain pressurised at a pressure not less than 7 kg/cm². In the event of a fire, the hydrants close to the seat of fire shall open, causing a drop in water pressure in the hydrant main which shall bring the fire fighting pump into operation automatically, ensuring steady supply of water to the system. If the main pump fails to start initially, the standby pump comes into operation automatically. However, the pumps can only be stopped manually after ascertaining that the fire is extinguished.

Total hydrants required shall be estimated as per TAC recommendations. Proposed locations of hydrants shall be shown by the bidder in the form of table and drawing.

2.2 Fire Detection and Alarm Annunciation System

The Fire detection system shall be "Conventional wired type". A microprocessor based addressable automatic fire alarm control panel (Loop Controller) with necessary controls and signal indications has been envisaged to annunciate a fire alarm. This panel shall receive the electric signal from the fire / heat / smoke detectors, Manual Call Points (MCP), hooters, Response indicators (group flashers), isolator and control modules etc. and convert it into visual and audible alarm and also incorporate a facility to provide an alarm at a remote location. Area under protection shall be divided into loops depending upon the number of detectors, Manual Call Points, different type of interfacing modules etc. and each detector shall be addressable type having unique address to pinpoint the exact location of fire. The detectors for each loop shall be connected to the control panel by a separate pair of 2-core cable, thus separating the visual indication for each loop.

The fire alarm panel / loop controller shall be located at a place where attendant shall be available round the clock.

2.3 Portable/ Mobile Fire Extinguishers

Various types of portable and mobile fire extinguishers shall be provided at strategic locations in the entire plant for fire protection.

3.0 TECHNICAL REQUIREMENTS

3.1 High Pressure hydrant System

The total water requirement of the hydrant system shall be met by suitable capacity pumps in accordance with the stipulations of the Fire Protection Manual of TAC considering the coal handling plant as an ordinary hazard occupancy. The pump head shall be so selected that a minimum running pressure of 3.5 kg/cm^2 is available at the hydraulically remotest/highest hydrant point.

Water for the hydrant system shall be handled by two pumps, one driven by an electric motor and the other driven by diesel engine. The pumps shall be horizontal centrifugal type, drawing water from the fire water sump.

Pumps in the high pressure hydrant system shall be suitable for parallel operation.

The number of hydrants shall be in accordance with TAC/NFPA regulations. A set of two lengths of 15 m hoses, a nozzle and a branch pipe shall be kept in hose boxes adjacent to each hydrant.

Hose houses shall be located at strategic places, each covering a group of external hydrants.

Fog nozzles shall be used for spraying atomised hydrant water on electrical fires in a discontinuous fog jet to avoid electrical shocks.

Air release valves shall be provided at the highest points of Hopper complex, sub-station and control room.

3.2 The hydrant system shall be kept pressurised by jockey pump of suitable capacity to make up small system leakage and maintain pressure in hydrant system.

Jockey pump shall cut in approximately at 0.35 kg/cm^2 drop and cut out at normal system pressure. Fire pumps shall be arranged to cut in approximately at 1 kg/cm^2 drop and cut out manually at churn pressure.

Miscellaneous Equipment

The following items will be provided wherever necessary throughout the plant:

Compliance With Standards

The design, selection, and construction of equipment, components and material shall conform to relevant Indian Standard Specifications and Codes of Practice incorporating the latest revisions or in their absence to equivalent BS/DIN/AMERICAN Standards.

1.1 Chain pulley block

Chain pulley blocks of suitable capacity will also be provided wherever required for effective maintenance of equipment. The number and capacity will be fixed during detail design stage. The chain pulley block shall have chain & wheel facility to move in horizontal and vertical locations.

The effort required at pulling chain will not be more than 25 kg at full load and speed. The hanging structures will have an outside projection for easy handling of material. The supply will include complete chain pulley block with hanging structure.

2.0 Pollution Control System

To eliminate dust at dust generating points dust suppression (Fog type) arrangement has been envisaged as given in the following table-

Sl.No.	Locations/Dust generating points	Fog type DS/ DE
1	Hopper Top	Fog type DS
2	Wagon loading	Fog type DS

2.1.1 Dust Suppression System (Fog Type)

Automatic Fog type dust suppression system employing water has been envisaged to minimise the water consumption. Fog system shall be capable of generating water fog to suppress dust generated during loading. Fog system for dust suppression shall be complete with storage tank, pump, micron water filters, nozzles, water pipe line and necessary water treatment arrangements to eliminate the possibility of nozzle choking and scale formation in pipe lines. The nozzle shall be of stainless steel which can withstand orifice wear due to high pressure. Flow rate of nozzles shall be at sufficiently high pressure to suit the requirement of fogging. Provision to control the quantity of fog shall be made. System shall be equipped with on/off/auto switches. The system should be suitable to work with the available plain Industrial water received from main reservoir of Project.

3.0 Noise and vibration control

It is a fact that noise pollution causes fatigue to operation personnel. Every effort will be made to keep down the noise Level to the extent it is feasible. All machine mounting will have suitable arrangement for reducing the vibration and thereby noise. All transfer chutes within synthetic/Rubber lining. The noise level near the noise generating points will be maintained below 75 dB as per relevant Indian/ International standards.

4.0 Safety devices

All the equipment shall be provided with necessary safety devices such as emergency stop switches, overload protection etc wherever applicable. All equipment in the stream will be started and stopped from the central control room in a pre-determined sequence consecutively. In case of stoppage of any equipment in the circuit for any reason, all the preceding equipment shall be stopped automatically.

5.0 Repair facilities

Necessary spot repair facilities shall be provided for plant and equipment including lifting tools and tackles. Provision for site storage of spares and tools shall also be made. All lubrication charging points shall be dust free. Suitable arrangement shall be made to facilitate automatic changing of conveyor belt.

6.0 Plant cleaning and drainage

- 6.1 Suitable arrangements shall be made for cleaning of plant especially at the spillage point with the help of vacuum cleaners in case of electrical panels and plant equipment.

Plant cleaning points shall be provided at loading point. The effluent shall be discharged into a suitable location by drainage. Compressed air points should be provided at different floors wagon loading complex for cleaning. These shall be served by portable compressors as envisaged in the bid document.

MAINTENANCE & SAFETY

1.0 Safety Precautions and Provisions

- 1.1 Proper safety precaution and provision shall be provided as per relevant Indian Standards.
- 1.2 Adequate lighting provision shall be made in the control rooms for natural lighting. For night operations, the lighting arrangements shall conform to IS: 3646 –1986 'Code of Practice for interior illumination : Part 1 Principles of good lighting and aspects of design, IS:3646-1968 'Code of Practice for interior illumination Part 3 calculation of coefficients of utilization by the BZ method'
- 1.3 Adequate ventilation facilities shall be provided wherever required to protect men and equipment.

2.0 Marking of Controls:

- 2.1 All controls shall be marked with the words appropriate to the function they control, such as stop, start, forward, reverse, raise or lower. Arrows indicating the direction of travel control shall be provided at all forward and reverse controls.
- 2.2 **Location of signs** – Each stop control shall be readily accessible and shall be indicated by a standard or uniform type signs erected in suitably conspicuous positions and shall have letters not less than 15 mm high.

3.0 SAFETY GUARDS :

- 3.1 Guards shall be designed to prevent injury to persons and shall be provided at every dangerous part of equipment normally accessible to personnel. They shall be designed to form part of the equipment and shall not in themselves create hazards.
- 3.2 Guards shall be provided to prevent accidental contact by persons or parts of clothing being caught in equipment. All guards shall comply fully with the requirements of the relevant statutory authority.
- 3.3 All sheet metal guards shall be aluminium. All guards shall be painted safety yellow.
- 3.4 Lifting handles or lugs shall be provided where required for the safe removal or opening of guards.

4.0 SAFETY AND IDENTIFICATION SIGNS :

- 4.1 Safety and identification signs shall be placed on all equipment and work areas. All signs shall be painted with luminous paint on 2.5 mm minimum thickness brass or stainless steel sheet.
- 4.2 Identification signs shall be bold lettering (minimum of 50 mm high) on a white background. Each item of equipment shall be clearly identified with a minimum of two signs.
- 4.4.1 All equipment and work areas shall have signs for :
 - a) Hearing protection
 - b) Warning that equipment may start without notice
 - c) High voltage
 - d) Eye protection.

Inspection and Quality Control Before Despatch

1.0 Inspection and Quality Control Before Despatch

i) Special Material

The manufacturer should furnish during inspection without extra charge test certificates covering mechanical properties and chemical composition for special raw materials used including that of liners. The certificates should be from the accredited testing laboratories like CMERI, Durgapur, NPL, New Delhi. etc. If considered necessary, samples for material may be selected as per IS :1548 (Current) by the Employer's representative from amongst the raw materials and manufactured components of equipment and got tested in the approved laboratory. In case samples so selected fail to meet the standard specifications. the whole lot of manufactured components will be rejected and disqualified for use again for any of the Employer's supplies.

ii) Stage Inspection

Employer reserves the right to carry out inspection at any stage of the process of manufacture and assembly for which all facilities will be provided by the Contractor. Before carrying out such inspection, necessary information will be given to the manufacturer by the Contractor.

iii) Availability of Standard Specification Meters, Gauges etc. for Testing & Inspection.

The manufacturer will maintain all relevant standards and codes of practice for manufacture, inspection and testing of components of the equipment ordered. He will also maintain a set of meters, gauges etc. as may be required for testing and inspection of components.

2.0 Checks during inspection

The details of the checks to be carried for various components are to be submitted by the contractor for Owner's approval. However, some indicative checks on different items are given below which should necessarily form part of the quality assurance programme to be agreed with the Owner.

2.1 All plates above 20mm thickness to be ultrasonically tested for laminations.

After forgings and castings to be checked for hardness ,microstructure and ultrasonic testing in addition to check for chemical and mechanical properties

2.2 Following minimum NDT requirements to be ensured for welds.

- i) Butt welds : 10 % Ultrasonic / Radiographic and 100 % MP/ DP test**
- ii) Fillet welds : 10% Magnetic Particle/ DP test**

Guaranteed percentage availability

All the equipment should be guaranteed for a minimum of 90% availability during 12 months from the date of commissioning.

The following formula will be adopted to calculate percentage availability.

$$\frac{(\text{Total shift hours}-\text{breakdown hours}-\text{maintenance hours})}{(\text{Total shift hours})} \times 100$$

Total shift hours=8x no of shifts operated in 12 months including those on scheduled holidays.

SUB-SECTION – 7.4.2

ELECTRICALS

SUB-SECTION – 7.4.2

TECHNICAL SPECIFICATIONS

2.1 GENERAL INFORMATION

- 2.1.1 The supply and installation of electrical equipment specified herein are required for both indoor and outdoor.
- 2.1.2 The successful tenderer shall furnish all, but not limited to, equipment, materials and accessories and services specified herein to complete this work. The work shall have to be completed and operative in all details. Any item of work or material which may not have been specifically mentioned but incidental to or necessary for complete installations and operation shall be provided by the Bidder without any additional charge to the purchaser.
- 2.1.3 The successful tenderer shall supply and/or erect the addition or modification as will be agreed upon in writing after mutual discussion.
- 2.1.4 The equipment to be furnished under this specification shall be packaged for shipment so as to meet the space and weight limitations to transport facilities, right up to destination.

2.1.5 STANDARDS

- 2.1.5.1 The equipment and materials to be furnished shall be designed, manufactured and tested in accordance with the latest revisions of the Indian Standards (IS). Where Indian standards are not available International standards like British Standards (BS), ISO, DIN, JIS or Other standards and International Electro-Technical Commission (IEC) publications unless otherwise stated, which ensures performance equivalent or superior to Indian standard shall be followed.
- 2.1.5.2 The equipment conforming to any other national standard which ensures equivalent quality is also acceptable. In such cases the tenderers shall clearly indicate the standards adopted and furnish a copy of the English Version of the Standard along with the tender.
- 2.1.5.3 The equipment covered under these specifications shall comply with all the latest applicable statutory rules, regulations, acts and safety codes which may be in force during the period of execution and which are related with design, construction and operation of equipment in the locality where the equipment is to be installed.
- 2.1.5.4 The electrical installation shall meet the requirement of Indian Electricity Act 1910 and Indian Electricity Rules, 1956 as amended up-to-date, Mines Rules and Regulations (latest revision) and also the applicable section of the latest revision of the relevant IS code of practice.
- 2.1.5.5 Nothing in these specifications shall be construed as to relieve the supplier of the responsibility for correctness of the design and construction of the equipment. All the standards being followed shall be listed out in the bid. Where any foreign standard is being followed, the copy of the same shall be provided with the bid.
- 2.1.5.6 Wherever service conditions and requirements laid down in these specifications differ from applicable standards, the conditions specified herein shall prevail.

2.1.5.7 Distribution Transformers upto and including 200 kVA, Tubular Fluorescent Lamps, Ceiling Fans, Air Conditioners etc. shall bear minimum 3 star BEE labeling, whereas, LT motors shall be of EFF2 type for ratings specified by BEE.

2.1.5.8 In addition, any relevant regulations applicable to the work shall be followed. In case of any discrepancy, the decision of purchaser will be final.

2.1.6 **SERVICE CONDITIONS**

Ambient air temperature : 5°C to 50°C .

Altitude : Maximum upto 1000 M above MSL.

Relative Humidity : Approximately 97 %.

Pollution degree : Degree 4 as per IS : 13947 (Part I) (i.e. the pollution generates persistent conductivity caused by conductive dust)

2.1.7 **INSPECTION**

The manufacturer shall carry out a comprehensive inspection and testing program during manufacture for all bought out items and also workmanship during this stage. The manufacturer shall submit the inspection program at least four weeks prior to the purchaser.

The manufacturer shall carry out all standard routine tests in accordance with relevant IS. The manufacturer shall also carry out type tests in accordance with relevant IS on one piece of one rating. While the routine tests shall be carried out at manufacturer's works under prior information to purchaser, the type test certificates from reputed test houses shall be submitted for purchaser's approval giving details of each test and evaluation of test data.

Tests which are common to both type and routine tests may be covered under routine test in the presence of purchaser's representative, if required.

2.1.8 **TEST CERTIFICATE**

The equipment covered under these specifications shall be Type tested in accordance with relevant codes. The bidder shall supply at the time of execution the routine test certificates from the manufacturer indicating the type of tests conducted and the test results in accordance with relevant codes.

ANNEXURE - ES-1**SPECIFICATION FOR MOTOR CONTROL CENTRES AND DISTRIBUTION BOARDS****1.0 SCOPE**

This specification covers requirements for 415 V Switch Boards/Motor Control Centres (MCC) incorporating circuit breakers or fuse switch units or any combination of these.

The Boards/MCC shall comply with the latest version of IS 8623 & IEC 439-1 except where modified or extended by this specification and with the relevant parts of standards mentioned in clause 2.0.

2.0 OTHER RELEVANT STANDARDS

The other relevant standards applicable are as under:

- IS :13947 LV switch gear and control gear
- IS :10118 Code of practice for selection, installation and maintenance of switchgear and control-gear
- IS :4237 General requirements for Switchgear and Control gear for voltages not exceeding 1000 V.
- IS :6875 Switches and push-buttons
- IS :13703 LV fuses for voltages not exceeding 1000 V AC
- IS :12021 Specification of control transformers
- IS :2705 Current Transformers
- IS :3156 Voltage Transformers
- IS :11353 Guide for uniform system of marking and identification of conductors and apparatus terminals
- IS :2147 Degree of protection provided by enclosures for low voltage switchgear and Control gear
- IS :3043 Code of practice for earthing
- IS :6005 Code of practice of phosphating iron and steel.
- IS :3202 Code of practice for climate proofing of electrical equipment
- IS :2629 Hot dip galvanising
- IS :5082 Wrought Aluminium and Aluminium alloys for electrical purposes
- IS :722 A C Electricity Meters
- IS :1248 Electrical Indicating instruments
- IS :3231 Electrical relays for power system protection
- IS :5 Colors for ready-mixed paints and enamels.
- IS :1554 PVC insulated cables for working voltages up-to and including 1100V
- IS :2551 Danger Notice Plates
- IS :8544 AC motor starters of voltage not exceeding 1000 volts
- IS :8686 Static Relays
- IE Rules 1956

2.1 SERVICE CONDITION

- Ambient air temperature - Minimum 5⁰C to Maximum 50⁰C with daily average ambient temperature of 40⁰C
- Altitude - Maximum upto 1000 meters above MSL.
- Relative Humidity - Approximate 97 % during rainy season.
- Pollution degree - Degree 4 as per IS: 13947 (part I i.e. the

Pollution generates persistent conductivity caused by conductive dust.

2.2 OPERATIONAL CONDITIONS

Nominal system voltage	-	415 V $\pm$ 10 %
Supply frequency	-	50 HZ $\pm$ 3 %
System Earthing	-	Effectively earthed
Highest Fault Level	-	31 MVA

3.0 CONSTRUCTIONAL DETAILS OF SWITCHBOARDS/MCC

- 3.01 All Switchboards, i.e., 415 V Switchgears, Motor Control Centres (MCCs), A.C. Distribution Boards (ACDBs) shall be of metal enclosed, indoor, floor-mounted, single front, free-standing type. Each panel shall comprise one or more of the modules mentioned in Annexure-A.
- 3.02 All switchboard frames and load bearing members shall be fabricated using suitable mild steel structural sections or pressed and shaped cold-rolled sheet steel of thickness not less than 2.0 mm. Frames shall be enclosed in cold-rolled sheet steel of thickness not less than 1.6 mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. The gland plate thickness shall be 3.0 mm (minimum) for hot/cold rolled sheet steel and 4.0 mm (minimum) for non-magnetic material.
- 3.03 All panel edges and cover/door edges shall be reinforced against distortion by rolling, bending or by the addition of welded reinforcement members. The top covers of the panels should be designed such that they do not permanently bulge/bend by the weight of maintenance personnel working on it.
- 3.04 The complete structures shall be rigid, self-supporting, free from flaws, twists and bends. All cutouts shall be true in shape and devoid of sharp edges.
- 3.05 All switchboards shall be of dust-proof and vermin-proof construction and shall be provided with a degree of protection of IP 52 as per IS:2147. However, the busbar chambers having a degree of protection of IP 42 are also acceptable where continuous busbar rating is 1600 A and above. Provision shall be made in all compartments for providing IP 52 degree of protection, when circuit-breaker or module trolley has been removed. All cutouts shall be provided with synthetic rubber gaskets. The switchboards which are meant for outdoor duty shall be provided with degree of protection of IP 54 as per IS:2147.
- 3.06 Provision of louvers on switchboards would not be preferred. However, louvers backed with metal screen are acceptable on the busbar chambers where continuous busbar rating is 1600 A and above.
- 3.07 All switchboards shall be of uniform height.
- 3.08 Switchboards shall be easily extendable on both sides by the addition of vertical sections after removing the end covers.
- 3.09 Switchboards shall be supplied with base frames made of structural steel sections along-with all necessary mounting hardware required for welding down the base frame to the foundation/steel insert plates. The base frame height shall be such that floor finishing (50 mm thick) after erection of the switchboards does not obstruct the movement of doors, covers, withdraw-able modules etc.

3.10 All switchboards shall be divided into distinct vertical sections (panels), each comprising of the following compartments.

a) **Busbar Compartment**

A completely enclosed bus bar compartment shall be provided for the horizontal and vertical busbars. Bolted covers shall be provided for access to horizontal and vertical busbars and all joints for repair and maintenance which shall be feasible without disturbing any feeder compartment. Auxiliary and power busbars shall be in separate compartments.

b) **Switchgear/ feeder Compartment**

All equipment associated with incomer or outgoing feeder shall be housed in a separate compartment of the vertical section. The compartment shall be sheet steel enclosed on all sides with the withdraw-able units in position or removed. Insulating sheet at rear of the compartment is also acceptable. The front of the compartment shall be provided with the hinged single leaf door with captive screws for positive closure.

c) **Cable Compartment or Cable Alley**

A full-height vertical cable alley of minimum 175 mm width shall be provided for power and control cables. Cable alley shall have no exposed live parts and shall have no communication with busbar compartment. Cable terminations located in cable alley shall be suitably shrouded to prevent accidental contact by falling of tools etc. For distribution boards, the partition between the feeder compartment and cable alley made of FRP sheet may also be offered. It shall be of such construction as to allow cable cores with lugs to be easily inserted in the feeder compartment for termination. Wherever cable alleys are not provided for distribution boards, segregated cable-boxes with complete shrouding for individual feeders shall be provided at the rear for direct termination of cables in each individual feeder. For circuit breaker external cable connections, a separately enclosed cable compartment shall also be acceptable. The Contractor shall furnish suitable plugs to cover the cable openings in the partition between feeder compartment and cable alley, for at least 50% of the total number of feeders. Cable alley door shall be hinged.

d) **Control Compartment**

A separate compartment shall be provided for relays and other control devices associated with a circuit breaker.

3.11 Sheet steel barriers shall be provided between two adjacent vertical panels running to the full height of the switchboard, except for the horizontal busbar compartment. Synthetic rubber gasket shall be provided between the panel sections to avoid ingress of dust into panels. Each shipping section shall have full metal sheets at both ends for transport and storage.

3.12 After isolation of power and control circuit connections it shall be possible to safely carryout maintenance in a compartment with the busbar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose. Wherever two breaker compartments are provided in the same vertical section, insulating barriers and shrouds shall be provided in the rear cable compartment to avoid accidental touch with the live parts of one circuit when working on the other circuit.

3.13 All 415 V switchgear (circuit-breaker) panels shall be of single-front type MCCs and ACDBs shall be of single-front construction. All single-front switchboards shall be provided with single-leaf, hinged or bolted covers at the rear. The bolts shall be of

captive type. The covers shall be provided with "DANGER" labels. All panel doors shall open by 90 degree or more.

- 3.14 All ACDBs shall be of fixed module type. All 415 V circuit breaker modules and MCC modules shall be of fully draw-out type having distinct 'Service' and 'Test' positions. The equipment pertaining to a draw-out type incomer or feeder module shall be mounted on a fully withdraw-able chassis which can be drawn out without having to unscrew any wire or cable connection. Suitable arrangement with cradle/rollers and guides shall be provided for smooth movement of the chassis. For modules of size more than half the panel height, double guides shall be provided for smooth removal or insertion of module. All identical module chassis of same size shall be fully interchangeable without having to carryout any modifications.
- 3.15 All disconnecting contacts for power and control circuits of draw-out modules shall be of robust and proven design, fully self-aligning and spring-loaded. Both fixed and moving contacts shall be silver-plated and replaceable. The spring-loaded power and control draw-out contacts shall be on withdraw-able chassis and same on fixed portion shall not be accepted. Detachable plug and socket type control terminals shall also be acceptable.
- 3.16 Individual opening in the vertical bus enclosure shall permit the entry of moving contacts from the draw-out module into vertical droppers.
- 3.17 All equipments and components shall be neatly arranged and shall be easily accessible for operation and maintenance. The internal layout of all modules shall be subject to Purchaser's approval. The Contractor shall submit dimensional drawings showing complete internal details of busbars and module components, for each type and rating for approval of Purchaser.
- 3.18 However, the Purchaser reserves the right to alter the cable entries top or bottom, if required, during detailed engineering, without any additional commercial implication.
- 3.19 Each switchboard shall be provided with undrilled, removable type gland plate which shall cover the entire cable alley. Bidder shall ensure that sufficient cable glanding space is available for all the cables coming in a particular section through gland plate. For all single core cables, gland plate shall be of non-magnetic material. The gland plate shall preferably be provided in two distinct parts for the ease of terminating additional cables in future. The gland plate shall be provided with gasket to ensure enclosure protection.
- 3.20 The composition and disposition of various modules in a switchboard shall be finalized during detailed engineering. The Bidder shall include in his quoted price the cost of any adopter panel/dummy panel required to meet various configuration arrangement of busbars adopted by the Bidder.

3.21 Clearances

The minimum clearance in air between phases and between phases and earth for the entire run of horizontal and vertical busbars and bus-link connections at circuit-breaker shall be 25 mm. For all other components the clearance between 'two live parts', 'a live part and an earthed part', shall be atleast 10 mm throughout. Wherever it is not possible to maintain these clearances, insulation shall be provided by sleeving or barriers. However, for horizontal and vertical busbars the clearances specified above should be maintained even when the busbars are sleeved or insulated. All connections from the busbars up-to switch/fuses shall be fully shrouded/insulated and securely bolted to minimise the risk of phase to phase and phase to earth short circuits.

4.0 POWER BUSBARS AND INSULATORS

- 4.01 All 415 V Switchboards, MCCs and ACDBs shall be provided with three phase and neutral busbars.
- 4.02 All busbars and jumper connections shall be of high conductivity aluminium alloy/copper of adequate size.
- 4.03 The cross-section of the busbars shall be uniform throughout the length of switchboard and shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Neutral busbar short circuit strength shall be same as main busbars.
- 4.04 All busbars shall be adequately supported by non-hygroscopic, non-combustible, track-resistant and high strength sheet moulded compound or equivalent type polyester fibre glass moulded insulators. Separate supports shall be provided, for each phase and neutral busbar. If a common support is provided, anti-tracking barriers shall be provided between the supports. Insulator and barriers of inflammable material such as Hylam, shall not be accepted. The busbar insulators shall be supported on the main structure.
- 4.05 All busbar joints shall be provided with high tensile steel bolts, belleville/spring washers and nuts, so as to ensure good contacts at the joints. Non-silver plated busbar joints shall be thoroughly cleaned at the jointed locations and suitable contact grease shall be applied just before making a joint. The overlap of the busbars at each joint surface shall be such that the length of overlap shall be equal to or greater than the width of the busbar. All copper to aluminium joints shall be provided with suitable bi-metallic washers.
- 4.06 All busbars shall be color coded as per IS : 375.
- 4.07 Wherever the busbars are painted with black matt paint, the same should be suitable for temperature encountered in the switchboard under normal operating conditions.
- 4.08 The Bidder shall furnish calculations establishing the adequacy of busbar sizes for specified current ratings.
- 4.09 The neutral bus in MCC shall be connected to earth bus at two points by separate vertical droppers which shall be insulated from MCC enclosure. The neutral bus shall not be earthed in all the other boards in which incomers are not from transformers.

5.0 AUXILIARY BUSBARS AND CONTROL TRANSFORMERS**5.01 AC Control Supply Bus bar**

Each bus-section of all Switchgears and MCCs shall be provided with one (1) no. 415 V/110V control transformer as shown in enclosed Drawing. The 110 V AC control supply from the control transformers shall be run through the MCC by means of two sets of control supply busbars of electrolytic copper. In case of failure of one transformer, whole bus section can be fed through single transformer. The control supply to different modules shall be tapped individually from the control supply busbars. One pole of secondary winding of control transformers shall be solidly grounded through a test link. The transformer body shall be earthed at two points.

5.02 DC Control Supply Bus bars

For PLC based control system, DC supply to PLC unit including relays shall be provided with one (1) no. of 415 V/220V control transformer with inverter unit in

each section of the MCC. The Bidder shall provide suitable terminals, switch etc. to receive the DC supply and distribute the same through above mentioned control busbars to the required modules of the respective section. The DC control supply bus of one section shall be coupled to the control supply of other section through a switch located in the bus-coupler breaker panel. The DC supply to the bus-coupler breaker may be given from any of the control buses.

5.03 **Space Heater Busbars**

Panel and motor space heaters shall be fed from separate AC auxiliary busbars running throughout the switchboard. The supply for these busbars shall be tapped from incomers before the isolating switch/circuit breaker. Incoming circuit to space-heater bus shall have an isolating switch, HRC fuse and neutral link of suitable rating. Suitable terminals shall also be provided to facilitate energisation of space-heater bus from outside during long shutdowns of unit/switchboard.

5.04 **Control Transformers**

The control transformers shall be dry type, of insulation class B or better. The sizing of Control transformers shall be carried out by Bidder considering the actual load of power contactors, auxiliary contactors, indicating lamps and other equipments in the module circuit. An additional load of 15 watts should also be considered for each module, for remote auxiliary relays and lamps to be connected in the control circuit of modules. Bidder shall also ensure that control transformers are adequately designed for meeting the momentary loading requirements and the voltage drop during this condition shall not be more than 5%.

6.0 **EARTH BUS AND EARTHING**

- 6.01 A galvanised steel earth bus shall be provided at the bottom of each panel and shall extend throughout the length of each switchboard. It shall be welded/bolted to the framework of each panel and breaker earthing contact bar. Vertical earth bus shall be provided in each vertical section which shall in turn be bolted/welded to main horizontal earth bus.
- 6.02 The earth bus shall have sufficient cross section to carry the momentary short circuit and short time fault current to earth, without exceeding the allowable temperature rise.
- 6.03 Suitable arrangements shall be provided at each end of the horizontal earth bus for bolting to earthing conductors. The horizontal earth bus shall project out of the switchboard ends and shall have predrilled holes for this connection. All joint splices to earth bus shall be made through at-least two bolts and taps by proper lug and bolts connection.
- 6.04 All non-current carrying metal work of the switchboard shall be effectively bonded to the earth bus. Electrical conductivity of the whole switchgear enclosure framework and truck shall be maintained even after painting.
- 6.05 The carriage and breaker frame shall get earthed while being inserted in the panel and positive earthing of the breaker frame shall be maintained in all positions, i.e. SERVICE & ISOLATED, as well as the throughout the intermediate travel.
- 6.06 Each module frame shall get engaged to the vertical earth bus before the disconnecting contacts on the module are engaged to the vertical busbars.
- 6.07 All metallic cases of relays, instruments and other panel-mounted equipments shall be connected to earth by independent stranded copper wire of size not less than 2.5 sq. mm. All the equipment mounted on the door shall be earthed through

flexible wire/braids. Insulation color code of earthing wires shall be green. Earthing wires shall be connected to terminals with suitable clamp connectors, soldering is not acceptable. Looping of earth connections which would result in loss of earth connections to other devices, when a device is removed, is not acceptable. However, looping of earth connections between equipments to provide alternative paths to earth bus is acceptable.

- 6.08 VT and CT secondary neutral point earthing shall be at one place only, i.e., on the terminal block. Such earthing shall be made through links so that earthing of one secondary circuit shall be removed without disturbing the earthing of other circuit.
- 6.09 All hinged doors having potential carrying equipment mounted on it shall be earthed by flexible wire/braid. For doors not having potential carrying equipment mounted on it, earth continuity through scraping hinges/hinge pins of proven design may also be acceptable. The Bidder shall establish earth continuity at site also.

7.0 MOULDED CASE CIRCUIT BREAKERS

7.1 SCOPE

This specification covers requirements for 415V Moulded Case Circuit Breakers suitable for installation in a switchboard (MCC).

The Moulded case circuit breakers shall comply with the latest revision of IS: 13947(Part I) and IEC: Publication 947 except where modified or extended by the provision of this specification and with the relevant parts of standards mentioned in clause 1.2.

Any material and component not specifically stated in this specification but necessary for trouble free operation of the equipment and accessories specified herein shall deemed to be included.

7.2 OTHER RELEVANT STANDARDS

The other relevant Indian standards are as under :

IS : 3072: Code of practice for installation and maintenance of switchgear.

IS : 4237: General requirements for switchgear and controlgears for voltages not exceeding 1000V AC.

IS : 10118: Code of practice for selection, installation and maintenance of Switchgear and Controlgear.

IS : 11353: Guide for uniform system of marking and identification of conductors and apparatus terminals.

Where Indian standards are not available International standards like British standards, ISO, DIN, JIS or Other standards which ensures performance equivalent or superior to Indian standard shall be followed.

The equipment covered under this specification shall comply with all the latest applicable statutory rules, regulations, acts and safety codes which may be in force during the period of execution and which are related with design, construction and operation of equipment in the locality where the equipment is to be installed.

Nothing in this specification shall be construed as to relieve the supplier of the responsibility for correctness of the design and construction of the equipment.

All the standards being followed shall be listed out in the bid. Where any foreign standard is being followed, the copy of the same shall be provided with the bid.

Wherever service conditions and requirements laid down in this specification differ from applicable standards, the conditions specified herein shall prevail.

7.3 DESIGN CRITERIA

The Moulded Case Circuit Breakers shall operate on a 415V (-15% to + 10%), 3 phase, 50 Hz (+3%) power supply. Fault withstand capacity shall not be less than 50 kA (P1 category duty cycle).

All similar components shall be interchangeable and shall be of same type and rating for easy maintenance and low spare inventory.

The rated carrying capacity shall be as specified in annexure-I at the rated voltage and frequency and the circuit breaker shall carry this current continuously while complying with this specification.

7.4 CONSTRUCTIONAL DETAILS

- 1) The Circuit breakers shall be three / four pole, moulded case air break type.
- 2) The circuit breakers shall have tripping mechanism for over load and short circuit irrespective of the type of operating mechanism. In addition, provision shall be made for manual tripping of the breaker. The breakers shall be fixed type.
- 3) Circuit Breakers shall be provided with anti-pumping and trip free feature.
- 4) Tripping shall be possible by means of front mounted "OFF" switch. Making of the breaker shall be possible by means of "ON" switch.
- 5) Suitable arc splitters and magnetic blowouts and chutes shall be provided for efficient arc extinction of high as well as low values of interrupting currents.
- 6) Suitable indications shall be provided on circuit breaker to show "ON", "OFF", conditions.
- 7) The following protection (release type) shall be provided :
 - a) Ambient temperature compensated thermal overload trip with adjustable settings.
 - b) Magnetic Short circuit trip

7.5 PERFORMANCE

- 1) The temperature rise of parts of the equipment like terminals, accessible parts, main circuit, windings of coils and electromagnets etc. measured during the test carried out in accordance with IS: 13947 (Part I) shall not exceed temperature rise limits specified in the said standard.
- 2) The dielectric property of the equipment shall conform to co-ordination of insulation related to insulation levels indicated in IS: 13947 (Part I).
- 3) Clearances shall be sufficient to enable the equipment to withstand the rated withstand voltage as indicated in the IS: 13947 (Part I).
- 4) The minimum creepage distance shall be as per IS: 13947 (Part I).
- 5) The equipment shall be capable of making and breaking load and overload currents without failure under the conditions stated in the relevant product standard for the required utilisation category.
- 6) The equipment shall be capable of withstanding thermal and electromagnetic stress from short circuit currents during current making, current carrying in the closed position and during current interruptions.

ANNEXURE - I

SPECIFICATION FOR 415 V MOULDED CASE circuit breaker

- 1 Installation : Switch board
- 2 Number of Poles : 3 / 4
- 3 Service Voltage : 415 V (-15% to 10%)
- 4 Rated current (A) : 630A, 500A, 350A, 300A, 250A, 200 A, 160A
- 5 Making capacity : 120 kA (peak)
- 6 Frequency : 50 Hz (+ 3%)
- 7 Symmetrical breaking capacity : 50 kA (rms)
- 8 Short time current for 1 Second : 50 kA (rms)
- 9 Settings : 500A /400A/300A/250A/200A/160A/120A
Magnetic 9 kA
- 10 Operating Mechanism : Manual Trip free
- 11 Tripping arrangement : Thermal overload and Short circuit electromagnetic release.
- 12 Protections to be provided : i) Short circuit
ii) Overload
- 13 Cable Entries :
- 13.1 Incoming : Suitable for PVC SWA with Aluminium conductor.
Totally shrouded to avoid risk of electric shock to operating personnel.
- 13.2 Outgoing : Connected to Bus.
- 14 Execution : Fixed

8.0 AIR BREAK SWITCHES

- 8.1 Air break switches shall be of heavy duty, single throw, group operated, load break, fault make type when associated with fuses and complying with IS:4064. All switches for motor circuits shall be of utilisation category AC-23 with 1NO+1NC auxiliary contact which shall be wired to the control circuit as shown in the schematic drawings. All switches for other outgoing feeders shall be of utilisation category AC-22.
- 8.2 Continuous current rating of the switches shall be selected for various feeders.
- 8.3 The main switches shall be operable from outside the module door. The switch handle shall clearly indicate the position of switch. Switch operating handles shall be provided with padlocking facilities to lock them in "OFF" position. However, incomer switches of switchboards shall be provided with padlocking facility in both "ON" and "OFF" positions.
- 8.4 Interlocks shall be provided such that the cubicle door will not open when the switch is in closed position and the switch will close only when the door is closed.
- 8.5 Switches and fuses for AC control supply and heater supply wherever required, shall be mounted inside the cubicles.
- 8.6 Even for a single feeder the Bidder shall provide TPN switch, fuse-bases and cable/link connections between switch/fuse and vertical busbars for all the three phases, so that changing from single phase feeder to three phase feeder is possible without any modification other than inserting fuses at site.

9.0 CONTROL AND SELECTOR SWITCHES

- 9.1 Control and Selector switches shall be of rotary type, with escutcheon plates clearly marked to show the function and positions. The switches shall be suitable for mounting on panel front.
- 9.2 Circuit breaker control switches shall have three positions and shall be spring return to "NEUTRAL" from "CLOSE" and "TRIP" positions and shall have pistol grip handles. The control switch shall have at least two (2) contacts closing in 'Close' position, and two (2) contacts closing in 'Trip' position.
- 9.3 Circuit breaker selector switches for motor feeders shall have three stay put positions marked "Switchgear", "Normal" and "Trip" respectively. They shall have at least three contacts for each of the three positions and shall have black spade handles. Circuit breaker selector switches for other feeders shall have two stay put positions marked "Switchgear" and "Normal" with two contacts for each of the two positions.
- 9.4 Ammeter and voltmeter selector switches shall have four stay put positions with adequate number of contacts for 3-phase 4-wire system. Ammeter selector switches shall have make before break type contacts to prevent open circuit of CT secondary.
- 9.5 Contacts of the switches shall be spring assisted.
- 9.6 The contact ratings shall be at least the following :
- i) Make and carry, continuously 10 A, 110 V AC.
 - ii) Breaking current at 110 V AC and 0.3 lagging p.f., 5A.

10.0 CONTACTORS

- 10.1 Motor starter contactors shall be of air break, electro-magnetic type rated for uninterrupted duty as per IS :2959.
- 10.2 Contactors shall be double-break, non-gravity type and their main contacts shall be silver faced.
- 10.3 Direct-on-line contactors shall be of utilisation category AC3. Reversing starters shall comprise of Forward and Reverse contactors mechanically and electrically interlocked with each other. These contactors shall be of utilization category AC4.
- 10.4 The number of normally open (NO) and normally closed (NC) auxiliary contacts of a contactor shall be as per requirement shown in the respective module drawings. It shall, however, be not less than 2 NO+2NC.
- 10.5 Operating coil of contactors shall be of 110 V AC unless otherwise specified elsewhere. The contactor shall operate satisfactorily between 85% to 110 % of the rated voltage. The contactor shall not drop out at 70% of the rated voltage but shall definitely drop out at 20% of the rated voltage.

11.0 FUSES

- 11.1 All fuses shall be of HRC cartridge fuse link type. Fuses for AC circuits shall be rated for 80 KA rms (prospective) breaking capacity at 415 V AC.
- 11.2 Fuse shall have visible operation indicators. Insulating barriers shall be provided between individual power fuses.
- 11.3 Fuse shall be mounted on insulated fuse carrier which is mounted on fuse bases. Wherever it is not possible to mount fuses on carriers, fuses shall be directly mounted on plug - in type of bases. In such cases one set of insulated fuse pulling handles shall be supplied with each switchboard.
- 11.4 Fuse ratings shall be selected by the Bidder for various feeders.

- 11.5 The Neutral links shall be mounted on fuse carriers which shall be mounted on fuse bases.

12.0 INSTRUMENT TRANSFORMERS

- 12.1 All current and voltage transformers shall be completely encapsulated cast resin insulated type suitable for continuous operation at the temperature prevailing inside the switchgear enclosure, when the switchboard is operating at its rated condition and the specified ambient temperature. The class of insulation shall be 'E' or better.
- 12.2 All instrument transformers shall be able to withstand the thermal and mechanical stresses resulting from the maximum r.m.s short circuit breaking and peak making current ratings of the associated switchgear.
- 12.3 All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to separate terminals on an accessible terminal block where star point formation and earthing shall be done.
- 12.4 Current transformers may be multi or single core type. All voltage transformers shall be single phase type.
- 12.5 The bus VTs shall be housed in separate compartment. All VTs shall have readily accessible HRC current limiting fuses on both primary and secondary sides.
- 12.6 All CTs shall be provided with supports independent of busbar/ busbar supports.
- 12.6 The metering CTs shall be of Class 1 accuracy and adequate VA burden. The Protection CTs shall be of 5P₁₀ accuracy class with adequate burden.

13.0 RELAYS & TIMERS

- 13.1 All relays and timers in protective circuits shall be flush mounted on panel front with connections from the inside. They shall have transparent, dust tight covers removable from the front. All protective relays shall have a draw-out construction for easy replacement from the front. They shall either have built in test facilities or shall be provided with necessary test blocks and test switches located immediately below each relay.
- 13.2 All AC relays shall be suitable for operation at 50 Hz with 110 Volt VT secondary and 1A or 5A CT secondary.
- 13.3 Protective relays, auxiliary relays and timers shall be provided with hand reset operation indicators.
- 13.4 All relays shall withstand a test voltage of 2.5 KV AC rms for one second or 2 KV AC rms for one minute. The accuracy class shall be 5 of IS : 3231.
- 13.5 All fuse protected contactor controlled motor and actuator starters shall be provided with three element, ambient temperature compensated, time lagged, hand reset type thermal overload relays with single phasing protection using differential movement and bimetallic strips. The single phasing protection shall operate even with 100% of the set current flowing in two of the phases and no current in the third phase. The setting ranges shall be adjustable type. These relays shall have a separate hand reset push button mounted on compartment door and shall have at least one changeover contact. Heavy duty starting overload relays shall be provided for modules controlling motors with long starting time. The requirement shall be finalised during detailed engineering.
- 13.6 All releases in circuit breakers shall conform to IS:13947. The releases shall be instantaneous or time delayed as per the requirement mentioned in module description. The releases shall have an operation indicator. The instantaneous release used for motor feeders shall be co-coordinated such that it does not operate with motor starting current.

- 13.7 The DC auxiliary relays for PLC system shall be designed for 220 V DC unless otherwise specified and shall operate satisfactorily between 75% and 110 % of the rated voltage. Relays shall have adequate thermal capacity for continuous operation. For PLC-controlled modules the coupling relays shall be provided by Bidder. The other parameters of these relays shall be same as Cl. no. 13.4 except for peak inverse voltage of diode which will be twice the rated voltage of coil.

14.0 INDICATING INSTRUMENTS

- 14.1 All indicating and integrating meters shall be flush mounted on panel front. The instruments shall be of at least 96 mm. square size with 90 degree linear scales, and shall have an accuracy class of 2.0 or better. The covers and cases of instruments and meters shall provide a dust and vermin proof construction.
- 14.2 All instruments shall be compensated for temperature errors and factory calibrated to directly read the primary quantities. Means shall be provided for zero adjustment without removing or dismantling the instruments.
- 14.3 All instruments shall have white dials with black numerals & lettering. Black knife edge pointer shall be provided for meters.
- 14.4 Ammeters provided for motor feeders shall have a compressed scale at the upper current region to cover the starting current upto 6.0 times the CT primary current.

15.0 PUSH BUTTONS

- 15.1 Push buttons shall be of spring return, push-to-actuate type. Their contacts shall be rated to make, continuously carry and break 10 A at 110 V AC.
- 15.2 All push buttons shall have one normally open and one normally closed contact unless specified otherwise. The contact faces shall be of silver alloy.
- 15.3 All push buttons shall be provided with integral escutcheon plates marked with its function.
- 15.4 The colour of the button shall be as follows :
Green for motor START, breaker CLOSE, commands.
Red for motor TRIP, breaker OPEN, commands
Black for all annunciation functions, overload, reset and miscellaneous commands including reversal
- 15.5 All emergency push buttons shall have mushroom knobs.

16.0 INDICATING LAMPS

- 16.1 Indicating lamps shall be of the panel mounting, LED/filament type and low watt consumption. The lamps shall have escutcheon plates marked with its function wherever necessary.
- 16.2 Lamps shall have translucent lamp-covers of the following colors, as warranted by the application.
Red for motor ON, valve/damper OPEN, breaker CLOSE
Green for motor OFF, valve/damper CLOSE, breaker OPEN
White for motor AUTO TRIP
Blue for all healthy conditions (e.g. CONTROL SUPPLY ON, and also for "SPRING CHARGED")
Amber for all Alarm Conditions (e.g. overload). Also for "SERVICE" and "TEST" position indications.
- 16.3 Bulbs and lamp covers shall be easily replaceable from the front of the cubicle.
- 16.4 All indicating lamps shall be suitable for continuous operation at 90% to 110% of their rated voltage.

17.0 SPACE HEATER

- 17.1 Space heaters shall be provided in the switchboards wherever the manufacturer considers them necessary and recommends their provision for preventing harmful moisture condensation.
- 17.2 The space heaters shall be suitable for continuous operation on 240 V AC, 50 Hz, single phase supply and shall be automatically controlled by thermostats. Necessary switches and fuses shall also be provided.
- 17.3 The circuit for each panel and motor space heater should have an isolating switch, HRC fuse and isolating link. In addition, the space heater circuit of each panel shall also have a thermostat of suitable rating.

18.0 INTERNAL WIRING

- 18.1 All switchboards shall be supplied completely wired internally up-to the terminals ready to receive external cables.
- 18.2 All inter-cubicle and inter-panel wiring and connections between panels of same switchboard including all bus wiring for AC supplies shall be provided by the Bidder.
- 18.3 All auxiliary wiring shall be carried out with 650 V grade, single core, stranded copper conductor, color coded, PVC insulated wires. Conductor size shall be 1.5 mm² (min.) for control circuit wiring and 2.5 mm² (min.) for CT and space heater circuits.
- 18.4 Engraved core identification ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. The ferrule shall be of self locking type. The wire identification marking shall be in accordance with IS: 375.
- 18.5 Wiring for equipment, which are to be supplied by the Purchaser/Other Contractor and for which the Contractor has to provide mounting arrangement in his panels, shall also be provided by the Contractor, upto the terminal blocks.
- 18.6 All connections from vertical busbars for individual modules above 100 A shall be by Copper links only. The cable connections for modules less than 100A shall be selected in such a way that there will not be any melting/shorting in case of a short circuit inside the module. For all modules where use of cable is envisaged by the Contractor specific approval from the Purchaser regarding cable details are to be taken. For power wiring color coded wire insulation/tapes shall be provided.

19.0 CONTROL TERMINAL BLOCKS

- 19.1 Control terminal blocks shall be of 650 Volts grade, rated for 10 Amps and in one piece moulding. It shall be complete with insulating barriers, clip-on type terminals and identification strips. Marking on terminal strip shall correspond to the terminal numbering on wiring diagrams. It shall have insulating material conforming to relevant code.
- 19.2 Terminal blocks for CT & VT secondary leads shall be provided with test links and isolating facilities. CT secondary leads shall be provided with short circuit and earthing facilities.
- 19.3 In all circuit breaker panels at least 10% spare terminals for external connections shall be provided and these spare terminals shall be uniformly distributed on all terminal blocks.
- 19.4 All terminal blocks shall be suitable for terminating on each side two (2) nos. stranded copper conductors of size up-to 2.5 mm² each.

- 19.5 All terminals shall be numbered for identification and grouped according to the function. Engraved white-in-black labels shall be provided on the terminal blocks.
- 19.6 Terminal blocks shall be arranged with at-least 100 mm clearance between two sets of terminal blocks. The minimum clearance between the first row of terminal blocks and the associated cable gland plate shall be 250 mm.
- 20.0 POWER CABLE TERMINATION**
- 20.1 Cable termination compartment and arrangement for power cables shall be suitable for heavy duty, 1.1 KV grade, stranded aluminium conductor, PVC/XLPE insulated, armoured and PVC sheathed cables. All necessary cable terminating accessories such as supporting clamps and brackets, power cable lugs, hardware etc. shall be provided by the Bidder to suit the cable sizes.
- 20.2 All power cable terminals shall be of stud type and the power cable lugs shall be of tinned copper solder less crimping ring type conforming to IS: 8309. All lugs shall be insulated/sleeved.
- 21.0 NAME PLATES AND LABELS**
- i) The MCC shall be provided with prominent, engraved identification plates. The module identification plate shall clearly indicate the feeder number and feeder designation as indicated elsewhere.
 - ii) The name plates shall be of non rusting metal with white non graved letterings on black back grounds. Inscriptions and lettering sizes shall be subject to purchaser's approval.
 - iii) Suitable stenciled paint mark shall be provided in side the panel /module for identification of all equipments in addition to the plastic sticker labels, if provided. The labels shall be positioned so as to be clearly visible. The labels shall bear the device number as indicated in the approved module wiring drawing.
 - iv) Caution plate with the inscription "WARNING LIVE TERMINALS" shall be provided at all joints where the terminals are likely to remain live and isolation is possible only at remote end.
- 22.0 PAINTING**
- The sheet steel work shall be pre treated, in tanks, in accordance with relevant code. Finishing paint on panels shall be shade 692 (smoke grey) in accordance with relevant code. The inner surface of the panels shall be glossy white. All hardware shall be nickel chromium plated or zinc passivated.
- 23.0 GASKETS**
- The gaskets wherever specified shall be of good quality synthetic rubber with good ageing, compression and oil resistant characteristic suitable for panel application.
- 24.0 PERFORMANCE**
- 24.1 TEMPERATURE-RISE**
- The temperature rise of the horizontal and vertical busbars and main bus links including all power draw out contacts when carrying 90% of the rated current along the full run shall in no case exceed 55⁰C with silver plated joints and 40⁰C with all other types of joints over the specified ambient temperature.
- 24.2 DERATING OF EQUIPMENTS**
- i) The Bidder shall ensure that the equipment offered carry the required load current at specified ambient temperature and perform the operating duties without

exceeding the permissible temperature as per relevant code. Continuous current rating at specified ambient temperature shall in no case be less than 90% of the normal rating specified.

- ii) The Bidder shall indicate clearly the derating factors, if employed for any component and furnish the basis for arriving at these derating factors duly considering the specified current ratings and ambient temperature specified.

24.3 PROTECTION CO-ORDINATION

It shall be the responsibility of the Bidder to fully co-ordinate the overload and short circuit tripping of the circuit breakers with the upstream and downstream circuit breakers/fuses/motor starters, to provide satisfactory discrimination. Further the various equipment supplied shall meet the requirements of Type C class of Co-ordination as per IEC 292.

ANNEXURE - A

A) Module Type AE (Electrically Controlled Circuit Breaker)

- One (1) Triple-pole circuit breaker, complete with all accessories and power operated mechanism
- One (1) Circuit breaker control switch
- Three (3) Current transformers for metering
- Three (3) Current transformers for protection
- One (1) Ammeter
- One (1) Ammeter selector switch
- One (1) 'Switchgear'/'Normal' selector switch
- Three (3) Indicating lamps with resistors and colored lenses
- Six (6) HRC Control fuses
- One (1) Lock out relay
- One (1) Suitable time delayed over current release. Alternatively, over current definite time delay relay with adjustable current setting 150% to 600% of the CT secondary current and adjustable time setting 0.1 Sec to 1 Sec may be offered .The relay shall have a resetting ratio of not less than 90%.
- One (1) Neutral link
- One(1) DC isolating switch

B) Module Type AET (Electrically Controlled Circuit Breaker for Incomer from Transformer)

Similar to module type AE but with following additions :

- One (1) Neutral current transformer for earth fault protection
- One (1) Single pole instantaneous earth fault relay with adjustable current setting of 50%-200% of rated secondary current of neutral CT. The relay shall have a resetting ratio of not less than 80%.

C) Module Type CD (Contactor Changeover with Bus Coupler and Two Incoming Supplies)

(Note : Incomer-A, Incomer-B and Bus Coupler shall be housed in separate drawout modules in different panels. Each of the drawout modules shall be provided with 'Service' position limit switch having 2 NO+2NC contacts).

Incomer-A / Incomer-B

- One (1) Triple pole load break isolating switch
- One (1) Triple pole contactor with coil suitable for 415 VAC
- Two (2) Auxiliary contactors with coil suitable for 415 V AC
- One (1) Indicating lamp with resistor & colored lens suitable for 415 V AC
- Three (3) HRC control fuses

Bus Coupler

- One (1) Triple pole contactor with coil suitable for 415 V AC
- Three (3) HRC fuses
- Four (4) HRC control fuses
- Two (2) Monitoring lamps suitable for 415 V AC

D) Module Type CS (AC Control Supply Module)**(Note : Module Type CS shall be of non-drawout type)**

- Two (2) 415/110 V control transformers
- Two (2) 110 V auxiliary relays
- Two (2) Earth links
- Eight (8) HRC Control fuses
- Two (2) Selector switches

E) Module Type E/E1/E2 (Switch Fuse Module)

- One (1) Triple pole switch-fuse unit with three pole isolating switch and three/one/two HRC fuses for E/E1/E2 modules, respectively
- One (1) Neutral link

F) Module Type G1 (PT Module with Under Voltage Relay)

- Two (2) 440/110 V single phase potential transformers, vee/vee connected, mounted on a common draw-out chassis
- Four (4) HRC fuses for PT primary
- One (1) Voltmeter (0-500 V for use with 440/110 V PT)
- One (1) Four position voltmeter selector switch
- Two (2) Single pole, instantaneous under voltage relays with continuously variable setting range of 40%-80% of 110 volts.
- Four (4) HRC control fuses
- One (1) Timer having a delay of 0.5 Sec to 3 Sec on pick up with 2 NO self reset contacts suitable for 220 V DC .

G) Module Type H (Isolating Switch Module)

- One (1) Triple pole load break isolating switch
- One (1) Neutral link

H) Module Type KI (Non Reversible Motor Rated Below 30 KW Controlled from MCC)

- One (1) Triple pole fuse switch unit with three pole load break isolating switch and three HRC fuses.
- One (1) Triple pole contactor
- One (1) Bimetallic thermal overload relay with single phasing preventor
- Two (2) Push buttons
- Three (3) Indicating lamps with resistors and colored lenses
- One (1) HRC control fuse
- One (1) Control link

I) Module Type K11 (Non reversible Motor Rated 30 KW to below 110 KW Controlled from MCC)**Similar to module type K1 but with the following additions**

- One (1) Current transformer for metering
- One (1) Ammeter
- One (1) Single -pole switch and fuse for motor space heater

J) Module Type K2 (Non Reversible Motor Rated below 30 KW Controlled from Remote Control Panel)

- One (1) Triple pole switch fuse unit with three pole load break isolating switch and three HRC fuses.
- One (1) Triple pole contactor

-
- | | | |
|--|-----------|---|
| | One (1) | Bimetallic thermal overload relay with single phasing preventor |
| | Three (3) | Indicating lamps with resistors and colored lenses |
| | One (1) | HRC Control fuse |
| | One (1) | Control link |
| | One (1) | 'Normal' / 'Trial' selector switch |
| | One (1) | Auxiliary contactor |
- K) **Module Type DK2 (Non Reversible Motor Rated Below 30 KW Controlled from PLC)**
(Similar to module type K2 without 'Normal'/ 'Trial'/ selector switch but with two (2) coupling relays.)
- L) **Module type K2/DK21 (Non Reversible Motor Rated 30 KW to below 110 KW Controlled from Remote Control Panel/PLC)**
(Similar to module type K2/DK2 but with the following additions)
- | | | |
|--|---------|--|
| | One (1) | Current transformer for metering |
| | One (1) | Ammeter |
| | One (1) | Single-pole switch and fuse for motor space heater |
- M) **Module Type K3 (Non Reversible Motor Rated Below 30 KW Controlled Locally)**
- | | | |
|--|-----------|---|
| | One (1) | Triple pole fuse switch unit with three pole load break isolating switch and three HRC fuses. |
| | One(1) | Triple pole contactor |
| | One (1) | Bimetallic thermal overload relay with single phasing preventor |
| | Three (3) | Indicating lamps with resistors and colored lenses |
| | One (1) | HRC control fuse |
| | One (1) | Control link |
- N) **Module Type K31 (Non Reversible Motor 30 KW to below 110 KW controlled locally)**
(Similar to module type K3 but with the following additions)
- | | | |
|--|---------|--|
| | One (1) | Current transformer for metering |
| | One (1) | Ammeter |
| | One (1) | Single pole switch and fuse for motor space heater |
- O) **Module Type NI (Reversible Motor Controlled from Remote Panel)**
- | | | |
|--|---------|---|
| | One (1) | Triple pole fuse switch unit with three pole load break isolating switch and three HRC fuses. |
| | Two (2) | Triple pole mechanically interlocked, forward and reverse contactors. |
| | One (1) | Bimetallic thermal over load relay with single phasing preventor. |
| | One (1) | 'Normal' / 'Trial' selector switch. |
| | One (1) | Indicating lamp with resistor and colored lens. |
| | One (1) | HRC control fuse |
| | One (1) | Control link |
- P) **Module Type DN1 (Reversible Motor Controlled from PLC)**
- | | | |
|--|---------|---|
| | One (1) | Triple pole fuse switch unit with three pole load break isolating switch and three HRC fuses. |
| | Two (2) | Triple pole mechanically interlocked, forward/reverse contactors. |
| | One (1) | Bimetallic thermal overload relay with single phasing preventor. |
| | One (1) | Indicating lamp with resistor and colored lens. |
| | One (1) | HRC control fuse |
| | One (1) | Control link |
| | One (1) | Auxiliary contactor |
-

Two (2) Coupling relays

ANNEXURE- I**TECHNICAL INFORMATION**

1	Applicable Standard	:	IS 8623
2	Enclosure	:	Single Front
3	Protection of Enclosure	:	IP52 for indoor
4	Location	:	Indoor
5	Rated voltage	:	415 V
6	Rated control voltage	:	110 V AC
7	Bus Bar system	:	TPN , Aluminium
8	Bus Bar rating	:	As Required
9	Short time rating	:	50 kA for 1 Sec
10	Power frequency withstand voltage	:	2.5 kV for 1 min for Bus Bars & Breakers , Switches & Contactors 2 kV for 1 min for Relays , Timers , Transformers
11	Interrupting capacity of breakers	:	P1 for MCCB & P2 for ACB
12	Duty of power contactors	:	AC 3 for non reversible & AC 4 for reversible
13	Duty of auxiliary contactors	:	AC 1
14	Category of switches	:	AC 23 for fuse switches & AC 22 for auxiliary devices
15	Type of HRC fuses	:	Current limiting
16	Rating of HRC fuses	:	50 kA
17	Type of control transformer	:	Dry type, 415/220 V and 415/110 V of adequate rating
18	Type of potential transformer	:	Dry type, 415/110 V of adequate rating
19	Cabling for power circuits	:	Cable alley for external cables , Modules for internal cables below 70 mm ² & in separate cable chamber for 70 mm ² and above
20	Cable entry	:	Bottom/Top
21	Cabling for control circuits	:	1.5 mm ² , 660 V PVC
22	Earthing	:	Main Bus- Aluminium 300 mm ² and Vertical Bus-150 mm ²
23	Dimension of a single panel	:	As required subject to Purchaser's approval
24	Paint & Finish	:	Panel outer surface- Smoke Grey Panel inner surface -glossy White Chassis- Zinc passivated Command module-Aluminium anodised Name plate-Non rusting material Lettering-White non graved on black back ground

ANNEXURE - ES-2**SPECIFICATION FOR CONTROL PANELS FOR PLC & OTHER SYSTEM REQUIREMENT****1.0 SCOPE**

This covers requirements for Control Panel for PLC and other system requirement in accordance with IS 8623.

The entire Plant control system shall be controlled by a Programmable Logic Controller (PLC) based distributed control system. The system integrates with a suite of programs running on PC to provide the operator with a comprehensive window to all aspects of the plant operation. The computer software shall provide a data acquisition system whereby all digital or analog variables entered into the system can be logged or achieved for future analysis. This allows process variables to be trended over a long period of time (typically one month) and all alarms occurring to be date and time stamped as they occur. Additionally, the logging of all motor starts and run-time intervals shall provide maintenance personnel with a powerful tool in predicting meantime before failure of all motors and ancillary equipment.

A second PLC and computer shall be provided as back-up, In case of failure of the primary unit automatic change over to the back-up unit shall be envisaged.

The operator's console shall be rugged industrially hardened housing for the PLC processor and the computers. All inputs by the operator as necessary to run the plant shall be via industrial water proof and dust proof push buttons.

All sequential interlocking shall be done with programmable logic controllers. The entire plant shall use the PLC system.

The basic function of the programmable controller is to provide output commands to the process equipment that are based on some combination input condition received from the machines. It is digitally operating electronic apparatus which uses a programmable memory for the internal storage of instruction for implementing specific function such as logic sequencing, time counting and automatic control through digital / analog input / output of various machines or process.

2.0 STANDARDS CODES & RULES

The equipment shall be designed in accordance with the provisions of the following standards, codes and rules :

IS :13947	LV switch gear and control gear
IS : 4064	Air Break Switches, air break disconnectors and fuse combination for voltages not exceeding 1000 V AC
IS : 8828	Miniature Circuit Breakers for voltages not exceeding 1000 V AC
IS :6875	Switches and push-buttons
IS :13703	LV fuses for voltages not exceeding 1000 V AC
IS :11353	Guide for uniform system of marking and identification of conductors and apparatus terminals
IS :2147	Degree of protection provided by enclosures for low voltage switchgear and Control gear
IS :3043	Code of practice for earthing
IS :6005	Code of practice of phosphating iron and steel.
IS :1248	Electrical Indicating instruments

IS : 2419	Panel mounted indicating and recording electrical instruments dimension
IS : 1554	PVC insulated(Heavy Duty) cables for working voltages up to and including 1100V
IS : 694	PVC insulated cables for working voltages up to and including 1100V
IEC-65 A	Programmable controllers
IS : 5	Colours for ready-mixed paints and enamels.
IE Rules 1956	

3.0 DESIGN & CONSTRUCTION

3.1 Design

The equipment shall be designed to ensure the following :

- (i) Continuous operation at rated capacity at service condition mentioned below :
 - Ambient air temperature : 5⁰C to 50⁰C.
 - Altitude : Maximum upto 1000 M above MSL.
 - Relative Humidity : Approximately 97 %.
 - Pollution degree : Degree 4 as per IS : 13947 (Part I) (i.e. the pollution generates persistent conductivity caused by conductive dust)
- (ii) Ready interchangeability of components of equipments with identical specification
- (iii) The bidder shall prepare electrical drawings for each module of the equipment for purchaser's approval

3.2 Construction

- 3.2.1 The panel frame shall be fabricated using suitable mild steel sections of pressed and shaped, cold-rolled sheet steel of thickness not less than 2.0 mm. Frames shall be enclosed in cold-rolled sheet steel of thickness not less than 1.6 mm. Gland plates shall be of removable type and at least two separate gland plates shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.

The panels shall be assembled on channel / angle base frames.

The standing type panels shall be provided with hinged doors of width not exceeding 600 mm (with in built locked arrangement and handle). It shall be possible to open the door through 100 degree. The doors, cut-outs and covers shall be equipped with approved type of synthetic / rubber all round and sufficient number of latches / bolts shall be provided to achieve a degree of protection of IP 52 as per IS: 2147.

The height of all control devices on the panels shall be between 700 mm and 1600 mm from the finished floor level. Maximum height of the panels shall not exceed 2300 mm.

All equipment mounted on the front face of the panels shall be flush or semi-flush type.

Detailed internal arrangement drawing of the control panel indicating spacing between different components shall be submitted for Purchaser's approval.

For PLC controlled systems, the control panel shall have control desk type of configuration. The desk shall have doors at the back.

The control desk shall have one vertical bench surface , one inclined surface and one horizontal bench surface at the front. The mimic diagram shall be on the

vertical face. All meters, indicators, control CRT , annunciation windows etc. shall be mounted on inclined face . On horizontal bench, key boards, electrical switches, push buttons, indicating lamps and selector switches shall be mounted. .

The PLC panel shall be free standing vertical type separate from control desk. The equipment shall be rack mounted and arranged in clearly defined sections for I/O devices, processors, power supplies etc. About 20% space shall be left for future expansion in each section. A cable marshalling section shall be included.

The PLC panels shall be provided with Perspex / glass doors in front to facilitate monitoring of the LED indication of various cards mounted in the card rack.

All components shall be clearly and unambiguously marked for proper identification and easy maintenance. Readily accessible and clearly marked test points shall be provided in all important modules and circuits.

I/O racks and processor cabinets shall be provided with door switches which shall provide proper annunciation on control desk in case doors are open.

Removable eye bolt or lifting lugs shall be provided on all panels to facilitate easy handling.

The Bidder shall ensure that the control panels are vermin proof, and all surplus holes in the gland plates shall be tightly closed by rubber plugs.

3.2.2 **Control and selector switches**

Control and selector switches shall be of rotary type with escutcheon plates clearly marked to show the function and positions.

Control / Selector switches shall be spring return or stay put type as per the requirements. Shape and type of handles shall be subject to approval of the Purchaser.

Ammeter and voltmeter selector switches shall have four stay-put positions with adequate number of contacts for three phase 4-wire system. Ammeter selector switches shall have make before break type contacts to prevent open circuiting of CT secondary.

Contacts of the switches shall be spring assisted.

The contact ratings shall be at least the following:

- i) Make and carry continuously - 6 Amp.
- ii) Breaking current at 220 V DC - 0.5A (Inductive)
- iii) Breaking current at 240 V AC - 5A at 0.3 p.f. lagging

3.2.3 **Push buttons**

Push buttons shall be spring return, push to actuate type and rated to make, continuously carry and break 6A at 240 V AC and 0.5 A (Inductive) at 220 V DC. The push buttons shall have at least 1 NO and 1 NC contacts. All contact faces shall be of silver or silver alloy.

Every push button shall be provided with integral escutcheon plate marked with its function.

The color of push buttons shall be as follows :

GREEN - for motor START breaker CLOSE,

RED - for motor TRIP, breaker OPEN,

BLACK - for all annunciator functions, overload reset and miscellaneous

3.2.4 **Indicating lamps**

Indicating lamps shall be of the panel mounting, filament / LED type, low wattage and capable of clear status indication to operator under the normal room

illumination. The lamps shall have escutcheon plates marked with their functions, wherever necessary.

Lamps shall have translucent covers of the following colors:

RED - for motor ON, breaker OPEN / CLOSED

GREEN - for motor OFF, breaker OPEN

WHITE - for breaker TRIP

BLUE - for all HEALTHY conditions (e.g. control supply, lube oil pressure)

AMBER - for all ALARM conditions

All indicating lamps shall be suitable for continuous operation at 90% to 110% of their respective nominal control supply voltage, i.e. 220 V DC or 240 V AC.

3.2.5 Indicating instruments

All indicating and integrating meters shall be flush mounted on panel front. The instruments shall be of miniaturized type with 90° scales and shall have an accuracy class of 2.0 or better.

Ammeters with selector switches shall be provided for all motors rated 22 KW and above. These shall have a compressed scale at the upper current region to cover the starting current. They shall be suitable to withstand, five times CT Secondary current for 30 seconds.

3.2.6 Name plates and labels

Each panel shall be provided with prominent, engraved identification plates for all front mounted equipment. Panel identification name plates shall be provided at front and rear.

All name plates shall be of non-rusting metal with white engraved lettering on black back ground. Inscription and lettering sizes shall be subject to Purchaser's approval.

For easy identification of all equipment inside the panel, they shall be marked with suitable, clear, indelible paint markings. Labels for fuses shall also clearly indicate current ratings of the respective fuses.

3.2.7 Mimic display

Mimic display of the mechanical / electrical system shall be provided on the VDU as per requirement. Besides VDU, Hardware Mimic panel and annunciation panel shall also be envisaged in the control room along with the control desk.

3.2.8 Air break switches

Air break switches shall be of heavy duty, single throw, load break, complying with relevant code. The Bidder shall ensure that all switches are adequately rated so as to be fully matching with the associated fuses.

Power supply switch operating handles shall be provided with padlocking facilities to lock them in 'OFF' position.

All switch fuse units shall be provided with removable type neutral link.

3.2.9 Fuses

All fuses shall be of HRC cartridge fuse link type, and suitable rating.

All DC circuits shall be fused on both poles. AC circuits shall have fuses on phase side and link on neutral side.

All fuses shall have visible operation indicator

3.2.10 Contactors

Auxiliary Contactor shall be of air break, electro-magnetic type and shall be of 6 A. 240 V AC, AC 11 utilization category. Contacts shall have a rated standard thermal current of at least 10 A. The contacts shall also have a 220 V, DC 11 utilization, category rating of at least 0.5 A. The contactor shall have a rated make/break life of at least one million operations.

Contactors shall have contacts as required for control schemes. Contacts shall be silver faced.

3.2.11 Relays and timers

All protective relays, auxiliary relays and timers shall be of proven design and of reputed make. Timers shall have the provision to adjust the delay on pick-up or reset as required.

Relays and timers shall have the necessary NO / NC contacts, as per scheme requirement.

3.2.12 Terminal blocks

Terminal blocks shall be of 650 Volts grade, rated for 10 Amps and in one piece moulding. They shall be complete with insulating barriers, clip-on-type and identification strips.

Terminal blocks for CT and VT secondary leads shall be provided with test link and isolating facilities. Terminals for CT secondary leads shall also be provided with short circuiting earthing facilities.

All terminal blocks on which external cables are connected shall be suitable for terminating at least 2 nos. of 1.5 mm² of stranded copper wire. Not more than two (2) wires shall be connected to any terminal.

All terminals shall be numbered for identification and grouped according to the function.

Terminal blocks shall have minimum clearances of 200 mm to cable gland plates, and of 150 mm to adjacent terminal rows, panel sides and other equipment.

Twenty (20) percent spare terminals shall be provided, distributed over all terminal blocks.

3.2.13 Wiring

All inter panel wiring and connections between adjacent panels including all bus wiring for AC and DC supplies, shall be provided by the Bidder.

All internal wiring shall be carried out with 650 V grade single core, 1.5 mm² or larger, stranded copper wires having color-coded, PVC insulation. Space heater circuits shall have wires having adequate current carrying capacity, but not less than 2.5 mm² Copper. Internal wiring between electronic cards shall be as per the standard practice of manufacturer.

Engraved core identification ferrules marked to correspond with panel wiring diagrams, shall be fitted at both ends of each wire. Jumper wires between two terminal blocks shall also be ferruled at both ends.

Spare contacts of relays, timers and switches shall be wired out to the panel terminal blocks only as required by the Purchaser, during approval stage.

3.2.14 Earthing

A continuous copper earthing bus of 25mm x 3mm size shall be provided along the bottom of the panel structure. It shall run continuously through out the length of the panel and shall have provision at both ends for connection to the station earthing grid. Wherever termination of shielded cables is envisaged, provision for termination of cable shields shall be made.

Metallic parts of all components shall be effectively earthed using insulated copper wire or other approved means. Electrical continuity of the whole enclosure / frame work shall be maintained even after painting. All hinged doors shall be earthed through flexible earthing braids of copper.

Earthing of electronic circuits shall be looped between cabinets, I/O racks and shall be earthed at one point of PLC panel. The common earth point shall be connected to station earth mat on a separate riser.

3.2.15 Space heater and lighting

Space heaters shall be provided in the panels wherever the manufacturer considers necessary and recommends their provision for preventing harmful moisture condensation.

The space heaters shall be suitable for continuous operation on 240 V AC single phase supply and shall be automatically controlled by thermostat. Each free standing control panel section shall have a 240 V AC, plug point and a fluorescent light operated by door switch.

Necessary isolating switches and fuses shall also be provided.

3.2.16 Control and power supply scheme

One feeder of 415 V AC (two phases) shall be drawn by the Bidder from each bus section of MCC. The Bidder shall provide isolating switch fuse unit for receiving this supply. Two numbers of 415 / 110 V single phase dry type transformers shall be provided in control panel for A.C. control supply. These transformers shall be adequately sized to meet power requirements of auxiliary relays, indicating lamps & other auxiliary instruments. One pole of the secondary of these transformers shall be solidly earthed through link. A manual or automatic change-over arrangement (depending on requirement) shall be provided on secondary side of transformers.

The Bidder shall ensure proper discrimination in the fuses provided for different circuits, grouping of which shall be to Purchaser's approval.

For the PLC panel the power supply shall be tapped from the control panel. Necessary transformer / power packs shall be provided by the Bidder. The equipment power supply unit shall be mounted as an integral part of the enclosure and provide all voltages necessary to power the central processor and I/O cabinets. For separately mounted I/O racks separate power supplies shall be provided. Power supply module shall be of ample capacity to supply all modules. Additionally, about 20% spare capacity for future use shall be provided.

The components shall be suitable for the supply voltage variation of $\pm 10\%$ of the rated voltage and suitable for withstanding a momentary supply voltage rise upto 70% for about 10 secs. above the nominal system voltage. Necessary constant voltage transformers or voltage stabilisers shall be provided by the Bidder if required.

3.2.17 Annunciation system

The annunciation system shall be complete with suitable VDU having audio visual facility. Additionally Hardwired annunciation panels shall also be provided.

3.2.18 PAINTING

All sheet steel work shall be pre-treated in tanks in accordance with IS: 6005. Finishing paint on panels exterior shall be shade 692 (smoke gray) of relevant code. The inner surface of the panels shall be glossy white.

4.0 Technical requirements of programmable logic controller :

- 4.1 The PLCs shall be of modular construction and it shall be possible to change any module without disconnection of any wire.
The PLC system shall be capable of operating in automatic and/or manual control mode with commands from VDU control console and/or from a separate control desk.

4.2 **PLC processor**

The processor unit shall be capable of executing the following functions :

- a) Receiving binary and analog signals from the field and operator intimated command from the control panels.
- b) Implementing all logic functions for control & protection of the equipment and system
- c) Issuing control commands
- d) Providing alarm and status information.
- e) Performing self monitoring and diagnostic functions
- f) Providing log output

The controller shall provide all basic functions, operations, storage, counting, timing, logging and transfer operations and comparison functions. The programmable system shall be delivered completely programmed for the complete and reliable operation of the MCC.

In case of failure of working processor there shall be an appropriate alarm. In the event of both failing, the system shall revert to fail safe mode. It shall be possible to keep any of the processor as master and other as standby.

The memory shall be field expandable. The memory capacity shall be sufficient for the complete system operation with provision for at least 20% expansion in future. Programmed operating sequences and criteria shall be stored in non volatile memories. All dynamic memories shall be provided with buffer battery back up which shall be for at least 360 Hours. The batteries shall be lithium or Ni-Cd type.

The PLC system shall be provided with necessary hard-ware for inter connection with Purchaser's / Other Contractor's data high-way, if required in future.

Facility shall be provided for changing the states of inputs and outputs, timers and flags to facilitate fault finding and other testing requirements. It shall be possible to display the signal flow during operation of the program.

A NORMAL/TEST/PROGRAMME/OFF lockable selector switch shall be provided on the control panel or processor.

Priority of different commands shall be as follows :

Manual intervention shall be possible at any stage of operation. Protection commands shall have priority over manual commands and manual commands shall prevail over auto commands.

INPUT / OUTPUT:

The PLC system should be designed according to the location of the input / output cabinets.

Individually output circuits with fuse blow indicator shall be provided. All input / output points shall be provided with status indicator. Input circuits shall be provided with fuses preferably for each input, alternatively, suitable combination of inputs shall be done and provided with fuses such that for any fault, fuse failure shall affect the particular drive system without affecting other systems.

All input / output cards shall have quick disconnect terminations allowing for card replacement without disconnection of external wiring.

The Bidder shall provide the following monitoring features :

- a) Power supply monitoring
- b) Contact bounce filtering
- c) Optical isolation between input and output signals with the internal circuits
- d) In case of power supply failure or hardware fault the critical outputs shall be automatically switched to the fail safe mode. The fail safe mode shall be decided during approval stage.

There shall be at least 20% spare capacity available on input, output and memory modules, over and above the system requirement.

Output module shall be capable of switching ON / OFF inductive loads like solenoid valves, auxiliary relays etc. without any extra hardware.

Only one changeover contact shall be provided in MCC for control and interlock requirement. Further, multiplication if required shall be done in PLC.

All input field interrogation voltage shall preferably be DC only.

In case of loss of remote I/O communication link with the main processing unit, the remote I/O shall be able to go to pre-determined fail safe mode with proper annunciation. This shall be decided in approval stage.

4.3 **PRINTER & COLOUR MONITOR :**

Printer shall be a part of the control system. It shall print out all alarm / trip conditions and event changes in plant status along with date and time of occurrence. Printer provided shall be laser type. The make of the same shall be subjected to Purchaser's approval.

IBM compatible LED color monitor with graphic facility shall be provided for control / monitoring and programming purposes. Configured keyboard with well defined levels and color coding shall be provided.

4.4 **REMOTE I/O COMMUNICATION LINKS**

The I/O communication system shall have two independent links that are continuously checked for failure. Any failure of communication links shall result in annunciation.

Bidder shall provide and install two runs of pre-fabricated plug in type shielded cables between I/O modules and PLC. In case of remote I/O's the communication link shall be operable when installed in underground conduits and may be subjected to submersion in water. The Bidder shall supply complete information for specification of the communication cables.

ANNEXURE - ES-3**SPECIFICATION FOR MICRO-PROCESSOR BASED CONTROL SYSTEM
AND UPS****1. OPERATION OF MICRO-PROCESSOR BASED PLANT MONITORING AND
CONTROL SYSTEM**

- 1.1 The micro-processor based control system for sequencing operation shall be provided for monitoring and control of proposed Loading arrangement. The system shall comprise the following:

- i) Programmable logic controller based on micro-processor technology
- ii) Input / Output racks
- iii) Compatible system with colour monitor and standard key board
- iv) Modem for communication with remote PC
- v) Necessary pre-fabricated inter-connecting cables

The system shall be micro-processor based system that can be used as a direct replacement for relay system and other hardware systems. The programming shall be in the form of Relay Ladder Diagram.

All the equipment will be controlled from a control desk located at control room .

The control system shall have the facility for :

- a) Local operation of equipment .
- b) Mimic display of equipment on Color VDU
- c) Fault Annunciation of equipment on VDU
- d) Sequence and interlocking operation

One number printer shall be provided at Control Room for providing hard copies of management information reports like hourly logs, shift logs, daily logs etc.

Individual Audio Visual units (AVU) should be installed in sub-station , switch room, hopper and all other strategic locations for the purpose of composite mimic display of the entire plant along with audio signaling.

MICRO-PROCESSOR CONTROLLER

The system shall have micro-processor controllers for inter-acting with the starter panels of the drives with or without inter posing relays. These controllers shall also interact with various control instrumentation provided for monitoring of drives and shall basically consist of a regulated power supply unit and plug-in type cords for easy maintenance. The controller shall comprise a central processing unit, solid state memory, digital input modules with optical isolation with potential free contacts, digital output modules for generation of control output. The micro-processor memory shall contain software which shall achieve all logical processing by executing instructions in the CPU. The controller hardware shall be modular in construction so that future additions or alternations in the plant can be easily carried out at a nominal cost.

V.D.U

Single or dual VDU (TFT / LCD monitor, 26" Minimum) shall have to be provided with micro-processor controller for displaying mimics, alarms, plant status etc. A variety of mimics shall have to be provided so as to ensure enhanced and clear

visibility of the plant. The mimics shall have separate colour codes for healthy and faulty drives, local and remote drives etc. Besides mimics, the VDU shall be capable of showing various alarms and warning messages sequentially indicating the time of occurrence, name of faulty drive and the type of the fault. The alarms of critical nature shall have to be indicated to catch the immediate attention of the operator. The status of various plant drives shall have also to be shown on the VDU as described earlier.

FUNCTIONAL KEY BOARD

Necessary functional keyboard shall have to be provided as an operator inter-face with the plant. The operator shall be able to key in various plant commands, provide individual start / stop, sequential start / stop, block start / stop, acknowledge alarms etc. The operator shall also be able to call up various display of the VDU as desired by him.

P R I N T E R

A printer shall have to be there to provide a hard-copy of various displays and logging reports for management reporting. Various logs e.g. hourly logs, shift logs and demand logs shall have to be provided.

SOFTWARE

The micro-processor plant monitoring and control system shall have to be based on easily reconfigurable software. Various sequencing inter-locks and timing functions shall have to be provided with the help of the software. The software shall be flexible and easily expandable in case of future additions / alterations in the plant. It shall be operator friendly and easy to understand.

LOCAL CONTROL STATION

The inter-locking and selector switch, start stop push buttons and indication lamps on the local control station shall be mounted on the front face of the enclosure. The local control stations shall be pedestal / wall mounted.

SELECTOR SWITCH

All the selector switches shall be dust proof and oil tight, rotary switches with pistol handle operating facility. The rating of contact shall be minimum 10 amps at 230 Volts. The switches shall conform to IS: 2628 (latest).

START – STOP PUSH BUTTONS

Push buttons shall be dust and oil tight and the face of the button shall be flushed with the retaining ring. 'Start' buttons should be green and stop buttons should be red in color.

INDICATING LAMP:

The indicating lamps shall be preferably miniature, filament / LED type with caps of colored translucent lenses. The lamp on the local control station shall be so fitted that it is removable from the front of the unit without disturbing the internal wiring and the holder. The indicating lamps shall conform to IS: 1901(Latest).

EMERGENCY STOP PUSH BUTTON

All hand operated emergency stop push buttons shall have mushroom type head, Red in color with manual resetting facility. Emergency stop switches shall be dust

and oil tight with necessary NO and NC contacts rated for 10 Amps. at 230 Volts A.C.

LEGEND PLATE

The legend plates shall be provided to identify the rating and function or operation of all control components / indications. All the legend plates shall be of block anodized aluminium with text engraved thereon.

CONTINUOUS LEVEL MONITOR

The continuous level monitor shall be dust and water tight and suitable for continuous monitoring of level of coal in the hopper. The system shall be either ultrasonic type or can be based on advanced micro-wave circuitry and micro processor technology. The system shall ensure high reliability and have local and remote display facilities indicating average level and quantity of coal in the hopper at any instant.

1.2 INSTRUMENTATION/SIGNAL / COMMUNICATION CABLE

Instrumentation and signaling cables and fiber optic cables required for instrumentation and signaling, interfacing and communication between different PLCs and field mounted equipment shall be provided.

2. UPS SYSTEM AND BACK-UP ARRANGEMENT :

UPS system of sufficient capacity with redundancy shall have to be provided, with suitable batteries for 30 minutes back-up arrangement. The UPS system shall be 'ON-LINE' system which shall ensure that there is no break in the power supply to the PLC based control system.

In the event of loss of power supply it will be able to maintain the status record of various equipment of plant control system on un-interruptible power supply having capacity to feed the load of PLC system for duration of ½ hour during which the power supply is restored.

ANNEXURE - ES-4**1. SPECIFICATION FOR LOCAL CONTROL STATION**

The Local Control Stations (LCS) shall be metal enclosed, suitable for outdoor / indoor mounting on wall or steel structures. The enclosure shall be die-cast aluminium or cold rolled sheet steel of at least 1.6 mm thickness. The enclosure shall be provided with a hinged guard at the front, covering full length, to avoid inadvertent operation of pull chord switches / push buttons. LCS shall be painted to shade no. 692 of IS: 5 in accordance with relevant code. The LCS shall be dust and vermin proof and shall have a degree of protection of IP-53 as per relevant code.

The LCS shall be suitable for both top and bottom cable entry (either of which may be used depending on cabling convenience) and shall be provided with removable undrilled gland plates or knockouts. Adequate space shall be available inside the LCS enclosure for terminating external cables directly on pull cord / push button terminals. Overall size of LCS shall be subject to Purchaser's approval.

The Local Control Stations shall have the following functions :

- i) EMERGENCY STOP push button with one NO and one NC contact.
- ii) Self reset "Trial Run" and a self reset "Trial Stop" push button each with one NO and one NC contact.
- iii) "LOCAL" & "REMOTE" selector switch.
- i) Required Indication Lamps

2. SPECIFICATION FOR LOCAL MOTOR STARTER

The Local Motor Starters shall be provided for manual switching of 415 V, 3 phase squirrel cage motors.

The starters shall be metal enclosed, suitable for outdoor / indoor mounting on wall or steel structures. The enclosure shall be die-cast aluminium or cold rolled sheet steel of at least 1.6 mm thickness. The enclosure shall be provided with a hinged guard at the front, covering full length, to avoid inadvertent operation of push buttons. The starters shall be painted to shade no. 692 of IS:5 in accordance with relevant code and shall be dust and vermin proof and shall have a degree of protection of IP-52 as per relevant code.

The Starters shall be suitable for both top and bottom cable entry (either of which may be used depending on cabling convenience) and shall be provided with removable undrilled gland plates or knockouts. Adequate space shall be available inside the starter enclosure for terminating external cables directly on push button terminals. Overall size of Starters shall be subject to Purchaser's approval.

Each Starter shall comprise of :

- i) A 3-pole contactor, mechanically latched type
- ii) Start Push Button, colored GREEN
- iii) Stop Push Button, colored RED
- iv) Ambient temperature compensated thermal overload relay with single phasing protection. The continuously variable relay setting range shall be suitable for the motor rating.

The start push button when pressed shall preferably remain in depressed position and shall be released along the contactor when the stop push button is pressed or when thermal overload relay operates. Local starters shall be suitable for loop-in and loop-out of incoming cable and for one outgoing cable to a motor.

ANNEXURE - ES-5**SPECIFICATION FOR INDUCTION MOTORS****1.0 SCOPE**

This specification covers the requirements for three phase foot / flange mounted continuous rating and duty type induction motors.

The motors shall comply with the latest version of IS 325 & IEC 34-1 except where modified or extended by this specification and with the relevant parts of standards mentioned in para 2.0

2.0 OTHER RELEVANT STANDARDS

The other relevant standards applicable are as under :

IS: 900	Code of practice for installation and maintenance of induction motors
IS: 8223	Dimensions and output ratings for foot mounted electrical machines with frame number 355 to 1080
IS: 1231	Dimension of three phase foot mounted induction motors
IS: 2223	Dimension of flange mounted induction motors
IS: 210	Frames for rotating electrical machines
IS: 1271	Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service
IS: 2253	Designation for type of construction and mounting arrangement for electrical machines
IS: 3043	Code of practice for earthing
IS: 4029	Guide for testing three phase induction motors
IS: 4691	Degree of protection provided by enclosures for electrical machinery
IS: 4722	Rotating electrical machinery
IS: 6362	Designation of methods of cooling for rotating electrical machinery
IS: 7816	Guide for testing insulation resistance of rotating machinery
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibrations of rotating electrical machines
IS: 2147	Degree of protection provided by industrial enclosures
IS: 4729	Measurement and evaluation of vibration of rotating electrical machines
IS: 4889	Method of determination of efficiency of rotating electrical machines
IS: 8789	Values of performance characteristic for three phase induction motors
IS: 12824	Type of duty and classes of rating for rotating electrical machines
IS: 12802	Temperature rise measurement of rotating electrical machines
IS: 3003	Carbon Brushes for electrical machines

3.0 DESIGN**3.1 Electrical**

- a) The motors shall be of continuous duty (S1) and rating type in accordance with relevant code.
- b) The temperature measured over the surface of the motor shall not exceed 70°C over the ambient air for the class of insulation B and 80°C for class F in accordance with relevant code.
- c) The motor shall be designed to deliver rated output with the terminal voltage differing from its rated value by not more than $\pm 10\%$, frequency differing from its rated value by not more than $\pm 3\%$ and any combination of these limited to 10%.

- d) The motors shall be capable of withstanding the forces associated with the maximum in rush current, the locked rotor torque and the pull out torque at the highest system voltage and at the upper limit of supply frequency during starting.
- e) The motors shall be capable of starting and accelerating to the rated speed along-with the fully loaded driven equipment without exceeding the acceptable winding temperature even when the supply voltage is 80% of rated voltage.
- f) The motors shall be suitable for two cold starts in succession under the normal loading condition.
- g) The motors shall withstand for 15 seconds without stalling or abrupt change in speed under gradual increase of torque up to 1.6 times its rated value, the voltage and frequency being maintained at their rated value.
- h) The accelerating torque at any speed with the lowest starting voltages shall be at least 10% of rated full load torque.

3.2 **Mechanical**

- a) The method of cooling for motors shall depend upon the system requirement.
- b) The enclosures for motor shall have IP44 protection for indoor application and IP55 protection for outdoor applications in accordance with IS: 4961.
- c) The motor vibration shall confirm to the requirements in accordance with relevant code.
- d) The motor noise level shall confirm to the requirements in accordance with relevant code.

4.0 **CONSTRUCTIONAL DETAILS**

4.1 **General**

- a) The motor and its components such as stator, rotor end shield, terminal boxes and the bearings shall be designed to be readily inter-changeable as integral units for the same design and rating.
- b) All non-metallic components used shall be resistant to flame propagation
- c) All heavy parts of the motors shall be provided with necessary lifting arrangements

4.2 **Stator frames and shields**

- a) The stator frames and end shields shall be rugged and made of cast iron conforming to relevant code.
- b) The frame holding the stator core and windings must be strong and rigid to withstand short circuit force and unbalanced magnetic pull and minimise vibrations.

4.3 **Cooling arrangements**

- a) LT Squirrel cage motors shall be Totally Enclosed, Fan Cooled, (TEFC) by a light weight cast Aluminium fan of bi-directional design and very low inertia. The fan shall be keyed to the shaft. Slip-ring type motors, if provided shall be with CACA cooling.

4.4 **Enclosures**

The enclosure shall be totally enclosed fan cooled with suitable means for breathing and drainage. The drain hole diameter shall not exceed 6 mm.

4.5 **Stator**

- a) The stator core shall be built up of low loss high permeability steel laminations.
- b) The winding shall be two layer type consisting of synthetic enameled copper conductors in Semi closed slots.

- c) Insulation shall be class-B for 415V motors .
- d) All winding overhangs and leads shall be adequately supported braced and blocked.

4.6 Rotor

- a) The rotor core shall be of similar construction to that of the stator
- b) The cage bars for cage motors shall be of copper.
- c) The complete rotor shall be dynamically balanced with the fan on the shaft for TEFC motors ensuring vibration free smooth running.

4.7 Shaft

- a) The shaft shall be manufactured from high grade steel, preferably C-40. The sustained deflection of the shaft shall well below 10% of the air gap.

4.8 Bearings

- a) The bearings shall be ball / roller type for 415 V motors .
- b) The bearings shall be self lubricated.
- c) The bearings shall be in accordance with the relevant codes.
- d) 415 V motors shall be grease lubricated.

4.9 Terminal box

- a) Terminal boxes integral with the stator frame shall be provided with terminals for stator leads.
- b) Terminals shall be suitable for receiving single layer armoured Aluminium conductor PVC / XLPE insulated cables.
- c) Terminal boxes shall be suitable for top entry of cables.

4.10 Earthing terminals

Two independent earthing terminals shall be provided in accordance with I.E Rules on diagonally opposite corners of the motor for bolted connection.

4.11 Mounting

The motors for pumps, compressors, fans, and blowers shall have the mounting B3 or as specified elsewhere in this tender.

4.12 Auxiliary devices

The motor shall be suitable for the auxiliary devices mentioned below:

Type of load	Auxiliary devices on the shaft
Compressor and fans	Pulleys
Conveyors, feeders and Screens if any	Gears / Fluid coupling
Space Heaters	Space Heaters suitable for 230 V, 50 Hz, single phase supply system shall be provided for motors above 30 kW capacity. For motors below 30 kW, space heaters shall be provided if it is meant for specific use in damp areas.

5.0 Performance

The values of minimum full load speed, maximum full load current, minimum pull out torque and minimum locked motor torque as percentage of full load torque at rated voltage and frequency for duty type S1 shall be in accordance with relevant code.

6.0 Rating Plate

A rating plate stating the following information shall be supplied with each motor :

- a) Reference standard
- b) Name of manufacturer
- c) Manufacturer's number and frame reference
- d) Type of duty
- e) Class of insulation
- f) Frequency in Hz
- g) Number of phases
- h) Rated output in kW
- i) Rated voltage and winding connections
- j) Current, approximate in amperes at rated output
- k) Speeds in revolutions per minute, at rated output
- l) Rotor (Secondary) voltage and winding connections
- m) Rotor (Secondary) current in amperes at rated output
- n) Ambient temperature
- o) Enclosure Type

7.0 All motors shall be provided with eye bolts, lugs or other means to facilitate lifting.

8.0 The design, manufacture, installation and performance testing shall conform to the latest revisions of the Indian Standards or their equivalent IEC standards for the applicable motor type and rating, and to the latest Indian Electricity Acts, Indian Electricity Rules and IS: 325.

TECHNICAL PARAMETERS

1	Reference standard	: IS : 325
2	Service conditions	
a)	Ambient Air Temperature	: Maximum 50 ⁰ C
a)	Altitude	: Maximum upto 1000M above MSL
b)	Location	: Heavily polluted with coal dust medium
3	Rated voltage (with percent variation)	: 415 V $\pm$ 10%
4	Frequency(with percent variation)	: 50 Hz $\pm$ 3%
5	Class of duty	: Continuous (S1)
6	Type of rating	: Continuous
7	Class of insulation	: Class B for 415 V motors
8	Temperature rise allowed over the ambient air	: 70 ⁰ C over ambient for class B
9	Type of enclosure of motor	: TEFC
10	Degree of protection for enclosure of motor	: IP 44 for indoor & IP 55 for outdoor motors and motors for conveyors
11	Degree of protection for terminal box	: IP 54
12	Method of cooling	: TEFC
13	Lubrication of bearings	: Lithium grease for roller and thrust bearings, oil for pedestal bearings
14	Mounting	: Horizontal foot (B3)/Flange or Face (B5)/As per requirement

15	Type of rotor	:	Squirrel cage / Slip ring
16	No. of poles	:	4/6/8/10
17	Maximum value of slip	:	5 Percent
18	No. of phases	:	Three
19	Minimum efficiency at full load	:	90% for motors above 18.5 kW
20	Maximum value of locked rotor current as percentage of full load current	:	650%, subject to tolerance as given in IS:325
21	Minimum value of locked rotor torque as percentage of full load torque	:	185% for motors above 18.5 kW
22	Minimum value of pull out torque as percentage of full load torque	:	200% for motors above 18.5 kW
23	Clearance between phases at terminal box	:	10 mm for 415 V motors
24	Clearance between phases to earth at terminal box	:	10 mm for 415 V motors
25	Fault withstand level for terminal box	:	31 MVA for 415V motors
26	Particular of test requirements		
	a) Certificate for Type tests issued by a test house of repute conducted on one motor of a lot having identical specification.	:	Required
	b) Certificate for Routine tests issued by a test house of repute conducted on each motor having identical specification. The certificate shall bear the serial number of the motor identical to that appearing on the rating plate .	:	Required

ANNEXURE - ES-6**SPECIFICATION FOR 100 kVA, 415 V / 230 V(L-L)
LIGHTING TRANSFORMER****1. SCOPE**

This specification covers the requirements for two winding indoor type lighting transformer fitted with tap changer.

The transformer shall comply with the latest revisions of IS: 2026 and IEC: 76 except where modified or extended by the provisions of this specification and with the relevant parts of standards mentioned below .

2. OTHER RELEVANT STANDARDS

The other relevant standards that are applicable are as under :

IS : 10561 : Application guide for power transformers.

IS : 10028 : Code of practice for selection, installation and maintenance of transformers.

IS : 1866 : Code of practice for maintenance and supervision of mineral insulating oil.

IS : 2099 : Bushing for alternating voltages above 1000 V.

IS : 3639 : Fittings and accessories for power transformers.

IS : 335 : New insulating oil for transformers.

IIS : 6600 : Guide for loading of oil immersed transformers.

IS : 2165 : Insulation Co-ordination.

IS : 2071 : Method of Impulse voltage testing.

IS : 3043 : Code of practice for earthing.

IS : 1271 : Thermal evaluation and classification of electrical insulation.

IS : 1554 : PVC insulated (heavy duty) electric cables - 1100V. (Part -I)

IS : 7404 : Paper covered copper conductors

IS : 5 : Color for ready mix paints.

3. DESIGN FEATURES

The design of the transformer and accessories shall be in accordance with the latest standard practice and shall be such as to facilitate inspection, cleaning, repairs, maintenance and operation and shall ensure safety operations under situation of sudden variations of loads and voltages as may be required under local operating conditions.

Electrical Features

The electrical features shall ensure the following :

- a) Continuous operation at rated kVA within ± 10 percent variation (combined) of voltage and frequency.
- b) Continuous operation at rated kVA at each of the tap voltages
- c) Over loading of units as indicated in IS : 6600
- d) Temperature rise limited to the following values :

Cooling	Oil	Winding
ONAN	45°C	55°C

Mechanical Features

- a) The transformer shall be able to withstand the electro-dynamic stress due to terminal short circuit of the secondary side assuming the primary side fed from an infinite bus. All leads, windings in cores shall be properly supported, clamped and tightened after vacuum drying to ensure the short circuit withstand ratings. The short circuit withstand duration shall be minimum 2 sec.
- b) The transformer shall be so designed as to minimise any undue noise and vibration.

4. **CONSTRUCTIONAL DETAILS**

Core

- a) The transformer core shall be made as per relevant IS. Lifting eyes and lugs shall be provided on the limbs and coils assembly.
- b) Cores and windings shall be capable of withstanding shocks during transport, installation & service and adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.

Tanks

- a) Tanks shall be of welded construction and fabricated as per relevant IS.
- b) Tanks stiffeners shall be provided for general rigidity and these shall be designed to prevent retention of water.
- c) The tanks shall be designed to withstand :
 - i) Mechanical shocks during transportation
 - ii) Vacuum filling of oil
 - iii) Short circuit force
- d) Adequate space shall be provided at the bottom of the tank for settlements of sediments.
- e) Suitable guides shall be provided in the tank for positioning the core and coil assembly.
- h) The tank shall be suitable for movement in both directions during shipment. Each tank shall be provided with
 - i) Lifting lugs suitable for lifting the complete transformer
 - ii) A minimum of four jacking pads to be raised or lowered using hydraulic or screw jacks.

Tank Cover

- a) The tank cover shall be sloped to prevent retention of rain water.
- b) At least two adequately sized inspection covers one at each end of the tank shall be provided for easy access to bushings and earth connection. The inspection covers shall have suitable lifting arrangement.
- c) Bushings, inspection covers etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.
- d) All bolted connections shall be fitted with weather proof hot oil resistant neoprene gasket in between for complete oil tightness. If gasket is compressible metallic stop shall be provided to prevent over compression.

Mounting Arrangement

- a) The transformer shall be provided with two nos. bi-directional skids and pulling eyes integral with the tank body for fixing the transformer tank on foundation.

- b) These skids shall be such that the bottom of the tank is at a sufficient height above foundation for cleaning purposes. The transformer shall be provided with uni-directional, flat rollers of 1000 mm length.

Conservator Tank

- a) The conservator tank shall have adequate capacity to accommodate oil preservation system and volumetric expansion of the total cold oil volume in the transformer and radiators for a change in temperature from minimum ambient air temperature of 5°C to 110°C.
- b) The conservator shall be bolted into position so that it can be removed for cleaning purposes.
- c) The conservator tank, shall be fitted with a silica gel filter breather.
- d) The conservator shall be fitted with plain oil level gauge. The oil level at 30°C shall be marked on the gauge.

Explosion Vent

- i) The transformer shall be provided with the single type of explosion vent.
- ii) An equaliser pipe shall be connected to explosion vent from the conservator.

Windings

- a) The conductors shall be of electrolytic grade copper.
- b) All windings shall be fully insulated.
- c) The insulation of transformer windings and connections shall be as per relevant IS.
- d) All bus bars and leads shall be adequately supported in insulated cleats or frames from the clamping structure.
- e) The studs, set screws or bolts provided for securing cleats or frames shall be effectively locked.
- f) The impedance values shall be 4 % $\pm$ 10 %.
- g) The winding shall be connected to achieve a vector group of DY11.

Insulation Materials

- a) Class 'A' insulating materials specified in IS : 1271 or latest version shall be used.
- b) Insulating Oil
 - i) The insulating oil supplied with the transformer shall conform to the requirements of IS : 335 tested at bidder's premises.
 - ii) Prior to filling the oil in the main tank suitable number of samples shall be tested for BDV, moisture content, resistivity at 90°C, tan delta at 90°C and interfacial tension. The oil samples taken from the transformer at site shall conform to the requirements of IS : 1866.
 - iii) The manufacturer shall dispatch the transformer filled with oil. Ten percent (10%) extra oil shall be supplied for topping up, in non returnable sealed containers suitable for outdoor storage.

Earthing Terminals

Two earthing terminals suitable for connecting 65 x 8 mm mild steel flat shall be provided at positions close to the two diagonally opposite bottom corners of tank. These grounding terminals shall be suitable for bolted connection.

OIL Preservation System

The transformer shall be provided with the conventional conservator preservation system with a single compartment with dry air filling of space above the oil. The top of the conservator shall be connected to the atmosphere through a silica gel filter breather. It shall be so designed that :

- i) Passage of air is through dust filter and silica gel
- ii) Moisture absorption indicated by a change in color of the tinted crystal can easily observed from a distance
- iii) Breather shall be mounted not less than 1400 mm above rail top level.

TERMINAL ARRANGEMENT**a) Porcelain Bushing**

- i) The minimum clearances in air between the phases and between the phase and earth potential of the porcelain bushings shall be in accordance with IS : 2026 - part V, 1994.
- ii) Bushing terminals shall be provided with suitable terminal connectors of approved type and size for ACSR/AAAC/Cable as specified in the annexure.
- iii) All transformer bushings shall be of solid porcelain with plain sheds conforming to IS:8603.
- iv) The removal of bushing shall be possible without disturbing the current transformers, secondary terminals and connectors or pipe work.

b) Cable Boxes and Disconnecting Chambers

- i) Wherever cable connections are specified, suitable air insulated type cable boxes of required sizes shall be provided to accommodate cable termination. Cable boxes shall be designed and installed such that it shall be possible to move away the transformer without disturbing the cable termination leaving the cable box on external supports. The support for the cable box shall be of galvanised iron.
- ii) Cable boxes shall have terminal connectors of adequate size and bolt holes to receive cable lugs.
- iii) The bidder shall provide earthing terminals on the cable box to suit 65 x 8 mm GI flat.
- iv) All necessary cable terminating accessories such as supporting brackets, power cable lugs, hard ware etc. shall be provided by the bidder.
- v) Cable boxes shall have removable top cover and ample clearance shall be provided to enable either transformer or each cable to be subjected separately to high voltage test.
- vi) Cable boxes shall have degree of protection of IP-52 as per IS : 2147.

TERMINAL MARKING

The terminal marking and their physical position shall be in accordance with IS: 2026

TERMINATION ARRANGEMENT FOR NEUTRALS

- a) The transformer shall be solidly earthed at the secondary neutral.
- b) The neutral terminal brought on to a separate neutral bushing shall be connected to associated neutral grounding pit by a copper flat, which shall be supplied and installed by the bidder.

OFF CIRCUIT TAP CHANGE SWITCH

- a) The tap change switch shall be three phase, hand operated, for simultaneous switching of similar taps on the three phases by operating external handle.

- b) Arrangement shall be made for securing and pad locking the tap changer in each of the working positions, and it shall not be possible for setting or padlocking in any intermediate position. An indicating device shall be provided to show tap in use.
- c) The cranking device for manual operation shall be removable and suitable for operation by a man standing on ground level. The mechanism shall be complete with the following :
 - i) Mechanical operation indicator.
 - ii) Mechanical tap position indicator which shall be clearly visible from the transformer.
 - iii) Mechanical stops to prevent over cranking of the mechanism beyond extreme tap position.
 - iv) The manual operating mechanism shall be labeled to show the direction of operation for raising the secondary voltage and vice versa.
 - v) A warning plate indicating "The switch shall be operated only when the transformer has been de-energised" shall be fitted.

cooling tubes

The cooling tubes shall be mounted on the tank as per relevant IS.

PAINTING

The internal and external surfaces including oil filled chambers and structural work shall be painted with oil and weather resistant non fading paint of light grey color corresponding to shade no. 631 of IS : 5. Primary paint shall be as per IS : 104 and intermediate and final coats of paint shall be as per IS : 2932.

FITTINGS

The following fittings shall be provided with all the transformers :

- a) Rating and diagram plate.
- b) Terminal marking plate
- c) Two earthing terminals
- d) Lifting lugs
- e) Jacking lugs
- f) Drain valve with plug, 50mm size.
- g) Dehydrating breather
- h) Plain oil level indicator with minimum marking.
- i) Off load tap changing switch
- j) Oil filling hole with cover
- k) Conservator
- l) Explosion vent
- m) Skids and pulling eyes on both sides
- n) Rollers, Flat unidirectional limited to 1000 mm
- o) H.V. porcelain bushings with metal parts or H.V. cable box.
- p) Filter valve.
- q) Inspection cover
- r) L.V. cable box.

5. PERFORMANCE**a) Operating Conditions**

- i) The transformers shall be capable of being loaded in accordance with IS:6600 up-to load of 150%. There shall be no limitation imposed by bushings, tap changer etc.
- ii) The transformers shall be capable of being operated continuously without danger on any tapping at the rated KVA with voltage variation of $\pm 10\%$ corresponding to the voltage of the tapping.

b) Fault Conditions

- i) The transformer and all accessories shall be capable for withstanding any external short circuit at bushing terminal without damage for two (2) seconds.
- ii) Manufacturer shall also indicate 150 % over voltage withstand time.

c) Impedance

The impedance on principal tapping shall be guaranteed to be as indicated in the table below .

TECHNICAL PARAMETERS OF TRANSFORMERS**100 kVA, 415 V / 230 V (L-L)**

- | | | |
|----|---|---|
| 1 | Rated Capacity | : 100 kVA |
| 2 | Location | : Indoor |
| 3 | Type of transformer | : Core type oil immersed |
| 4 | Frequency | : 50 Hz $\pm$ 3% |
| 5 | Type of cooling | : ONAN |
| 6 | Type of oil | : Mineral oil |
| 7 | Rated Voltage | |
| | HV Winding | : 415 Volts $\pm$ 10% |
| | LV Winding | : 230 Volts (L-L) $\pm$ 10% |
| 8 | Highest system voltage | |
| | HV Winding | : 650 Volts |
| | LV Winding | : 250 Volts |
| 9 | Impedance voltage at rated current | : 4% $\pm$ 10% |
| 10 | Method of system earthing | |
| | HV Winding | : Nil |
| | LV Winding | : Solid |
| 11 | Connection symbol | : DY11 |
| 12 | Earthing of neutral terminals | : Required for LV winding |
| 13 | Tap changer type | : Off circuit |
| 14 | Tapping percentages | : $\pm$ 2.5, $\pm$ 5, $\pm$ 7.5%, (7 steps) |
| 15 | Terminal Arrangement | |
| | a) HV side | : Cable box |
| | b) LV side | : Cable box |
| 16 | a) Temperature rise (over Ambient) in Oil | : 45°C |
| | b) Temperature rise (over Ambient) in Winding | : 55°C |
| 17 | Type of Winding | : Double wound Copper |
| 18 | Standard applicable for transformer | : IS : 2026 (Current) |
| 19 | Standard applicable for oil used | : IS : 335 (Current) |

ANNEXURE - ES-7**A. SPECIFICATION FOR MAIN LIGHTING DISTRIBUTION BOARDs (M.L.D.B.)****SCOPE**

This specification covers requirements for 230V(L-L) MLDBs, metal enclosed, dust and vermin proof to be installed in substation, conforming to the latest revision of IS:8623-1993 except where modified or extended by the provision of this specification.

OTHER RELEVANT STANDARDS

The other relevant Indian standards are as under :

- IS : 3043 : Code of practices for earthing.
- IS : 4237 : General requirements for switchgear and control gears for voltages not exceeding 1000V AC.
- IS : 12021 : Specification of Control transformers for switchgear and control gears for voltages not exceeding 1000 V AC
- IS : 722 : A.C electricity meters.
- IS : 1248 : Direct acting indicating analogue elect measuring instruments
- IS : 2551 : Danger Notice Plates
- IS : 5082 : Wrought Aluminium Alloys for electrical purpose
- IS : 6005 : Code of practice of phosphating iron and steel
- IS : 3202 : Code of practice for climate proofing of electrical equipment
- IS : 2147 : Degree of protection provided by industrial enclosures
- IS : 5 : Colours for ready mixed paints and enamels.

DESIGN CRITERIA

The boards shall operate on a 230V (L-L) ($\pm 10\%$), 3 phase, 3 wire, 50 Hz ($\pm 3\%$) power supply. Fault withstand capacity shall not be less than 10 kA for one second.

The boards shall have power frequency withstand voltage of 3000V. All similar components shall be interchangeable and shall be of same type and rating for maintenance and low spare inventory.

CONSTRUCTIONAL FEATURES

The boards shall be made of two modular standard vertical sections, extendible on either side. Each vertical section shall be made of sheet steel enclosures on steel frames. The thickness of steel sheets shall be 2 mm for load bearing sections and 1.6 mm for non-load bearing sections.

The vertical sections shall be single front type and of two tier formation.

Degree of protection of the enclosure shall be IP 43 with coats of paints conforming to IS: 5.

The bus bars shall be TP, Aluminium and of adequate current rating for horizontal and vertical bus. The bus bars shall be mounted on non hygroscopic, anti tracking, flame retardant, self extinguishing insulators. The bus bars shall be PVC insulated (sleeved).

The cable termination for cable sizes within 70 mm² shall be inside each vertical section. For sizes above 70 mm², the termination shall be in a cable chamber extended type. All the cable entries shall be from bottom.

The earth bus bar shall be of minimum 90 mm² Aluminium.

The board shall have a mechanical safety door interlock device to prevent opening of the door if the switches are ON. Similarly, it shall be ensured that the switch cannot be switched ON unless the door is closed. There shall also be padlocking arrangement for the door to prevent unauthorized access.

The MCCBs, Horizontal bus bars, extended chambers and the MCBs shall be in separate compartments.

ON/OFF switches of the MCCBs and MCBs and knobs of Ammeters shall be protruded for operation without opening the doors.

The incoming feeders shall be provided with Ammeters with selector switches.

The boards shall have a display of Danger Notice and supply shall be made with front rubber mat.

TECHNICAL SPECIFICATION FOR 230 V(L-L) MLDB

1	Installation	: Indoor
2	Enclosure	: Single front, IP 43
3	Rated voltage	: 230 V(L-L)
4	Bus bar	: TP (Aluminium)
5	Horizontal bus bar rating	: Adequate Rating
6	Vertical bus bar rating	: Adequate Rating
7	Short time rating	: 13.1 kA rms for 1 second
8	Withstand voltage	: 3000 V, 50 Hz, 1 min.
9	Cable termination	: Cable chamber
10	Cable types	: Three core PVCSEA (Al.) conductor
11	Cable entry	: Bottom
12	Size of earth bus	: 90 mm ² Aluminium (minimum)
13	Metering Arrangement	: Ammeters with selector switch on incomers.
14	Safety interlock	: As mentioned above
15	Finish	: Two coats of primer and one coat of final paint as per IS : 5.

SPECIFICATION FOR MOULDED CASE CIRCUIT BREAKERS

SCOPE

This specification covers requirements for 230V (L-L) Moulded Case Circuit Breakers suitable for installation in switchboards (MLDB).

The Moulded case circuit breakers shall comply with the latest revision of IS: 13947(Part I) and IEC: Publication 947 except where modified or extended by the provision of this specification and with the relevant parts of standards mentioned below .

OTHER RELEVANT STANDARDS

The other relevant Indian standards are as under :

IS : 3072: Code of practice for installation and maintenance of switchgear.

IS : 4237: General requirements for switchgear and controlgears for voltages not exceeding 1000V AC.

IS: 10118:Code of practice for selection, installation and maintenance of Switchgear and Controlgear.

IS : 11353:Guide for uniform system of marking and identification of conductors and apparatus terminals.

DESIGN CRITERIA

The Moulded Case Circuit Breakers shall operate on a 230V (L-L) ($\pm 10\%$), 3 phase, 50 Hz ($\pm 3\%$) power supply. Fault withstand capacity shall not be less than 10 kA.

All similar components shall be interchangeable and shall be of same type and rating for easy maintenance and low spare inventory.

The rated carrying capacity shall be sufficient at the rated voltage and frequency and the circuit breaker shall carry this current continuously while complying with this specification.

CONSTRUCTIONAL FEATURES

- 1) The Circuit breakers shall be three pole, moulded case air break type.
- 2) The circuit breaker shall have tripping mechanism for over load and short circuit irrespective of the type of operating mechanism. In addition, provision shall be made for manual tripping of the breaker. The breakers shall be fixed type.
- 3) Circuit Breaker shall be provided with anti-pumping and trip free feature.
- 4) Tripping shall be possible by means of front mounted "OFF" switch. Making of the breaker shall be possible by means of "ON" switch.
- 5) Suitable indications shall be provided on circuit breaker to show "ON", "OFF", conditions.
- 6) The following protection (release type) shall be provided :
 - a) Ambient temperature compensated thermal overload trip with adjustable settings.
 - b) Magnetic Short circuit trip.

PERFORMANCE

- 1) The temperature rise of parts of the equipment like terminals, accessible parts, main circuit, windings of coils and electromagnets etc. measured during the test carried out in accordance with IS: 13947 (Part I) shall not exceed temperature rise limits specified in the said standard.
- 2) The dielectric property of the equipment, clearances and minimum creepage distance shall conform to IS: 13947 (Part I).
- 3) The equipment shall be capable of making and breaking load and overload currents without failure under the conditions stated in the relevant product standard for the required utilisation category.
- 4) The equipment shall be capable of withstanding thermal and electromagnetic stress from short circuit currents during current making, current carrying in the closed position and during current interruptions.

NAME PLATE

The name plates of the circuit breaker shall have suitable marking as under :

Manufacturer

Type designation and serial number

Rated voltage

Rated current

Rated frequency

Short circuit withstand capacity

Short circuit breaking capacity

Weight

Year of manufacture

TECHNICAL SPECIFICATION

1	Installation	: Switch board
2	Number of Poles	: 3
3	Service Voltage	: 230V (L-L) ($\pm 10\%$)
4	Rated current (A)	: As Required
5	Making capacity	: 25 kA (peak)
6	Frequency	: 50 Hz ($\pm 3\%$)
7	Sym. breaking capacity	: 10 kA (rms)
8	Short time current for 1 Sec.	: 10 kA (rms)
9	Settings	: Thermal (Adjustable), Magnetic 9 kA
10	Operating Mechanism	: Manual Trip free
11	Tripping arrangement	: Thermal overload and Short circuit electromagnetic release.
12	Protections to be provided	: i) Short circuit ii) Overload
13	Cable Entries	: Suitable for PVC SWA with Aluminium conductor, Totally shrouded to avoid risk of electric shock to operating personnel.
14	Execution	: Fixed

SPECIFICATION FOR 230V (L-L) MINIATURE CIRCUIT BREAKERS

SCOPE

This specification covers requirements for 230V (L-L) Miniature Circuit Breakers suitable for installation in switchboards (MLDBs).

The Miniature circuit breakers shall comply with the latest revision of IS: 8828-1993 except where modified or extended by the provision of this specification and with the relevant parts of standards mentioned below.

OTHER RELEVANT STANDARDS

The other relevant Indian standards are as under:

IS : 3072 : Code of practice for Installation and Maintenance of switchgear.

IS : 4237 : General requirements for switchgear and controlgears for voltages not exceeding 1000V AC.

IS : 10118 : Code of practice for selection, installation and maintenance of Switchgear and Controlgear.

IS : 11353 : Guide for uniform system of marking and identification of conductors and apparatus terminals.

DESIGN CRITERIA

The breakers shall operate on a 230V (L-L) ($\pm 10\%$), 2/3 phase, 50 Hz ($\pm 3\%$) power supply. Fault withstand capacity shall not be less than 9 kA for one second.

The rated carrying capacity shall be as specified in Annexure IB at the rated voltage and frequency and the breaker shall carry this current continuously while complying with this specification.

CONSTRUCTIONAL FEATURES

1) General

The miniature circuit breakers shall have IP-43 protection.

2) Miniature Circuit Breakers

The circuit breaker shall have current limiting devices with an inverse time delayed thermal trip device and an undelayed magnetic trip device to take care of steady overload and short circuit faults respectively. The breakers should be suitable for switching/protection of lighting circuits.

TECHNICAL SPECIFICATION

1	Application	: Switch board
2	Number of poles	: 2 / 3
3	Rated Current	: As Required
4	Breaking capacity	: 10kA (rms) / 9 kA for 1 second
5	Rated voltage	: 230V (L-L) ($\pm 10\%$)
6	Frequency	: 50 Hz ($\pm 3\%$)
7	Enclosure of the breakers	: Moulded self extinguishing thermoset plastic.
8	Dolly (Switching lever)	: Can be locked in either OFF or ON position.
9	Fixing	: Snap fitting
10	Terminals	: To take PVCSWA 25 mm ² conductors for the outgoing cables. Incoming terminals shall be connected to bus.
11	Mechanical service life	: Not less than 20,000 operations.
12	Electrical endurance at rated load	: Not less than 20,000 operations.
13	Climate resistance to confirm requirements of	: IEC - 68/2
14	Ambient temperature	: As mentioned elsewhere in this document
15	Operating mechanism	: Manual Trip Free
16	Tripping Arrangement	: Magnetic Short Circuit Release. Thermal Overload Release.

SPECIFICATION FOR 230V SWITCH FUSE UNIT

SCOPE

This specification covers requirements for 230V Switch Fuse Units conforming to IS:13947 (Part 3) inclusive of latest amendments, if any. Any material and component not specifically stated in this specification but necessary for trouble free operation of the equipment and accessories specified herein shall be deemed to be included.

DESIGN CRITERIA

The switches shall operate on a 230V (L-L) ($\pm 10\%$), 2 phase, 50 Hz ($\pm 3\%$) power supply. Fault withstand capacity shall be not less than 9 kA for one second.

The rated current carrying capacity shall be as specified below at the rated voltage and frequency and the switch shall carry this current continuously while complying with this specification.

CONSTRUCTIONAL DETAILS

The switches shall be made of two pole, silver tipped copper contacts with steel springs for rapid movement during changeover. The unit shall have suitable interlock type having interlock with switch board door.

The enclosure shall be of steel sheets 1.6 mm thick with aesthetic finish and final coats of paints.

TECHNICAL SPECIFICATION

1	Installation	: Switch board
2	No. of Poles	: 2
3	Service Voltage	: 230V (L-L) ($\pm 10\%$)
4	Continuous current	: As Required
5	Nominal short time current	: 10 kA (rms)/9 kA
6	Contactor Duty	: AC 1
7	Frequency	: 50 Hz ($\pm 3\%$)
8	Mechanical life	: Not less than 3 Million operations.
9	Safety interlock	: As mentioned above
10	Enclosure	: Sheet Steel 1.6 mm.

B. SPECIFICATION FOR 230V (L-L) LIGHTING DISTRIBUTION BOARD

SCOPE

This specification covers requirements for 230V (L-L) Miniature and/or Residual Current Circuit Breaker suitable for installation in a switchboard (LDB).

The Miniature-Residual Current circuit breaker shall comply with the latest revision of IS: 8828 and the associated switch board shall conform to IS : 8623 with the relevant parts of standards except where modified or extended by the provision of this specification.

OTHER RELEVANT STANDARDS

The other relevant Indian standards are as under:

IS : 3043: Code of practices for earthing.

IS : 4237: General requirements for switchgear and control gears for voltages not exceeding 1000V AC.

IS : 10118: Code of practice for selection, installation and maintenance of Switchgear and Control gear.

IS : 11353: Guide for uniform system of marking and identification of conductors and apparatus terminals.

IS : 8588 : Thermostatic bimetals

CONSTRUCTION

General

The miniature circuit breakers shall be suitable for mounting in 4 ways/8 ways/ 12 ways/16 ways distribution boards with IP-42 protection.

Enclosure

The enclosure shall be manufactured from at least 2 mm thick steel sheets in aesthetically appealing powder coated finish. The boards are to conform to the requirement of IS: 8623 for factory built assemblies.

Bus bar system

The bus bar system should incorporate integral single piece bar and coupling links to avoid chances of hot spot developing as is possible with bolted construction of bus bar and links. The bus bar system should accept double pole and single pole circuit breakers in any combination of these. The bus bars should be shrouded against accidental contact. The circuit breakers should be arranged in two horizontal or vertical banks with switch levers operating in vertical or horizontal planes for on-off switching. The mounting of breakers should be quick snap and easy removal type without disturbing the other breakers. It should be capable of being connected to at least cable sizes of 25 mm² for phase conductors and 16 mm² for neutral conductors. Two conduit entry plates at the top and the bottom should facilitate drilling of holes at site to suit individual requirements.

Miniature/Residual Current Circuit Breakers and Distribution Boards

These breakers shall be current limiting devices with an inverse time delayed thermal trip device and an un-delayed magnetic trip device to take care of steady overload and short circuit and earth leakage faults respectively. The breakers shall be suitable for switching/control/protection/regulation of lighting, control and motor circuits.

The circuit breakers should also be suitable for protection/control/switching of single phase, 230 Volt motors.

TECHNICAL SPECIFICATION FOR MINIATURE / RESIDUAL CURRENT CIRCUIT BREAKERS

1	Applicable standard	: IS 8828
2	Number of poles	: 2 for incoming MCB and RCCB if any. 2 for outgoing for MCB.
3	Rated Current	: As Required
4	Breaking capacity	: 9 kA

-
- | | | |
|----|--|---|
| 5 | Rated voltage | : 230 V for DP |
| 6 | Frequency | : 50 Hz |
| 7 | Enclosure of the breakers | : Moulded self extinguishing thermo set plastic. |
| 8 | Dolly (Switching lever) | : Can be locked in either Off or On position |
| 9 | Auxiliary contact poles (for control circuits, if any) | : 230V 5A, A.C. (Optional). |
| 10 | Fixing | : Snap fitting |
| 11 | Terminals | : 25 mm ² conductors for phase and 16 mm ² for neutral. |
| 12 | Mechanical service life | : Not less than 20,000 operations. |
| 13 | Electrical endurance at rated load | : Not less than 20,000 operations. |
| 14 | Climate resistance to conform requirements of | : IEC - 68/2 |

TECHNICAL SPECIFICATION FOR LDB :

- | | | |
|----|-------------------------------|--|
| 1 | Applicable Standard | : IS : 8623 |
| 2 | Bus current carrying capacity | : Suitable with DP |
| 3 | Enclosure | : 2 mm thick CRCA sheets. |
| 4 | No. of outgoing | : As Required |
| 5 | No. of incoming | : 1 No. |
| 6 | Mounting | : Channel mounted / Flush top cover. |
| 7 | Cable entry | : Top / Bottom cable entry conduits. |
| 8 | Protection | : IP 42 (Metallic double door) degree of protection. |
| 9 | Finishing | : Powder coated finish. |
| 10 | Locking | : Pad locking facility. |
| 11 | Bus bar | : Shrouded type integral single piece bus bar. |
| 12 | Arrangement of breakers | : Vertical/Horizontal arrays. |

C. SPECIFICATION FOR SWITCH BOARDS FOR LIGHTING CIRCUITS

SCOPE:

This covers requirements for switch boards for light & fan circuits.

CODES:

The applicable codes are as under:

IS : 1293	3-Pin, plug and socket outlets
IS : 3954	Switches for domestic and similar purposes
IS : 694	PVC unarmoured 660 V grade cable
IS : 5133	Boxes for enclosure of electrical accessories - Steel and cast iron boxes
IS : 9224	Low voltage fuses

CONSTRUCTION:

Switch Boards

- i) The switch boards shall be made of 1.6 mm thick, MS sheet with 3 mm, thick decorative bakelite cover. The switch boards shall be provided with earthing terminal, mounting holes and screws, specified number of conduit knock outs on both sides etc. The switch boards shall be suitable for surface mounting. The switchboards shall mount double pole MCBs and sockets.
- ii) The switches shall be Double pole MCBs, quick make quick break suitable for operation on 230 V AC supply.
- iii) The sockets shall be of 5 pin type 5/15 A, 230 V AC socket with 15 A switch.
- iv) The switch boards shall be adequately sized to accommodate switches/fan regulators/sockets. All switch boards mounted items shall be fully wired by 660 V grade PVC insulated flexible Copper wire.
- v) All in-coming and out-going wires shall be suitable for loop in loop out of 4 Sq. mm stranded Aluminium wire and tap off of 1.5 mm² copper wire.

TECHNICAL INFORMATION

1. Rated Voltage	: 230 V
2. No of 5A Double pole MCBs	: As required
3. No of 5/15A , 3/5 pin socket with 16A MCBs	: As required
4. No. of fan regulators (electronic)	: As required
5. Rewirable fuse 5A with base	: As required
6. Top cover	: Decorative Bakelite 3 mm thick
7. Switch board	: 1.6 mm thick MS sheet
8. Internal wiring	: with 660 V grade by 1.5 Sq mm Copper cable
9. Mounting	: Flush/projected
10. Earthing	: Two terminals shall be provided for earthing by 8 SWG GI Wire

D. SPECIFICATION FOR LAMP FIXTURES

SCOPE

This specification covers requirement for fixtures of tubular and compact fluorescent lamps, sodium and mercury vapor lamps & tungsten lamps in various applications.

The fixtures shall comply with the latest revision of IS:1913, IS:3287, IS:4013, IS:1777 & IS:10322 except where modified or extended by the provision of this specification and with the relevant parts of standards mentioned below .

OTHER RELEVANT STANDARDS

The other standards applicable are as under :

- IS : 1534 - Ballasts for fluorescent lamps for switch start circuits
- IS : 6616 - Ballasts for high pressure mercury vapour lamps
- IS : 1569- Capacitors for use in tubular fluorescent and high pressure Vapour discharge lamp circuits
- IS : 2215 - Starters for fluorescent lamps
- IS : 3323 - Bi Pin lamp holders for tubular fluorescent lamps
- IS : 7569 - Case acrylic sheets for use in luminaries
- IS : 8913- Methods of measurement of lamp cap. temperature rise
- IS : 10276 - Edison Screw lamp holders
- IS : 3043 - Code of practice for earthing

CONSTRUCTION

All lighting fixtures shall be complete with lamp holder, control gear, reflector and cable gland. Power Factor of the fixtures shall be not less than 0.96. Suitable p.f. correction capacitor shall be provided wherever required.

Fluorescent lamp fixtures

The single tube economy type fixtures of the batten type shall be made of M.S. sheet finished in white stove enamel suitable for direct fixing to wall or ceiling. The unit shall be complete with electronic ballast, starter and lamp holders with end covers.

The single/twin tube commercial type fixtures of the channel type shall be made of cold rolled cold annealed M.S. sheets finished in white/grey stove enamel suitable for direct fixing to wall or suspended from ceiling. The unit shall be complete with electronic ballast, p.f. correction capacitor, starter and rotor locking type lamp holders with end covers.

The twin tube decorative type fixtures with louvers of the hexagonal pattern shall be supplied on a channel type fixture .The louvers shall be supported below the channel by means of metallic side panels and plates. The unit shall be complete with electronic ballast, p.f. correction capacitor, starter and rotor locking type lamp holders.

The single/twin decorative tube fixtures with diffusers shall be extruded in opal thermoplastic compound and supported in black end plates. The diffuser shall be supplied on a channel type fixture. The unit shall be complete with electronic ballast, p.f. correction capacitor, starter and rotor locking type lamp holders.

The twin tube recessed fixture with louvers shall be made in a single piece moulding. The moulding shall be carried in a single piece sheet steel housing wired completely with electronic ballast, p.f. correction capacitor, starter and lamp holders. The fitting shall be designed for recessing into false ceiling and provided with a flange on all sides to ensure flush mounting.

The twin tube recessed fixtures with opal diffuser shall be made in an opal acrylic diffusing panel. The panel shall be carried in a single piece sheet steel housing wired

completely with electronic ballast, pf. correction capacitor, starter and lamp holders. The fitting shall be designed for recessing into false ceiling and provided with a flange on all sides to ensure flush mounting.

High bay/Medium bay fixtures for Vapor lamps.

The reflector shall be made of cast aluminium anodised and electrochemically treated for brightness to give a concentrated light distribution.

The control gear shall comprise ballasts, p.f. correction capacitors, ignitor. The control gear shall be housed adjacent to lamp holder housing. The lamp holder housing shall have radial cooling fins for efficient heat dissipation.

A cable gland shall be provided on the side of the canopy.

The fixture shall be suspended by means of a suspension hook in the top of the canopy. No chain suspension is acceptable.

The fixture shall be suitable for 1000 W HPSV lamp or 400 W HPSV / Metal Halide lamps.

High bay/Medium bay fixtures for emergency lighting

The reflector shall be made of cast aluminium anodised and electrochemically treated for brightness.

The fixture shall be suitable for 500 Watt tungsten G.L.S. lamps

The cable entry shall be on the side of the canopy

The fixture shall be suspended by means of a suspension hook in the top of the canopy. No chain suspension is acceptable.

Industrial Weather proof/Well Glass/bulk head fixtures

The fixtures shall be a single piece aluminium body

The unit shall be supplied with a frosted glass, synthetic rubber gasket and a lamp holder for 70 Watt HPSV lamps.

Flood light fixtures

The reflector shall be made of cast aluminium anodised and electrochemically treated for brightness.

The fixture shall be suitable for 1000/400 Watt HPSV lamp or 1000 W halogen / Metal Halide lamp.

The cable entry gland shall be fitted to the lamp holder housing

A graduated disc shall be provided to enable adjustment in the spinning angle of the fixture after mounting the fixture on a bracket.

The fixture shall be mounted on a bracket

Street light fixtures

The reflector shall be made of two cast aluminium anodised surfaces, one on either side.

The fixture incorporating reflector, control gear housing, lamp holder, terminal block shall be made of one piece aluminium sheet.

The cable entry shall be from the side

A locking device shall be provided to prevent unauthorised opening of the fixture.

The fixture shall be suitable for mounting 70 Watt/80 Watt/125 Watt/250 Watt/ 400 Watt lamps.

Street light fixtures for fluorescent lamp

The canopy shall be fabricated from aluminium sheets.

The control gear shall comprise p.f. correction capacitor, electronic ballast and starters

A transparent bowl moulded from acrylic sheet shall be fitted rigidly against a heat resistant rubber gasket fixed to the canopy by suitable means making the fixture dust & water proof.

The fixture shall be suitable for mounting on cantilevers having outside diameter 50 mm.

The fixture shall be suitable for Single/Twin tubes

Street light fixture for low pressure sodium vapour lamps

The reflector shall comprise aluminium reflectors housed inside cast aluminium canopy which shall be totally enclosed by an acrylic bowl. All control gear components, i.e. ballast, p.f. correction capacitors and starters shall be housed inside this canopy.

The canopy shall have a cable entry suitable for GI pipe with outside diameter 50 mm. The fixture shall be suitable for cantilever mounting on G.I. pipe.

The fixture shall be suitable for 135 Watt low pressure sodium vapor lamp

Mast top fixtures for vapor lamps

The reflector shall consist of an opal acrylic bowl secured to a cast aluminium spigot on a aluminium frame-work. The reflector shall be enclosed by an aluminium canopy which shall carry the lamp holders & control gear components like ballasts and starters. The p.f. correction capacitor & the HRC fuses shall be housed in a separate box.

The aluminium frame-work shall be fixed to a G.I. pipe

The G.I. pipe shall be suitable for mounting on a mast 14 m/18 m long.

The fixture shall be suitable for 250 Watt HPSV/400 Watt HPSV / Metal Halide lamps.

Chokes

The chokes shall be electronic type and conform to relevant Standards

Capacitors

The capacitors shall conform to relevant standards

ANNEXURE - ES-8**A. SPECIFICATION FOR STEEL TUBULAR POLES FOR LIGHTING****SCOPE**

This specification covers requirements for swaged type steel tubular poles for outdoor lighting.

The poles shall comply with the requirements of IS: 2713 except where modified or extended by this specification and with the relevant part or standards mentioned below.

OTHER RELEVANT STANDARDS

The other relevant standards applicable are as under :

IS:209	Specification of Zinc
IS :2633	Method of testing weight, thickness, and uniformity of coating on hard dipped, galvanising articles.
IS : 728	Method on determination of weight, thickness and uniformity of coating on galvanised articles other than wires & sheets.
IS : 1573	Specification for zinc plating
IS :5	Colour for ready mixed paints and enamels.

CONSTRUCTION

The tubular poles shall consist of 3 or 4 sections of dimensions conforming to the relevant standard.

The thickness of the steel sheets shall conform to the relevant standards.

The section shall be hard dip galvanised in accordance with the relevant standards.

The section shall be applied with 2 coats of primer and one coat of final paint in accordance with the relevant standards.

In case of swan neck pole, top section shall be curved in accordance with the requirement. The lamp fixture shall freely fit in with the coupler. For other type of poles, the lamp fixture mounted on a bracket clamped on the pole at a height of not less than 7 m from the road surface and projecting at least 1.3 m into the road from the centre of the pole.

The lower most section shall be provided with a base plate having holes for firm fixation in the foundation. The height of the pole shall be 9 m.

The bidder / supplier shall submit the dimensioned drawings for different sections for approval by Purchaser before fabrication.

B. SPECIFICATION FOR MASTS FOR LIGHTING**SCOPE**

This specification covers requirements for high masts for outdoor lighting with street light / flood light fixtures.

CONSTRUCTION

The mast shall comprise the following components :

The mast shall comprise sections of over 6 metre length. Each section shall be made of steel complying with I.S. 226 of appropriate grade, polygonal section, telescopic jointed and fillet welded with the exception of site joints. The welding shall be in accordance with B.S. 5135. Each section shall include one telescopic and welded joint which provides diaphragm stiffness to maintain the structural strength during delivery and in service. The whole mast shall be continuously tapered. A door shall be provided at the base of the mast to permit clear access to winch assembly and power supply sockets. The door shall be weather resistant with a heavy duty lock. The base flange of welded construction shall provide full strength to the mast assembly. The mast shall be delivered to site in sections and joined with sleeve joints. No welded or bolted joints shall be allowed.

The foundation shall be provided by anchor plates with high tensile bolts.

The entire mast section shall be hot dip galvanised in accordance with I.S. 2629. Each section shall be given two coats of primer and one coat of final paint in accordance with shade 631 of I.S. 5.

For installation and maintenance of the top luminaries assembly a winch shall be provided at the base of the mast. The winch shall be completely self sustaining without the need for brakes, springs, or clutches which require adjustment. The winch shall have one or more drums corresponding to number of steel ropes required for suspension of the top luminaries assembly. The drums shall be suitably grooved ensuring tidy rope lay and smooth return of the rope for each lay. At least 4 turns of rope shall remain on a drum when the top luminary assembly is fully lowered.

The winch shall be manually operable and also by power tools incorporating two speed reversible 230 volt single phase 50 Hz AC/DC universal motor coupled by a gear assembly of adequate ratio. The driving spindle shall be positively locked when not in use by a suitable automatic means. The winch shall be self lubricated by an oil bath. The capacity, the operating speed and the recommended lubricant shall be clearly marked on each winch with an indelible label. Each winch shall be supplied in waterproof enclosure.

Separate pulleys shall be mounted on a chassis integral with a sleeve which slips over the top of the mast axially and in azimuth. The pulleys made of non-corrodible material and run on self lubricating bearings with stainless steel spindles shall take on steel wire ropes and electric cables on suitable grooves. Suitable guides and stops shall be provided for the steel wire ropes for correct guiding of the luminary assembly. The pulley assembly along with chassis shall be hot dip galvanised in accordance with relevant code aforesaid. The assembly shall be supplied in a weatherproof enclosure.

Suitable steel wire ropes of the stainless type shall be provided.

Stainless steel stud of diameter not less than 12 mm shall be attached to the mast structure at a convenient point within the base compartment to provide an earthing point.

The luminary assembly shall consist of radial steel conduits for cables supplying power to fixtures. The assembly shall have fixing arms and plates for mounting junction boxes. Junction boxes in two separable halves shall provide supply of power to different fixtures. The assembly shall be provided with buffer arrangements to prevent damage to the mast finish.

Multicore flexible power cables shall be terminated on metal cased plug and sockets in the base compartment of the mast. At the mast head cables shall be connected to the weather proof junction box aforesaid with nylon glands.

Extension leads of multicore cables shall be provided with plug and socket to enable the fixtures to be tested when in the lower most position using base compartment socket supply.

TECHNICAL INFORMATION

- 1 Height of mast : 14 M/18M/25M/30M
- 2 Ground level diameter : 300 mm/386 mm/ 440 mm/610 mm
- 3 Top section diameter : 100mm/100mm/150mm/150 mm
- 4 Maximum projected area of : 0.8 sq.metre/0.8 sq.metre/
luminaires 0.9 sq.metre/2.8 sq. metre
- 5 Maximum weight of the : 150 kg/150 kg/350 kg/350 kg
luminaire assembly
- 6 Number of sections : 2/2/3/3
- 7 Length of longest section : not exceeding 11 metres
- 8 Luminaire assembly
This shall comprise :
 - a) High mast street light fixtures with aluminium body, integral control gear, lamp holder and variable optic reflector. The fixture shall be of IP 54 construction and suitable for mounting 400 watt HPSV / Metal Halide lamp.
 - b) Flood light fixture with aluminium body, integral control gear, lamp holder and cradle with fixture adjuster. The unit shall be of IP 54 construction and suitable for mounting 400 watt HPSV / Metal Halide and 1000 watt Tungsten Halogen lamps.

ANNEXURE - ES-9**POWER AND CONTROL CABLES****1. SPECIFICATION FOR 650 / 1100 V GRADE PVC ARMoured CABLE****SCOPE**

This specification covers requirements for 650 V / 1100 V grade PVC insulated (Heavy duty) armoured Aluminium conductor electric cables.

The cable shall comply with the latest version of IS:1554 (Part 1) except where modified or extended by this specification and with the relevant parts of standards mentioned below.

CODES

The other relevant standards applicable are as under:

- IS : 10418 : Specification of drums for electric cables
- IS : 8130 : Conductors for insulated electric cables and flexible cords
- IS : 3975 : Specification for mild steel wires, strips and tapes
- IS : 5831 : PVC insulation for armouring cables and sheath of electric cables
- IS : 10462 : Fictitious calculation method for determination of dimensions of protective covering of cables. Part I elastomeric and thermoplastic insulated cables
- IS : 2 : Rules for rounding off values
- IS : 10810 : Method of test for cables (Part 0 to Part 63)
- IS : 1885 : Electro technical vocabulary part 32, cables, conductors and accessories
- IS : 4905 : Methods for random sampling.

CONSTRUCTION**Material**

- (a) The conductor shall be Aluminium wires conforming to relevant codes and the insulation used shall be Poly Vinyl Chloride (PVC) compound conforming to the requirements of Type A and Type C compound conforming to relevant codes.
- (b) The outer sheath, fillers and inner sheath shall have FRLS property.
- (c) Armouring shall be either of the following types :
 - i) Galvanised round steel wire
 - ii) Galvanised steel strip

The Galvanised steel wires/ ropes shall comply with the requirements of relevant Code. A binder tape on the armour shall be provided.

Construnctional features

The conductor shall be of stranded construction complying with class 2 of relevant codes. A protective barrier shall be provided between the conductor and the insulation and this shall be compatible with the insulating material and the operating temperature of 70°C.

The conductor with protective barrier shall be provided with PVC insulation applied by extrusion.

The average thickness of insulation shall not be less than 1 mm to 2.4 mm depending upon the nominal area of the conductor. The tolerance of thickness of insulation shall be such that the smallest of measured values of thickness of insulation shall not fall below 0.2 mm to 0.34 mm respectively.

The values of thickness of inner sheath shall not be less than 0.4 mm to 0.7 mm depending the nominal area of the conductor.

Armouring shall be provided over the inner sheath.

The armour of the cables shall consist of either galvanized round steel wires or galvanized steel strips.

The nominal thickness of steel strips shall be between 0.8 mm to 1.4 mm and the nominal diameter of round armour wire shall be between 1.6 mm to 4 mm.

The thickness of outer sheath shall be between 1.4 mm to 3 mm depending upon the nominal area of the conductor.

2. SPECIFICATION FOR 650 / 1100 V GRADE UNARMoured CABLE

SCOPE

This specification covers requirements for 650 V / 1100 V grade PVC insulated unarmoured Aluminium conductor electric cables for power supply to light & fan circuits.

The cable shall comply with the latest version of IS: 14449 except where modified or extended by this specification and with the relevant parts of standards mentioned below.

CODE

The other relevant standards applicable are as under :

IS : 3961	Recommended current ratings for PVC insulated cables
IS : 5831	PVC insulation and sheath of electric cables
IS : 8130	Conductors for insulated electric cables and flexible cables
IS : 10810	Methods of tests for cables

CONSTRUCTION

Material

- (a) The conductor shall be Aluminium wires conforming to relevant codes and the insulation used shall be Poly Vinyl Chloride (PVC) compound conforming to the requirements of Type A compound conforming to relevant codes.
- (b) The fillers and sheath shall have FRLS property

Conductor

- (a) The construction of the conductors shall be for fixed wiring and the conductor shall be of stranded construction.
- (b) The conductor shall be provided with PVC insulation applied by extrusion. The thickness of the insulation shall be between 0.7 to 1 mm.
- (c) The sheath shall be applied by extrusion. It shall be applied over the laid up cores fitting closely and shall have FRLS property.. It shall be possible to remove the sheath without damage to the sheath. The colour of the sheath shall be Black. The thickness of the sheath shall be between 0.9 to 1.4 mm.

3. SPECIFICATION FOR 650 / 1100 V GRADE CONTROL CABLE

SCOPE

This specification covers requirements for 650 V / 1100 V grade PVC insulated armoured copper conductor control cables.

The cable shall comply with the latest version of IS:1554 (Part 1) except where modified or extended by this specification and with the relevant parts of standards mentioned below .

CODES

The other relevant standards applicable are as under:

- IS : 10418 : Specification of drums for electric cables
- IS : 8130 : Conductors for insulated electric cables and flexible cords
- IS : 3975 : Specification for mild steel wires, strips and tapes
- IS : 5831 : PVC insulation for armouring cables and sheath of electric cables
- IS : 10462 : Fictitious calculation method for determination of dimensions of protective covering of cables. Part I elastomeric and thermoplastic insulated cables
- IS : 2 : Rules for rounding off values
- IS : 10810 : Method of test for cables (Part 0 to Part 63)
- IS : 1885 : Electrotechnical vocabulary part 32, cables, conductors and accessories
- IS : 4905 : Methods for random sampling.

CONSTRUCTION

Material

- (a) The conductor shall be Copper wires conforming to relevant codes and the insulation used shall be Poly Vinyl Chloride (PVC) compound conforming to the requirements of Type A and Type C compound conforming to relevant codes.
- (b) The outer sheath, fillers and inner sheath shall have FRLS property
- (c) Armouring shall be either of the following types :
 - a) Galvanised round steel wire
 - b) Galvanised steel strip

The Galvanised steel wires/ ropes shall comply with the requirements of relevant Code.

Constructional features

The conductor shall be of stranded construction complying with class 2 of relevant codes. A protective barrier shall be provided between the conductor and the insulation and this shall be compatible with the insulating material and the operating temperature of 70⁰C.

The conductor with protective barrier shall be provided with PVC insulation applied by extrusion.

The average thickness of insulation shall not be less than 0.8 mm to 0.9 mm depending upon the nominal area of the conductor. The tolerance of thickness of insulation shall be such that the smallest of measured values of thickness of insulation shall not fall below 0.18 mm to 0.19 mm respectively.

Core identification shall be made by colour scheme of PVC insulation as per relevant code.

The values of thickness of inner and outer sheath shall not be less than 0.3 mm and 1.24 mm respectively.

Armouring shall be provided over the inner sheath.

The armour wires/strips shall be applied as closely as practicable.

The armour of the cables shall consist of either galvanized round steel wires or galvanized steel strips.

The nominal thickness of steel strips shall be between 0.8 mm to 1.4 mm and the nominal diameter of round armour wire shall be between 1.4 mm to 4 mm.

4. TECHNICAL INFORMATION

650 / 1100 V GRADE PVC ARMoured CABLE

Applicable Code	IS 1554 (Part-1)
Cable Code	AYFY
Voltage Grade	650 / 1100 V
Conductor Size	As required
No. of Cores	3/3.5/4
Sheathing	FRLS

650 / 1100 V GRADE UNARMoured CABLE

Applicable Code	- IS 694
Cable Code	- AYY
Voltage Grade	- 650 / 1100 V
Conductor Size	- As required
No. of Cores	- Two/Three/Four
Sheathing	- FRLS

650 / 1100 V GRADE CONTROL CABLE

Applicable Code	IS 1554 (Part-1)
Cable Code	YWY/YFY
Voltage Grade	650 / 1100 V
Conductor Size	1.5 mm ² (for internal wiring)/2.5 mm ² (for external connections)
No. of Cores	As required
Sheathing	FRLS

5. SPECIFICATION FOR ACCESSORIES OF CABLING

SCOPE

This covers requirements for accessories of cabling work like cable trays, cable ladders, PVC & Steel conduits and fittings, support systems.

CODE

The applicable codes are as under:

IS 732	Code of practice for electrical wiring
IS 513	Cold rolled low carbon steel and strips.
IS 1079	Hot rolled carbon steel and strips.
IS 9537	Conduits for electrical installation.
IS 2667	Fittings for rigid steel conduits for electrical wiring.
IS 8309	Compression type tubular terminal ends for Aluminium conductors of insulated cables .
IS 2629	Recommended practice for hot dip galvanizing.
IS 2633	Methods for testing uniformity of coating of Zinc coated articles.
IS 1367	Technical supply conditions for threaded steel fasteners.
IS 1663	Method for tensile testing of steel sheet & strip of thickness 0.5 mm to 3 mm.

CONSTRUCTION

Cable trays, fittings and accessories

- i) In RCC trenches, the cable trays shall be of cantilever construction, with one or multi tiers complete with matching fittings (like elbows, bends, reducers, tees, crosses, etc.), accessories (like side coupler plates etc.) and hardware (like bolts, nuts, springs, washers, etc.) as may be required. In vertical sections the trays shall be of ladder construction with one or multi tiers complete with matching fittings (like elbows, bends, reducers, tees, crosses etc.), accessories (like side coupler plates etc.) and hardware (like bolts, nuts, springs, washers, etc.) as may be required.
- ii) Cable trays, fittings and accessories shall be fabricated out of rolled Mild Steel sheets free from flaws such as laminations, rolling marks, pitting etc. conforming to relevant codes. Minimum thickness of Mild Steel sheets used for fabrication of cable trays and fittings shall be 2mm. The thickness of side coupler plates shall be minimum 3 mm. These shall be hot dip galvanized.
- iii) Cable trays in the RCC trenches shall be of standard width 250 mm and of standard lengths 2.5 metre. Cable ladders shall be of widths varying between 150 to 250 mm and of standard lengths 2.5 metre.
- iv) Each size and type of cable tray / ladder of 2.5 metre length and 250 mm width simply supported at the ends and uniformly loaded @ 76 kg. per metre shall not have deflection at the mid span exceeding 7 mm.

Support System for Trays and Cables

The support system shall be fabricated from standard structural steel members. The cable trays and support system shall be painted after installation with one coat of red lead primer, one coat of oil primer followed by two finishing coats of Aluminium paint.

Conduits, Fittings and Accessories

Conduits offered shall be rigid steel & PVC complete with fittings and accessories (like bends, check nuts, sockets etc.). The size of the conduit shall be selected on the basis of maximum 40% fill factor and in accordance with relevant code .

- i) **Rigid Steel Conduits**
Rigid steel conduits conforming to relevant codes shall be threaded on both sides and suitable for mechanical stresses. Conduits shall be smooth at inside and outside. Conduits shall be plugged by PVC caps at the ends for storage and transportation. Outer surface of conduit shall be hot dip galvanized and shall have high protection against corrosive and polluting substances. Inner surface of a conduit shall be protected against corrosion and polluting substances by hot dip galvanising. Fittings and accessories shall also be hot dip galvanised.
- ii) **Junction / Joint Boxes & power receptacles circuits**
Junction Box/cable joint boxes with IP:55 degree of protection, shall comprise a case and a detachable cover or hinged doors constructed out of cold rolled steel sheet of minimum thickness 2 mm. Top of the boxes shall be arranged to slope towards rear of the box. Gland plate shall be 3 mm thick sheet steel with neoprene/synthetic rubber gaskets. All junction boxes shall be suitable for mounting on walls, columns & structures. The boxes shall include brackets, bolts, nuts, screws, glands, lugs, earthing stud required for erection. Terminal blocks in side a junction box shall be of 660 volts grade. It shall be complete with insulating barriers, clip-on-type terminal numbering for wiring diagrams & arranged to facilitate

easy termination. Twenty percent spare terminals shall be provided in each terminal block.

iii) **Cabling Accessories:**

a) **Cable Glands :**

Cable glands shall be single compression type suitable for the voltage grade of cables and as per relevant codes. The glands shall be of robust construction capable of clamping cable and cable armour firmly. All washers and hardware shall be made of brass with nickel chrome plating. Rubber components shall be of neoprene.

b) **Cable Lugs :**

Cable lugs shall be tinned copper solder or crimping type suitable for the voltage grade of cables suitable for Aluminium conductor cables and copper conductor control cables.

c) **Galvanising**

Galvanising of steel components and accessories shall conform to relevant codes. The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per relevant codes.

d) **Painting**

Cable supports and cable trays mounting structures and all other non galvanized parts shall be brushed before giving one coat of red lead primer, one coat of oil primer followed by two finishing coats of Aluminium paint.

ANNEXURE - ES-10**SPECIFICATION FOR 415 V / 230 V POWER RECEPTACLES****1.SCOPE**

This specification covers the requirements for 415 V power receptacles incorporating switches, sockets and plugs.

The receptacles shall comply with the latest version of IS 8623 except where modified or extended by this specification and with the relevant parts of standards mentioned below.

2. OTHER RELEVANT STANDARDS

The other relevant standards applicable are as under :

IS :6875	Switches and push-buttons
IS :13703	LV fuses for voltages not exceeding 1000 V AC
IS :2147	Degree of protection provided by enclosures for low voltage switchgear and control gear
IS :3043	Code of practice for earthing
IS :2629	Hot dip galvanising
IS :5082	Wrought Aluminium and Aluminium alloys for electrical purposes
IS :1248	Electrical Indicating instruments
IS :5	Colours for ready-mixed paints and enamels.
IS :1554	PVC insulated cables for working voltages upto and including 1100V
IS :2551	Danger Notice Plates
IE Rules	1956

3.DESIGN**Electrical**

The receptacle shall be designed to ensure continuous operation at rated capacity at service condition and fault withstand capacity of 9 kA.

Mechanical

The receptacle shall be designed to ensure ready interchangeability of components and easy accessibility to components for inspection & maintenance.

4.CONSTRUCTION

The receptacle shall comprise single front panel, metal enclosed, dust & vermin proof floor mounted and free standing type. The frame shall be fabricated from suitable mild steel sheets of thickness not less than 2.0 mm. The frames shall be covered by cold-rolled steel sheets of thickness not less than 1.6 mm. Doors and covers shall also be of cold rolled sheets of thickness not less than 1.6 mm.

The panels shall be provided with a degree of protection IP 55.

The panel shall be supplied with base frames made of mild steel section along with all necessary mounting hardware required for welding down the base frame to the foundation/steel insert plates. The base frame height shall be such that floor finishing (50 mm thick) after erection of the board does not obstruct the movement of doors, covers withdrawable modules etc.

The panel doors shall open by at least 90 degree.

The ON / OFF switches in a receptacle shall be rotary type, heavy duty, double break, AC 23 category, suitable for AC supply.

Plug and socket shall be of shrouded die cast Aluminium. Sockets shall be provided with lid safety cover.

Robust mechanical inter-lock shall be provided such that the switch can be put ON only when the plug is fully engaged. Plug can be withdrawn only when the switch is in OFF position. Additional inter-lock should be provided such that covers can be opened only when the switch is in off position.

Wiring inside the receptacles shall be carried out with 1100 V grade PVC insulated stranded Aluminium conductor.

Terminal block in the receptacles shall be of 1100 V grade, clip on stud type, moulded in Melamine, suitable for terminating specified cable size. All the terminals shall be shrouded.

Receptacles shall include switches, sockets & plugs mentioned as under:

230V, 5A, SP, 2 Pin

230V, 20A, SP, 3 Pin

415V, 20A, TP, 3 Pin

415V, 63A, TPN, 5 Pin

Galvanised steel earth bus shall be provided at the bottom welded / bolted to the bottom of a panel.

Suitable arrangement shall be made at each end of the earth bus for bolting to earthing conductors. All joint splices to earth bus shall be made through atleast two bolts and taps by proper lug and bolts connection.

All non-current carrying metal work in a panel shall be effectively bonded to the earth bus.

Name plates and labels

- a) The receptacle shall be provided with prominent, engraved identification plates.
- b) The name plates shall be of non rusting metal with white non graved letterings on black back grounds. Inscriptions shall be subject to purchaser's approval.
- c) Caution plate with the inscription "WARNING LIVE TERMINALS" shall be provided on the front face of a receptacle. .

Painting

The sheet steel work shall be pre treated in accordance with relevant code. Finishing paint on panels shall be shade 692 (smoke grey) in accordance with relevant code. The inner surface of the panels shall be glossy white. All hardware shall be nickel chromium plated or zinc passivated.

ANNEXURE - ES-11**SPECIFICATION FOR EARTHING & LIGHTNING PROTECTION SYSTEM****SCOPE**

This specification covers the requirements for earthing system.

Earthing system shall be in strict accordance with IS: 3043 and Indian Electricity Rules / Acts (amended up to date) .

SYSTEM DESCRIPTION

Double earthing system shall be provided for earthing of equipment and buildings.

The earthing system shall consist of suitable nos. of earth pits and earthing conductors located in & around the sub-station buildings and the plant.

Neutral of the transformer shall be connected separately and solidly with at least two earth pits near the transformer .

Inter connected pits shall be provided for frame earthing of all equipments and cable trays/ladders, metallic conduits, steel tubular poles, trusses & structures over which cables run.

Independent pits shall be provided for earthing of transformer neutrals and down conductors of lightning masts.

CONSTRUCTION

The primary requirements of the earthing system are as follows:

Neutral of a transformer shall be effectively connected to an independent earth pit by copper flat 65 x 8 mm.

Down conductor of a lightning mast shall be effectively connected to an independent earth pit by GS flat 65 x 8 mm

Frame work of equipment shall be effectively connected to nearest pit by two separate GS flats or a combination of GS flats & wires of the sizes mentioned below:

Equipment	Earth conductor buried in earth	Earth conductor above ground level & in built up trenches
a) Main earth grid	40 mm dia MS Rod	65 x 8 mm GS flat
b) 415 V/230 V Switch boards	Not applicable	50 x 6 mm GS flat
c) Neutral point of transformer		65 x 8 mm GS flat
d) LT motors above 125 kW	Not applicable	50 x 6 mm GS flat
31 kW to 125 kW	Not applicable	25 x 6 mm GS flat
1 kW to 30 kW	Not applicable	25x6 mm GS flat
Fractional Horse Power	Not applicable	8 SWG GS wire
e) Columns, structures, cable trays, bus duct enclosures, steel tubular poles & Towers	Not applicable	50 x 6 mm GS flat
f) Crane gantries and other	Not applicable	25 x 6 mm GS flat

Equipment	Earth conductor buried in earth	Earth conductor above ground level & in built up trenches
non-current carrying metal parts		

Each earth pit shall have MS pipe electrode not smaller than 38 mm dia. The buried length of the electrode shall not be less than 2.5 meters. Each electrode shall be buried vertically in an earth pit of minimum 300 mm x 300 mm area and 3 meters depth preferably by using homogenous mixture of bentonite clay and soil in the ratio of 1:3. The distance between two earth pits shall be maintained at least double the length of the electrode pipe and earth pits shall be constructed away from drains.

Each pit shall be provided with a cast iron top cover for inspection & identification.

All conductors for earthing shall be made of Galvanised Steel (GS) on surface and of Mild Steel (MS) when planted below soil.

The grids inter connecting the pits shall have an area not less than 300 Sq mm and be buried at a depth not exceeding 600 mm below the soil. Back filling shall be placed in layers of 150 mm. Earthing conductors embedded in the concrete floor of the building shall have approximately 50 mm concrete cover.

The Bidder shall design and install the grounding system in the entire plant Complex including sub-station buildings. Excavation in rock/soil or both and back good earth filling required for the construction shall be in the scope of the bidder.

Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system each of 100% capacity. Crane rails, metal pipes and conduits shall be effectively earthed at two points. Steel RCC columns, metallic stairs, hand rails etc. of the sub-station building housing electrical equipment shall be connected to the nearby earthing grid conductor by one earthing ensured by bonding the different sections of hand rails and metallic stairs. Metallic sheaths, screens, armour of all cables shall be earthed at both ends.

Each continuous laid out lengths of cable tray shall be earthed at minimum two places by GS flats to the earthing system, the distance between earthing points shall not exceed 30 metre. Different sections of cable trays shall be connected by low resistance connecting links.

The neutral of transformer shall be connected to neutral of LT switchgear.

Neutral connections and metallic conduits/pipes shall not be used for the equipment earthing. Lightning protection system down conductors shall not be connected to other earthing conductors above the ground level.

Connections between earth leads and equipment shall normally be of bolted type.

A minimum earth coverage of 300 mm shall be provided between earth conductor and the bottom of trench / foundation / underground pipes at crossing. Earthing conductors crossing the road can be installed in hume pipes. Wherever earthing conductor crosses on runs at less than 300 mm distance along metallic structures such as air, water, pipe lines, steel reinforcement in concrete, it shall be bonded to the same.

Earthing conductors along their run on columns, walls, etc. shall be supported by suitable welding / cleating at interval of 1000 mm and 750 mm respectively.

LIGHTNING PROTECTION SYSTEM

Lightning protection system shall be in strict accordance with IS:2309.

Lightning masts shall be provided on any structure having height 15 metre or more. The height of the masts above its fixing point on the structure shall be 2 metre. The spacing between two adjacent masts shall not be less than 20 metre.

Lightning conductor shall be of 25 x 6 mm GS strip when used above ground level. It shall be connected through test link with earth electrode/earthing system.

The Bidder shall furnish the details including typical arrangement drawings for the lightning protection system offered.

Down conductor shall not be connected to other earthing conductors above ground level. The size of down conductor of each mast shall not be lower than 65 x 8 mm. Each down conductor shall be effectively connected to independent earthing pit.

Each down conductor shall be provided with a test link at 1000 mm above ground level for testing.

All joints in the down conductors shall be of welded type.

Down conductors shall be cleated on outer side of building wall, at 750 mm interval or welded to outside building columns at 1000 mm interval.

Lightning conductor on roof shall not be directly cleated on surface. Supporting blocks of PCC/insulating material shall be used for conductor fixing.

All metallic structures within a vicinity of two meters of the conductors shall be bonded to conductors of lightning protection system.

The lightning protection system shall not be through cables, conduits and metal enclosures of electrical equipment.

Lightning conductors shall not pass through or run inside GI Conduits.

Testing link shall be made of galvanised steel of size 25 x 6 mm.

SPECIFICATION FOR CENTRALISED WELDING SYSTEM**1. General**

Centralised welding circuit comprising two nos. transformer welding sets shall be envisaged for proposed plant .

From these welding sets the welding circuit shall be fed in such a way that, the power for welding shall be available immediately after inserting the plug to the socket outlet with 50 metres length of extra welding cable. The Welding system shall be provided on each floor of the plant , switchgear room and control room of the sub-station building. The Bidder shall give the quantity, location and specification of the socket cum switch in the offer. The location of socket shall be such as to facilitate welding at any point in the plant .

The welding circuit shall have suitable metallic socket connection at suitable intervals to cover the complete area for which it is to be provided. While designing the welding circuits necessary consideration shall be taken to avoid voltage drop.

The system shall comprise of 2 nos. welding machines, PVC cable of suitable size in form of ring main for power and 75 mm x 6 mm MS Flat in form of earth bus around the area for which it is installed. The system shall have adequate nos. socket outlet of adequate capacity for direct connection of welding cable through plugs. Earthing connection of welding machine shall be connected to the earth ring main through insulated cable to avoid flow of welding current through structures, foundation bolts etc. Size of earth bus is tentative and subject to change during detail design stage.

The welding sets shall be complete with accessories like electrode and ground cables, electrode holder, earthing clamps, leather hand gloves and face shield with lens. The welding sets shall be located in welding transformer room of 2 x 3x 3 m .

2. Transformer welding set

Air cooled, aluminium wound arc welding transformers shall be envisaged for welding system of the plant . The transformers shall be suitable for $415\text{ V} \pm 10\%$, 3 phase, 50 Hz AC supply system. The transformers shall be designed for output of approximate 80 Amps to 450 Amps at 80 volt open circuit and 180 Amps to 350 Amps at 100 volt open circuit covering an electrode range from 2.5 mm to 6 mm. However, the exact values of the range should be quoted by the Bidder in the offer. The welding set shall be provided with a current selector plate and a cable reel for winding up the welding cable when not in use. Provision shall be made for easy lifting of the welding sets.

ANNEXURE - ES-13**SPECIFICATION FOR CAPACITOR BANKS****1.0 SCOPE**

- 1.1 This specification covers requirements for 415 V shunt capacitor banks suitable for indoor installation.
- 1.2 The capacitor banks shall comply with the latest version of IS: 2834 and IEC-831-1 & 831-2 except where modified or extended by the provision of this specification and with the relevant parts of standards mentioned in clause 2.0.

2.0 OTHER RELEVANT STANDARDS

The other relevant Indian Standards are as under:

IS : 12672 Internal fuses and internal over pressure disconnectors for shunt capacitors

IS : 9046 A.C. contactors of voltages above 1000 V up to and including 11000V

IS : 13118 General requirements for circuit breakers for voltages above 1000V

IS : 9920 Switches and switch isolators for voltages above 1000 V

IS : 13947 L.V. switch gear and control gear (Part 4 section 1- contactors)

IS : 13947 L.V. switch gear and control gear (Part 3 - switches)

IS : 13947 L.V. switch gear and control gear (Part 2 - circuit breakers)

IS : 9402 High voltage fuses for the external protection of shunt capacitors

IS : 13703 L.V. Fuses for voltages not exceeding 1000V A.C.

IS : 3043 Code of practice for earthing

3.0 DESIGN

The capacitor units shall be designed for the following :

- (a) Watt losses between 0.2 to 0.5 W per kVAR
- (b) Temperature withstand category of 55⁰ C
- (c) Output (kVAR) tolerance not exceeding 10 %
- (d) Capacitor - fuse co-ordination to reduce risk of tank rupture
- (e) Use of bio degradable eco friendly dielectric compound
- (f) Switching life not less than 60,000 operations

4.0 CONSTRUCTION

- 4.1 The basic units shall be made of dielectric compound polypropylene film impregnated with non-PCB bio-degradable liquid. Foil shall be preferred over paper for better heat dissipation and lower operating temperature.
- 4.2 The basic units shall be insulated for power frequency withstand voltages.
- 4.3 The basic units shall be provided with protection against sustained overload, earth fault and voltage/current unbalance, self healing type pressure sensitive detector for sensing excessive internal pressure, pressure activated tripper switch for tripping, discharge resistors and automatic power factor correction relay.
- 4.4 Each unit shall be supplied in a M.S. container with enamel paint finish.
- 4.5 Each element of capacitor unit shall have its own built in special fuse. In case of fault in an element, the over voltage on the remaining elements shall not exceed 10%. Internal discharge resistance shall be provided to limit the residual voltage to less than 50 volt as per relevant standard.

- 4.6 The capacitor banks shall be designed to withstand electro-dynamic and thermal stresses caused by transient over currents during switching.
- 4.7 To eliminate unduly frequent switching when peak load of short duration occur, a time relay shall be provided.
- 4.8 Zero voltage relay shall be provided to reset the control devices to their neutral position, so that on restoration of supply after any supply interruption, the capacitor stages are switched on again without any undesirable current and voltage peak.

5.0 **PERFORMANCE**

- 5.1 The unit shall deliver rated output within the limits of watt losses indicated in clause 3.0 without over heating within the limits of ambient temperature indicated in clause 2.1.6.
- 5.2 The Capacitor Banks shall be grouped in different kVAR rating, which shall be switched ON/OFF as required according to load connected. For this purpose capacitor kVAR shall be subdivided into a number of regulating stages. The regulating stages shall be switched ON/OFF by means of suitable relay to ensure the system power factor to 0.98 lagging. To eliminate unduly frequent switching when peak load of short duration occur a time delay relay shall be incorporated for stage to stage switching. In case of supply interruption a NO volt relay shall set the control devices to their neutral position. The tenderer shall also provide necessary reactive power relay, No volt relay, control devices and switching devices mounted separately in a dust tight vermin proof sheet metal enclosed cubicle suitable for floor mounting. This cubicle shall also be provided with other devices, such as, current and voltage transformer, protective relays, voltmeter, ammeter with selector switch, auxiliary relay etc., which are essential for automatic switching of capacitor banks.

All internal wiring for control sensing instruments, relays etc. shall be done with 650V grade, PVC insulated copper conductor of size not less than 2.5 mm². The capacitor bank shall be rated for continuous operation and shall be suitable for indoor installation.

The Bidder shall indicate the level of improved power factor in the offer.

ANNEXURE – I**TECHNICAL SPECIFICATION**

1.	Applicable Standard	:	IS : 2834
2.	System	:	415 V, 3 phase 50 Hz solid earthed system
3.	Location	:	Indoor
4.	No. of phases	:	Three
5.	Connection	:	Star / Delta
6.	Output kVAR	:	As required
7.	Insulation level	:	3 kV for One minute
8.	Overload	:	1.3 times rated current continuously
9.	Losses	:	Less or equal to 0.5 W / kVAR
10.	Output tolerance	:	10 % (Max)
11.	Inrush Current	:	Not exceeding 100 times rated current
12.	Peripherals to be supplied	:	Discharge resistors, HRC Fuse, Racks, Isolators
13.	Accessories	:	Control Panel with Automatic P.F. Correction relay
14.	Discharge device	:	Discharge Resistor
15.	Container	:	MS Sheet at least 3 mm thick

ANNEXURE - ES-14**SPECIFICATION FOR MISCELLANEOUS ITEMS**

The following general requirements shall be applicable to all the miscellaneous items furnished under these specifications.

1. Emergency Power Supply

For emergency power supply the following shall be provided :

- a) Air cooled type generator.
- b) Auto-cum-Manual starting of generator in case of power failure.
- c) Separate wiring should be provided from generator to strategic locations.
- d) Additional emergency lights shall be provided to other locations as per direction of site engineer, if felt necessary, within the maximum load of 5 kW.
- e) Inverter emergency lights shall be provided in the switch room and control room.
- f) For emergency light, minimum requirement of illumination level shall be 10 Lux. However, actual requirement shall be worked out by bidder.

2. Pressurisation and Air conditioning

The switch room of the plant shall be pressurised from inside to prevent dust entry with conditioning of inlet air (no. of air changes not less than 15) and humidity shall be controlled to ensure proper working of equipment and operating personnel inside the room. Requisite number of exhaust fans and ceiling fans shall be provided in rooms to ensure proper working conditions for equipment and personnel in the rooms in case of failure of pressurization.

The control room shall be air conditioned using required numbers of split type air conditioners of adequate capacity.

3. FIRE FIGHTING SYSTEM :

The switch room and all strategic points of the plant shall be provided with fire fighting equipment of the following class:

- | | |
|-----------------------|------------|
| Class B (Foam type) | : IS : 933 |
| Class A (Soda Acid) | : IS : 934 |
| Class BC (Dry Powder) | : IS : 933 |

The equipment shall be portable, wall mounted with refilling and recharging facility from time to time.

4. MISCELLANEOUS:**4.1 Painting:**

All electrical equipment should be painted as per relevant code in accordance with respective manufacturer's standard practice.

4.2 Standards:

The electrical equipment included in this tender shall comply with relevant IS specifications and IS code of practice. In the absence of IS, BS, any other standard of repute shall be followed.

4.3 Tests:

The offer shall include all test certificates as required by ISS and Indian Electricity Rules.

4.4 Tools & Tackles:

Tenderers shall quote separate price for standard tools and tackles required for maintenance of the electrical equipment. This shall also include the necessary measuring instruments, rubber mats & gloves etc.

4.5 Fitting & Spares:

All standard fittings should be provided. The tenderer shall quote item-wise unit price for spare parts.

4.6 Technical Particulars:

The supplier shall furnish the technical particulars duly filled as given elsewhere.

4.7 Guarantee:

All the supplies should be guaranteed for a period of one year from the date of installation and commissioning.

4.8 Deviations:

Deviations if any, from these specifications shall be clearly indicated in the offer.

5. Completeness of Offer:

The details given in the write-up / specifications (including drawings) in respect of electrical system / equipment are indicative, not exhaustive. The electrical system/equipment shall co-ordinate with mechanical system/equipment of the plant.

If any electrical component or equipment with associated wiring is considered necessary and desirable as per Indian Electricity Rules amended up to date or if the same is considered necessary and desirable to comply with the up-to-date engineering practices or with various Indian codes of Practices issued by the I.S.I. New Delhi from time to time the same shall be deemed to be a requirement of this

tender specifications and same should consequently included in the offer notwithstanding the fact that such requirements are not clearly or specifically indicated in these specifications along with the associated drawings.

All the equipment attachments, required for the execution of works as per scope of work as envisaged in the document shall be designed, fabricated erected and maintained for efficient and satisfactory performance, and the bidder shall be solely responsible for the same and the same shall be deemed to be within the scope of the offer/work whether specifically mentioned or not in these documents and the bidder shall not be eligible for any extra claim on this issue.

SUB-SECTION-7.5.1

DATA SHEET : MECHANICAL

**SUB-SECTION-7.5.1
(MECHANICAL)****DETAILS REQUIRED WITH THE OFFER**

The offer must be complete with the following details for correct appreciation of the proposal. The offers will be treated as incomplete and may be passed over if the data as asked for, are not submitted along with the offer.

1.0 General

- a) Plant description as envisaged.
- b) System drawings of the plant.
- c) Scope of supply.
- d) List of spares forming part of scope of supply.
- e) Equipment specifications.
- f) Deviations from the NIT, if any.
- g) Manufacturer's printed pamphlet
- h) Any additional alternative provisions.

2.0 Mechanical**2.1 Loading hopper**

- a) Size of hopper
- b) Height of hopper roof top from rail top (M)
- c) Struck volume of hopper (Cu.M.)
- d) Hopper side slopes (Degrees)

2.2 Level Indicators

- a) Type of level indicators provided
- b) Number of level sensors

2.3 LOAD –OUT SYSTEM**2.3.1 Hopper Outlet Gates :**

- a) Type of Gates
- b) Number of Gates
- c) Opening size of gates
- d) Number of hydraulic cylinders used for each gate operation

2.3.2 Pre-Weigh Hopper :

- a) Useful volume (Cu.m.)
- b) Angle of sloping sides (Degree)

2.3.3 Flood Loading System :

- a) Type of gate
- b) Opening size of gate
- c) Number of hydraulic cylinders used for gate operation

2.3.4 Swing chute:

- a) Inside opening of the swing Chute
- b) Minimum height of Roll away chute from Rail Top (M)
- c) Drive system.

2.3.5 Hydraulic system**2.3.5.1 Hydraulic Power Pack**

- a) Number of hydraulic power pack
- b) Reservoir capacity (Litres)
- c) Drive motor power

- 2.3.5.2 **Hydraulic Accumulator :**
 - a) Type of accumulator
 - b) Volume of hydraulic accumulator
- 2.3.5.3 **Hydraulic Cylinders :**
 - a) Bore and stroke of hydraulic cylinders (mm)
 - b) Operating pressure (BAR)
- 2.3.5.4 **Pre-weigh System Calibration :**
 - a) Type of calibration system
 - b) Number of calibration weights and denomination provided
- 2.4 **Dust control system**
 - a) Number of nozzles for each discharge chute
 - b) Consumptive water requirement for each nozzles (Cu.M./Hr.)
 - c) Operating pressure (BAR)
 - d) Total quantum of water required for dust suppression of discharge chutes (Cu.M./Hr.)
 - e) Number of pumps provided
 - f) Pump capacity (Water) (Cu.M/Hr.)
 - g) Drive motor power for the pumps (KW)
- 2.5 **Passenger lift**
 - a) Capacity – Number of persons
 - b) Freight capacity – Kgs.
 - c) Size of car platform
- 2.6 **Chain pulley block:**
 - a) Number chain pulley blocks provided
 - b) Lifting capacity (Te.)
 - c) Height of lift (Metres)
- 2.7 **Fire fighting system**
 - a) Type of Pump
 - b) Size of Pump
 - c) Motor Rating
 - d) Capacity
- 2.8 Fire detection system
 - a) Type
 - b) Make
 - c) System voltage
 - d) Compliance with standard
 - e) Approval obtained from

DATA TO BE FURNISHED BY THE BIDDER DURING DETAIL DESIGN STAGE

- 1.0 **Mechanical**
 - 1.1 **Hopper**
 - a) Inside dimension of hopper (M)
 - b) Height of hopper roof top from rail top (M)
 - c) Struck volume of hopper (Cu.M.)
 - d) Hopper side slopes (Degrees)
 - e) Construction material details
 - g) Thickness, grade and height of Carbon/ stainless steel liner (mm)
 - i) Any other relevant details.
 - 1.2 **Level Indicators**
 - a) Type of level indicators provided
 - b) Name of the manufacturer
 - c) Number of level sensors

- d) Type of control (Manual/automatic)
- e) Audio-visual alarms
- f) Level measuring device (Constructional/operational features)

1.3 **LOAD –OUT SYSTEM**

1.3.1 **Hopper Outlet Gates :**

- a) Type of Gates
- b) Number of Gates
- c) Opening size of gates
- d) Number of hydraulic cylinders used for each gate operation
- e) Minimum opening time of each gate (Seconds)
- f) Minimum closing time for each gate (Seconds)
- g) Hydraulic cylinder operating pressure (BAR)
- h) Loading time for complete filling of 60 Te. Capacity pre-weigh Hopper (Seconds)
- i) Numbers of Inter Locks and Signalling system provided (Explain)
- j) Make and any other relevant details including technical features.

1.3.2 **Pre-Weigh Hopper :**

- a) Struck volume (Cu.m.)
- b) Useful volume (Cu.m.)
- c) Angle of sloping sides (Degree)
- d) Thickness of steel plates used (mm)
- e) Type of liner material
- f) Thickness of liner material (mm)
- g) Load cell details, numbers, make and construction features.

1.3.3 **Flood Loading System :**

- a) Type of gate
- b) Opening size of gate
- c) Number of hydraulic cylinders used for gate operation
- d) Minimum opening time of each gate (seconds)
- e) Minimum closing time of each gate (seconds)
- f) Hydraulic cylinder operating pressure (BAR)
- g) Maximum closing force at above pressure (tonnes)
- h) Minimum discharge time for emptying out the pre-weigh hopper (seconds)
- i) No. of inter locks and signalling including positionar (Explain)

1.3.4 **Swing chute:**

- a) Inside opening of the swing chute
- b) Thickness of steel plates used (mm)
- c) Type of liner material
- d) Thickness of liner material (mm)
- e) Minimum height of Roll away chute from Rail Top (M)
- f) Maximum height of Roll away chute from Rail Top (M)
- g) Horizontal travel of Roll away chute(mm)
- h) Type of horizontal travel drive
- g) Type of material used for side skirt plate
- i) Width and thickness of skirt plate
- i) Drive system detail including interlocks and signalling.

1.3.5 **Hydraulic system**

1.3.5.1 **Hydraulic Power Pack**

- a) Number of hydraulic power pack
- b) Name of manufacturer
- c) Reservoir capacity (Litres)
- d) Type of hydraulic pump

- e) Pump capacity (Litres/Min.)
- f) Oil flow (Litres/Min.)
- g) Operating pressure (BAR)
- h) Test pressure (BAR)
- i) Type of filter
- j) Filtration (Microns)
- k) Type of the hydraulic oil
- m) Approx. life of hydraulic oil
- n) Type of gauges provided
- o) Drive motor power
- p) Complete hydraulic circuit
- q) Constructional and operational features.
- 1.3.5.2 **Hydraulic Accumulator**
 - a) Type of accumulator
 - b) Volume of hydraulic accumulator
 - c) Description of accumulator operating system and other constructional detail
 - d) Make
- 1.3.5.3 **Hydraulic Cylinders**
 - a) Bore and stroke of hydraulic cylinders (mm)
 - b) Operating pressure (BAR)
 - c) Test pressure (BAR)
 - d) Material of construction
 - e) Make
- 1.3.5.4 **Pre-weigh System Calibration**
 - a) Type of calibration system
 - b) Calibration weights (Te.)
 - c) Number of calibration weights and denomination provided
 - d) Description of the calibration system
 - e) Make
- 1.4 **Dust Control Between Hopper Outlet Gates & Pre-weigh Hopper**
 - a) Type of dust control arrangement
 - b) Scheme for disposal of coal laden air
 - c) Flexible cover duct provided (if any)
 - d) Constructional and operational detail
 - e) Make
- 1.5 **Dust Control during Wagon Loading**
 - a) Number of nozzles for each loading point
 - b) Consumptive water requirement for each nozzle (Cu.M./Hr.)
 - c) Operating pressure (BAR)
 - d) Nozzle Orifice diameter (MM)
 - e) Material of construction of nozzles
 - f) Name of manufacturer of nozzles
 - g) Total quantum of water required for dust suppression (Cu.M./Hr.)
 - h) Number of pumps required
 - i) Pump capacity (water) (Cu.M./Hr.)
 - j) Terminal head (M)
 - k) Termination head (M)
 - l) Drive motor power for pumps (KW)
 - m) Pump details including make
- 1.6 **Passenger lift**
 - a) Name of the manufacturer
 - b) Capacity – Number of persons

- c) Freight capacity – Kgs.
- d) Speed of the lift (m./sec.)
- e) Travel (Metres)
- f) Number of floor served
- g) Location of machine room
- h) Location of counter weight
- i) Size of car platform
- j) Type and size of car door
- k) Type and size of landing door
- m) Construction feature of car body
- n) Type of locking devices for landing doors
- o) Type of indicators provided
- p) Rope construction details including size and make
- q) Drive motor power

1.7 **Chain pulley block**

- a) Number of electric hoists and chain pulley blocks provided
- b) Location of chain pulley blocks
- d) Lifting capacity (Te.)
- e) Height of lift (Metres)
- f) Type of structural support
- g) Make and Maker's illustration pamphlets

1.8 **Fire fighting system**

- a) Make
- b) Type
- c) Constructional features
- d) Pump capacity recommended (Cu.M./Hr.)
- e) Drive motor power for pump (KW)
- f) System description
- g) Any other relevant details.

1.9 **Dust Suppression System** (Details as per location wise shall be given)

- a) A line diagram of the suppression arrangement (showing location of nozzles, pumps and layout of pipeline from reservoir to various distribution zone).
- b) Details of piping, fittings, pumps and nozzles. The material construction for nozzles, pipes and reservoirs.
- c) The details of water storage tanks used. Pressure and quantity of water required for nozzle.
- f) Illustrative literature for dust suppression plant in general.
- g) Make of different items like pumps, fittings, nozzles, pipes etc.

2.0 **Electric Motors** (Details as per location wise shall be given)

Note: The tenderer shall furnish the complete details for all the drive motors. :

- a) Maker's name.
- b) Standard to which the motor conforms.
- c) Equipment driven by motor.
- d) Motor type.
- e) Type of duty.

- f) Type of enclosure and mounting.
- g) Method of cooling.
- h) Standard continuous rating. kW.
- i) Rated speed at rated voltage and frequency, rpm
- j) Permissible variation of
 - i) Voltage. Volts
 - ii) Frequency, Hz
(Not less than asked for in the specification)
- k) Minimum permissible starting voltage*, volts.
(*Not less than asked for in the specification.)
- l) Full load and no load current at rated voltage and frequency.
- m) Power factor at 100%, 75% and no load Efficiency of motor at design duty point. (100%, 75% and 50% load at rated voltage and frequency).
- n) Starting current at 100%, 85% and 80% voltage.
- o) Torque (kg-m) at starting, rated load, pull up and pull out.
- p) Stator winding insulation
 - i) Class and type
 - ii) Whether tropicalised.
 - iii) Temp. rise over specified ambient of 50°C.
- q) Stator winding connection and resistance per phase.
- r) Number of stator terminals brought out.
- s) Starting time with minimum permissible voltage of.. % of rated voltage.
 - i) without driven equipment coupled
 - ii) with driven equipment coupled.
- u) Type of terminal box for space heater, temperature detector, instrument switches, cable connection etc.
- v) Space heaters
 - i) Maker's name and type
 - ii) Number
 - iii) Location
 - iv) Rated voltage
 - v) Rated power
 - vi) Whether thermostat provided.
- w) Bearings
 - i) Type of bearing at driving end.
 - ii) Type of bearing at non-driving end.
 - iii) Maker's name.
 - iv) Recommended lubricant.
- x) Type of construction of rotor.
- y) Weight of motor stator, rotor and total, weight.
- z) Main terminal box

- i) Location
 - ii) Entry of cables.
 - iii) Recommended cable size
 - iv) Fault level
 - aa) Temperature detector for stator winding and bearing
 - Numbers provided
 - ii) Location and maker's name
 - iii) Resistance – Value.
 - bb) Whether indication for winding and bearing temperatures have been carried over to the control desk.
 - cc) Temperature switch for bearings.
 - i) Type and make
 - ii) Accuracy and range
 - iii) Connection type and size
 - dd) Characteristics curves
 - i) Torque speed characteristics
 - ii) Time Vs starting current
 - iii) Thermal withstand curves
 - ee) Technical literatures
- 2.1 Fire detection system
- 2.1.1 Multisensing detectors having both optical and and heat sensing
- a) Type
 - b) Make
 - c) System voltage
 - d) Compliance with standards
 - e) Approval obtained from
 - f) Firm/Laboratory with whom detector is listed
 - g) Sensitivity
 - h) Sensitivity adjustment range
 - i) Detector circuit wiring formation
- 2.1.2 Electronic hooters
- a) Type
 - b) Make
 - c) System voltage
 - d) Compliance with standards
 - e) Year of manufacture
- 2.1.3 Manual call points
- a) Type
 - b) Make
 - c) System voltage
 - d) Compliance with standards
 - e) Approval obtained from
 - f) Firm/Laboratory with whom detector/MCP is listed
 - g) Sensitivity
 - h) Sensitivity adjustment range

i) Equipment circuit wiring formation

2.1.4 Response Indicators

- a) Type
- b) Make
- c) System voltage
- d) Compliance with standards
- e) Year of manufacture

2.1.5 FRLS PVC insulated cables

- a) Type/Size
- b) Make
- c) Rated voltage and Frequency
- d) Compliance with standards
- e) Type of insulation
- f) Type of armouring
- g) Rated current
- h) Sensitivity adjustment range
- i) Year of manufacture

2.1.6 Fire alarm control panel

- a) Type
- b) Make
- c) System voltage
- d) Compliance with standards
- e) Facility provided
- f) Year of manufacture
- g) Approval obtained from
- h) Firm/Laboratory with whom the panel is listed

SUB-SECTION-7.5.2

DATA SHEET : ELECTRICAL

TECHNICAL INFORMATION TO BE SUPPLIED BY THE BIDDER - ELECTRICAL (SUB-SECTION 7.5.2)

- 1.0 The Bidders are required to furnish broad parameters pertaining to the equipments as given in **clause no. 1.3** along with their offers failing which their offer may be treated as incomplete and passed over. However, all the necessary information as given in **clause no. 1.4** as may be required in respect of electrical system in terms of specific requirements given in tender document and also as per their tender specifications suiting to the Purchaser's specific requirement are required to be furnished during detail engineering stage. These information inter-alia shall include the following:

1.1 System Description :

Detail description of the Electrical supply, distribution and control system including earthing system indicating various functions and facilities being furnished shall be elaborated. The details provided shall be in line with the technical requirements of the supply system as elaborated in the tender document elsewhere.

1.2 Scope of Work :

The tenderers are required to indicate their scope of work under the tender in clear terms.

1.3 Equipment Details (To be submitted along-with the Bid):

In respect of all the electrical/electronics equipment the Bidders shall have to furnish broad technical details covering make, type, size, quantity, performance, parameters, specific technical features etc. In particular the following equipment wise information shall be furnished :

1.3.1 MOTOR CONTROL CENTRE (MCC) :

- | | |
|--|---|
| 1) Type (Single/Double front) | : |
| 2) Fault level | : |
| 3) Material of the busbars | : |
| 4) Whether fully drawout type or otherwise | : |
| 5) Make of MCC | : |

1.3.2 CONTROL CONSOLE :

- | | |
|--|---|
| 1) Type of control (Electromechanical /Solid :
State/Micro-processor based) | : |
| 2) Make of Control equipment/System | : |
| 3) Whether with audio visual annunciation or not | : |

1.3.3 MOULDED CASE CIRCUIT BREAKER :

- | | |
|---------------------------|---|
| 1) Make | : |
| 2) Rated Voltage | : |
| 3) Highest System Voltage | : |
| 4) No. of Poles | : |

- 5) Frequency :
- 6) Rated Current at Standard Ambient Temp. :
- 7) Symmetrical Breaking Capacity :
- 8) Type (Drawout/Non-drawout) :
- 9) Type of protection envisaged :
- 10) **Interrupter** :
- a) Interrupter type :
- b) Make :
- 11) **Operating Mechanism** :
- a) Type :
- b) Trip free or fixed trip :
- k) Protection provided (Overload/Earth :
leakage/instantaneous/ undervoltage etc.) :
- 12) IS Code No :
- 13) **Panel** :
- a) Fault withstand capacity - 1 sec. :
- b) Cable entry :
- c) Bus duct :
- d) Type of front :
- e) Sheet steel thickness :
- n) Indications on panel :
- o) Meters on panel :
- p) IS Code No & protection of enclosure :
- q) Details of any other additional :
facility/instruments/protection provided over and
above those mentioned :

1.3.4 Switch fuse unit :

- a) Make :
- b) **Fuses** :
 - i) Make :
 - ii) Type (HRC) :
- c) IS Code No & protection of enclosure :

1.3.5 MINIATURE/RESIDUAL CURRENT CIRCUIT BREAKERS AND DISTRIBUTION BOARDS :

- 1) Type :
- 2) Nominal System Voltage :
- 3) Highest System Voltage :
- 4) Frequency :
- 5) Symmetrical Breaking Capacity :
- 6) Type of protection envisaged (Overload/ :
Instantaneous/Earth leakage etc.) :
- 7) Mounting :
- 8) Padlocking facility :
- 9) Standards to conform :
- 10) Make :

1.3.6 MOTORS (LT & Single phase) :

- 1) Type of Motors :
- 2) Degree of protection envisaged for motors :
- 3) Standards to which motors conform to :
- 4) Insulation Class :
- 5) Make of the Motors :
- 6) Type & Make of Relays to be provided for the protection of the motors :

1.3.7 TRANSFORMERS :

- 1) Name of the Manufacturer :
- 2) Service :
- 3) Rating :
 - a) Rated KVA :
 - b) Rated Voltage of HV :
 - c) Rated Voltage of LV :
- 4) Number of phases :
- 5) Vector group reference :
- 6) Tappings :
- 7) **Terminal Arrangement** :
 - a) High Voltage :
 - b) Low voltage :
- 8) Reference standard :

1.3.7.1 DETAILS OF OFF-LOAD TAP CHANGING GEAR

- 1) Make :
- 2) Type :
- 3) Rating :
 - a) Rated Voltage :
 - b) Rated current :
 - c) Step voltage :
 - d) Number of steps :

1.3.8 LIGHTING :

- 1) Type of Luminaries :
- 2) Type of enclosure for outdoor lighting :
- 3) Type of Flameproof enclosure :
- 4) Make of Luminaries :

1.3.9 SWITCHBOARDS FOR LIGHTING CIRCUITS :

- 1) Rated Voltage :
- 2) Top cover of the board :

1.3.10 EARTHING :

- 1) Type of material of down conductors :

- 2) Type & material of earth conductors :
- 3) Type & Material of earth electrodes :
- 4) Whether separate earthing has been considered for lightning protection or not :

1.3.11 C A B L E S :

- 1) Type of power cables with Voltage grades :
- 2) Type of lighting cables with voltage grades :
- 3) Type of control cables with voltage grades :
- 4) Make of Power Cables :
- 5) Make of Lighting Cables :
- 6) Make of Control Cables :

1.3.12 WELDING SYSTEM

- 1) Type :
- 2) Make :
- 3) No. of welding sets :
 - a) Motor Generator sets :
 - b) Transformer welding sets :
- 4) Current range :
- 5) Corresponding voltage :

1.3.13 CENTRALISED REMOTE & SEQUENCE CONTROL**I. Control Desk, Annunciation Panels, Local Control Station****I.1 Control Desk**

- 1) Make :
- 2) Standard to which conforms :
- 3) Type of enclosure :
- 4) Control switch : Make & Type :
- 5) Push button : Make & Type :
- 6) Ammeter/Voltmeter Selector switch : Make & Type :
- 7) Lamps : Make & Type :
- 8) i) Space Heaters : Make & Type :
- ii) Whether thermostat provided :
- 9) i) Terminal Blocks : Make & Type :
- ii) Whether 20% spare terminals provided :
- 10) Instruments & Meters : Make & Type :

I.2 Programmable Logic Controller

- A) Central Processing Unit (CPU) subsystem comprising Power supply, Processor & Memory :
- B) Input/Output sub system
- C) Console sub system
 - i) Operator station (Nos.) :
 - ii) Programming station (Nos.) :
 - iii) Personal computer with printer (Nos.) :
- D) Communication sub system
- E) Software Packages
- F) UPS system with cabinet :
- G) Computer mimic & VDU :
- H) Laptop computer : Quantity & Configuration :
- I) Panels/Cabinets
 - i) Enclosure protection class :
 - ii) Internal wiring : size, type :
 - iii) Illumination of panels : features :

II. LOCAL CONTROL STATION

- 1) Make :
- 2) Type :
- 3) Standard to which conforms :
- 4) Degree of enclosure protection :
- 5) Facilities provided :

1.3.14 INVERTER SET FOR EMEGENCY LIGHTS

- 1) Type :
- 2) Make :

- 3) Rated kVA :
- 4) Rated Voltage, Volts :
- 5) No. of phases :
- 6) Frequency :
- 7) Current in Amps :
- 8) Whether automatic switching on facility provided in :
case of power failure

1.3.15 PRESSURISATION & AIR CONDITIONING

- A) **Pressurisation** :
 - 1) Make :
 - 2) Other details :
- B) **Air Conditioning** :
 - 1) Make :
 - 2) Type :
 - 3) Other details :

1.3.16 CAPACITOR BANK (415 V)

- 1) Installation :
- 2) Rated Voltage :
- 3) Frequency :
- 4) Phases :
- 5) Maximum service voltage :
- 6) Rated output :
- 7) Operation (Automatic/Manual) :
- 8) Protections :
- 9) Standards :
- 10) Make :

1.4 **Equipment Details (To be furnished along-with detail design during execution):**

In respect of all the electrical/electronics equipment the Bidders shall have to furnish their full technical details covering make, type, size, quantity, performance, parameters, specific technical features, descriptive pamphlets, past experience of equipment and place of installation, Civil/Structural specification etc. In particular the following equipment wise details shall be furnished :

1.4.1 **MOTOR CONTROL CENTRE (MCC) :**

- 1) Type (Single/Double front) :
- 2) Fault level :
- 3) Capacity of Horizontal busbars :
- 4) Capacity of Vertical busbars :
- 5) Size of Horizontal busbars :
- 6) Size of Vertical busbars :
- 7) Material of the busbars :
- 8) Size of the MCC :
- a) Length :
- b) Breadth :
- c) Height :
- 9) Whether fully drawout type or otherwise :
- 10) Number of feeders in MCC :
- 11) Make of MCC :
- 12) Material for Male & Female part of power contacts :
- 13) Material of control contacts :
- 14) Material for Anti-Tracking Barriers :
- 15) Material for busbar shrouding :
- 16) Rating of control contacts :
- 17) Number of spare feeders (cubicles) with rating :

1.4.2 **CONTROL CONSOLE :**

- 1) Type of control (Electromechanical /Solid State/Micro-processor based) :
- 2) Colour code of Push Buttons :
- 3) Colour code of Indication Lamps :
- 4) Make of Control equipment/System :
- 5) Size of control desk :
- 6) Whether with audio visual annunciation or not :

1.4.3 **MOULDED CASE CIRCUIT BREAKER :**

- 1) Make :
- 2) Rated Voltage :
- 3) Highest System Voltage :
- 4) No. of Poles :
- 5) Frequency :
- 6) Rated Current at Standard Ambient Temp. :
- 7) Symmetrical Breaking Capacity :

-
- 8) Making Capacity :
 - 9) Short time current for 1 Sec. :
 - 10) CPRI Certificate number :
 - 11) Impulse withstand voltage std.1.2/50 micro sec. :
wave :
 - 12) Power frequency withstand voltage for 1 minute :
 - 13) Opening time :
 - 14) Type (Drawout/Non-drawout) :
 - 15) Type of protection envisaged :
 - 16) Maximum frequency of operation per hour :
 - 17) Mechanical life :
 - 18) Weight :
 - 19) Type of releases envisaged :
 - 20) **Interrupter** :
 - a) Interrupter type :
 - b) Make :
 - c) Contact stroke :
 - d) Type of contacts :
 - e) Material of main contact :
 - f) Arcing contacts :
 - g) Shelf time :
 - h) Contact life :
 - i) at No load :
 - ii) at Normal current (up to rated current) :
 - iii) at Symmetrical short circuit current :
 - 21) **Operating Mechanism** :
 - a) Type :
 - b) Trip free or fixed trip :
 - c) Charging time for motorised mech. :
 - d) Coil Voltage (Closing coil/Shunt trip coil) :
 - e) Trip/Close coil power :
 - f) Motor operating voltage :
 - g) Power required by charging motor :
 - h) Designed to close and latch or fitted with make :
current release :
 - i) Auxiliary contact :
 - i) No. of auxiliary contacts No + NC :
 - ii) Breaking Capacity of auxiliary contacts :
 - iii) Type :
 - j) Mechanical operation counter :
 - k) Protection provided (Overload/Earth :
leakage/instantaneous/ undervoltage etc.) :
 - 22) IS Code No :
 - 23) **Panel** :
 - a) Typical Dimensions L x B x H :
 - b) Approx. weight :
 - c) Sheet steel thickness :
 - d) Test position :
 - e) Bus bar system :
 - f) Horizontal bus :
 - g) Vertical bus :
 - h) Fault withstand capacity - 1 sec. :
-

- i) Cable entry :
- j) Bus duct :
- k) Type of front :
- l) Sheet steel thickness :
- m) Test position :
- n) Indications on panel :
- o) Meters on panel :
- p) IS Code No & protection of enclosure :
- q) Details of any other additional facility/instruments/protection provided over and above those mentioned :

1.4.4 Switch fuse unit :

- a) Make :
- i) Location :
- ii) Quantity :
- iii) Rated Current :
- iv) Rated Voltage :
- v) Short time rating :
- b) **Fuses** :
 - i) Make :
 - ii) Type (HRC) :
 - iii) Rated Current :
 - iv) Quantity (Current rating wise) :
 - v) Rupturing capacity :
 - vi) Rated Voltage :
 - vii) Current carrying capacity for 0.12 sec & 1 sec. :
- c) Dimensions of switch fuse unit :
- d) Weight of switch fuse unit :
- e) IS Code No & protection of enclosure :

1.4.5 MOULDED CASE CIRCUIT BREAKER IN FIXED EXECUTION :

- 1) Make :
- 2) Rated Voltage :
- 3) Highest System Voltage :
- 4) No. of Poles :
- 5) Frequency :
- 6) Rated Current at Standard Ambient Temperature :
- 7) Symmetrical Breaking Capacity :
- 8) Making Capacity :
- 9) Short time current for 1 Sec. :
- 10) Power frequency withstand voltage for 1 minute :
- 11) Approx. weight :
- 12) Typical Dimensions L x B x H :

1.4.6 MINIATURE/RESIDUAL CURRENT CIRCUIT BREAKERS AND DISTRIBUTION BOARDS :

- 1) Type :
- 2) Nominal System Voltage :

- 3) Highest System Voltage :
- 4) No. of Poles + N for Incoming :
- 5) Frequency :
- 6) Normal Current Rating of circuit breaker at Standard Ambient :
- 7) Symmetrical Breaking Capacity :
- 8) Short time current for 1 Sec. :
- 9) Power frequency withstand voltage for 1 minute :
- 10) Approx. weight :
- 11) Typical Dimensions L x B x H of Distribution Board :
- 12) Number of Outgoings TP + N :
- 13) Number of Outgoings SP + N :
- 14) Type of protection envisaged (Overload/ Instantaneous/Earth leakage etc.) :
- 15) Earth leakage current for tripping in mA :
- 16) Bus Rating :
- 17) Mounting :
- 18) Array of Breakers :
- 19) Padlocking facility :
- 20) Body earthing screw :
- 21) Cable termination arrangement :
- 22) Mechanical life :
- 23) Standards to conform :
- 24) Make :

1.4.7.1 MOTORS (LT)

- 1) Type of Motors :
- 2) Degree of protection envisaged for motors :
- 3) Number of 3 phase LT Motors :
- 4) Standards to which motors conform to :
- 5) Insulation Class :
- 6) Make of the Motors :
- 7) Type & Make of Relays to be provided for the protection of the motors :
- 8) No. of Starts i) Cold, ii) Hot :

1.4.7.2 MOTORS (SINGLE PHASE)

- 1) Type of Motors :
- 2) Degree of protection envisaged for motors :
- 3) Number of single phase Motors :
- 4) Standards to which motors conform to :
- 5) Insulation Class :
- 6) Make of the Motors :
- 7) Type & Make of Relays to be provided for the protection of the motors :
- 8) No. of Starts i) Cold, ii) Hot :

1.4.8 TRANSFORMERS :

- 1) Name of the Manufacturer :
- 2) Service :
- 3) Rating :
- a) Rated KVA :
- b) Rated Voltage of HV :
- c) Rated Voltage of LV :
- d) Temperature rise in oil :
- e) Temperature rise by resistance of windings :
- 4) Number of phases :
- 5) **Connections** :
- a) High Voltage :
- b) Low Voltage :
- c) Vector group reference :
- 6) **Tappings** :
- High Voltage :
- 7) No-load loss at rated voltage & frequency :
- 8) Load loss at rated current & frequency at 75⁰ C. :
- 9) Impedance at rated current & frequency at 75⁰ C. :
- 10) Reactance at rated current & frequency :
- 11) **Efficiencies at 75⁰ C. at Unity Power Factor** :
- a) At full load :
- b) At 3/4 full load :
- c) At 1/2 full load :
- 12) **Regulation at full load at 75⁰C At U P F** :
- a) At Unity Power Factor :
- b) At 0.8 power factor lagging :
- 13) No-load current at rated voltage & frequency :
- 14) **Approx. weights** :
- a) Core & windings :
- b) Tank & fittings :
- c) Oil :
- d) Total weight :
- 15) Approximate capacity of oil :
- 16) **Approx. overall dimension** :
- a) Length :
- b) Breadth :
- c) Height :
- 17) **Terminal Arrangement** :
- a) High Voltage :
- b) Low voltage :
- 18) Reference standard :
- 19) Remarks :

1.4.8.1 ADDITIONAL TECHNICAL PARTICULARS

- 1) **Efficiencies at 75⁰C at 0.8 Power Factor lagging** :
- a) At full load :
- b) At 3/4 full load :
- c) At 1/2 full load :
- 2) Load at which maximum efficiency occurs :

- 3) Maximum efficiency :
- 4) Impulse level with 1/50 micro second :
- 5) **Type of windings** :
- a) High Voltage :
- b) Low Voltage :
- 6) **Insulation Material** :
- a) Turn insulation high voltage :
- b) Turn insulation Low voltage :
- c) Insulation core to low voltage :
- d) Insulation high voltage to low voltage :
- 7) **Clearances** :
- a) In oil :
- b) Out of oil :
- c) Minimum clearance high voltage to tank in oil :
- 8) **Details of Tank** :
- a) Approx. thickness of sides :
- b) Approx. thickness of bottom :
- c) Approx. thickness of cover :
- d) Approx. thickness of tube radiators :
- 9) Minimum clearance height for lifting core & windings from tank :
- 10) **Shipping Details** :
- a) Parts detached for transport :
- b) Approx. dimensions of largest package :
- i) Length :
- ii) Breadth :
- iii) Height :

1.4.8.2 DETAILS OF BUSHING

- 1) Type :
- 2) Momentary power frequency dry withstand voltage :
- 3) Visible power frequency discharge voltage :
- 4) One minute dry withstand power frequency voltage :
- 5) One minute withstand power frequency voltage :
- 6) Under oil flashover or puncture withstand power frequency voltage :
- 7) Full wave withstand impulse voltage :
- 8) Under oil flashover or puncture withstand impulse voltage :
- 9) Creeping distance in air :
- 10) Recommended gap setting :
- 11) Weight of assembled bushing :

1.4.8.3 DETAILS OF OFF-LOAD TAP CHANGING GEAR

- 1) Make :
- 2) Type :
- 3) Rating :
- a) Rated Voltage :

- b) Rated current :
- c) Step voltage :
- d) Number of steps :
- 4) Control :
- 5) Auxiliary supply details :
- 6) Voltage control :
- 7) Line drop compensation :
- 8) Parallel operation :
- 9) Protective devices :
- 10) Approx. over weight :
- 11) Approx. over dimensions :
- 12) Approx. over quantity of oil. :

1.4.9 LIGHTING :

- 1) Type of Luminaries in different locations :
- 2) Illumination Level (LUX) envisaged in different location giving reference of any standards, if any :
- 3) Watts corresponding to type of lamps :
- 4) Type of enclosure for outdoor lighting :
- 4) Type of Flameproof enclosure :
- 5) Make of Luminaries :
- 6) Approx. quantity of different type of luminaries :

1.4.10 SWITCHBOARDS FOR LIGHTING CIRCUITS :

- 1) Rated Voltage :
- 2) No of 5A double pole MCBs switches :
- 3) No of 5/15A , 3/5 pin sockets with 15A switches :
- 4) No of fan regulators (electronic) :
- 4) Rewirable fuse 5A with base :
- 5) Top cover of the board :
- 6) Switch board :
- 7) Internal wiring :
- 8) Mounting :
- 9) Earthing :

1.4.11 EARTHING :

- 1) No. of earth pits envisaged :
- 2) Type of material of down conductors :
- 3) Type & material of earth conductors :
- 4) Type & Material of earth electrodes :
- 5) Whether separate earthing has been considered for lightning protection or not :
- 6) Quantity of Material & Weight :

1.4.12 C A B L E S :

- 1) Type & size of power cables with Voltage grades :
- 2) Type & size of lighting cables with voltage grades :
- 3) Type & size of control cables with voltage grades :
- 4) Make of Power Cables :
- 5) Make of Lighting Cables :
- 6) Make of Control Cables :
- 7) Quantity (Size - wise) of power cable :
- 8) Quantity (size-wise) of Lighting Cable :
- 9) Quantity (size-wise) of control cables :

1.4.13 WELDING SYSTEM :

- 1) Type :
- 2) Make :
- 3) No. of welding sets :
- a) Motor Generator sets :
- b) Transformer welding sets :
- 4) Current range :
- 5) Corresponding voltage :
- 6) No. of output terminals/set :
- 7) Built-in protection for welding sets :
- 8) Type of protection for the operation :
- 9) Max. permissible temperature rise of the welding sets :
- 10) Continuous rating of MG Set :
- 11) Continuous rating of Transformer welding Set :

1.4.14 CENTRALISED REMOTE & SEQUENCE CONTROL

Control Desk, Annunciation Panels, Local Control Station

I.1 Control Desk

- 1) Whether General Arrangement drawing complete :
with all dimensions details furnished :
- 2) Make :
- 3) Standard to which conforms :
- 4) Mounting details :
- 5) Type of enclosure :
- 6) Thickness of sheet metal used for side walls, top & :
bottom covers, doors :
- 7) Paint shade :
- 8) Internal wiring :
- i) Voltage grade :
- ii) Insulation :
- iii) Conductor material :
- iv) Size of potential & control circuit :
- v) HV withstand rating of control wiring :
- vi) Colour code :
- 9) Control switch :

- | | |
|---|---|
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Contact rating | : |
| iv) Whether key interlock furnished | : |
| 10) Push button | : |
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Number of contacts provided | : |
| 11) Ammeter/Voltmeter Selector switch | : |
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Contact rating | : |
| 12) Lamps | : |
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Rated voltage, Volts | : |
| iv) Rated Power, Watts | : |
| 13) Space Heaters | : |
| i) Make & Type | : |
| ii) Rated voltage, Volts | : |
| iii) Rated Power, Watts | : |
| iv) Mounting details | : |
| v) Whether thermostat provided | : |
| 14) Terminal Blocks | : |
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Rated voltage, Volts | : |
| iv) Rated Current, Amps | : |
| v) Copper cable size | : |
| vi) Whether 20% spare terminals provided | : |
| 15) Instruments & Meters | : |
| i) Make & Type | : |
| ii) Standard to which conforms | : |
| iii) Range | : |
| iv) Rated voltage, Volts | : |
| v) Instrument accuracy class | : |
| vi) Mounting details | : |
| 16) Facilities provided on the control desk as per specification (List to be furnished) | : |

I.2 Annunciation on VDU

- | | |
|--|---|
| 1) Make | : |
| 2) Type of annunciation system | : |
| 3) Dimension | : |
| 4) Any other special feature | : |
| 5) Whether write-up with description of system furnished | : |

I.3 Programmable Logic Controller

- A) **Central Processing Unit (CPU)** subsystem :
 comprising Power supply, Processor & Memory
- a) Power supply :
- b) Processor :
- i) Word size :
- ii) Scan time :
- iii) I/O Scan time :
- iv) I/O Capacity :
- v) Transfer time :
- vi) Memory capacity :
- vii) System response :
- B) **Input/Output sub system**
- a) Chasis with power supply :
- b) I/O count & distribution (Inclusive of more than 10% spares) :
 i) Analog input (4 to 20 mA DC) :
 ii) Analog output (4 to 20 mA DC) :
 iii) Digital input (Potential free contacts) :
 iv) Digital output (Potential free contacts) :
- c) Type of I/O modules :
- d) Capacity per module :
 i) Analog input (4 to 20 mA DC) :
 ii) Analog output (4 to 20 mA DC) :
 iii) Digital input (Potential free contacts) :
 iv) Digital output (Potential free contacts) :
- e) Expansion chasis for housing I/O modules :
- f) CPU rack along with local I/Os :
- g) Remote I/O stations :
- h) I/O status indication :
- C) **Console sub system**
- a) Operator station (Nos. & function) :
- b) Programming station (Nos. & function) :
- c) Personal computer with printer (Nos. & function) :
- D) **Communication sub system**
- a) Between processor & I/O subsystem :
- b) Communication module (location and features) :
- c) Between Processor & console :
- d) Communication port in CPU (location and features) :
- e) Networking hardware :
 i) I/O bus cable :
 ii) Switching devices with ports :
 iii) Console bus cable :
 iv) For Communication between processor & each power analyzers & VFD for apron feeders if any :
 v) Necessary slave interfaces/protocols, if any :
- E) **Software Packages**
- a) For operator station & mimic station :
- b) For Programming station and laptop computer :
- F) **UPS system with cabinet** :

- G) **Computer , mimic & VDU** (Location & Features) :
- H) **Laptop computer** for reloading software in PLC/PC) : Quantity & Configuration :
- I) **Panels/Cabinets**
 - a) For housing CPU rack with local I/Os & Power : distribution accessories : features, quantity
 - b) For housing remote I/O racks & Power distribution : accessories : features, quantity
 - c) Fabrication material & cabinet finish :
 - d) Enclosure protection class :
 - e) Inside cable wiring : size, type :
 - f) Illumination of panels : features :

LOCAL CONTROL STATION

- 1) Make :
- 2) Type :
- 3) Standard to which conforms :
- 4) Degree of enclosure protection :
- 5) Material & thickness :
- 6) Facilities provided :
- 7) No. of regulating stages :
- 8) Provision of zero voltage relay :
- 9) Any other special features :
- 10) Details of automatic On/Off device :

1.4.15 INVERTER SET FOR EMEGENCY LIGHTS

- 1) Type :
- 2) Make :
- 3) Rated kVA :
- 4) Rated Voltage, Volts :
- 5) No. of phases :
- 6) Frequency :
- 7) Current in Amps :
- 8) Whether automatic switching on facility provided in : case of power failure

1.4.16 PRESSURISATION & AIR CONDITIONING

- A) **Pressurisation** :
- 1) Make :
- 2) Pressure :
- 3) Temperature :

- 4) No. of air changes :
- 5) Other details :
- B) Air Conditioning**
- 1) Make :
- 2) Type :
- 3) Temperature :
- 4) Humidity :
- 5) Other details :

1.4.17 **CAPACITOR BANK (415 V)**

- 1) Installation :
- 2) Rated Voltage :
- 3) Frequency :
- 4) Phases :
- 5) Maximum service voltage :
- 6) Rated output :
- 7) Configuration :
- 8) Discharge resistors :
- 9) Earthing :
- 10) Cable entry :
- 11) Weight :
- 12) Control voltage :
- 13) P.F. Setting :
- 14) Operation (Automatic/Manual) :
- 15) Capacitor Losses :
- 16) Total Losses, including accessories as contactors, discharge devices etc. :
- 17) Type of Capacitors :
- 18) Capacitor voltage tests :
- 19) Ambient Temperature
- i) Maximum :
- ii) Minimum :
- 20) Case Material :
- 21) Case thickness :

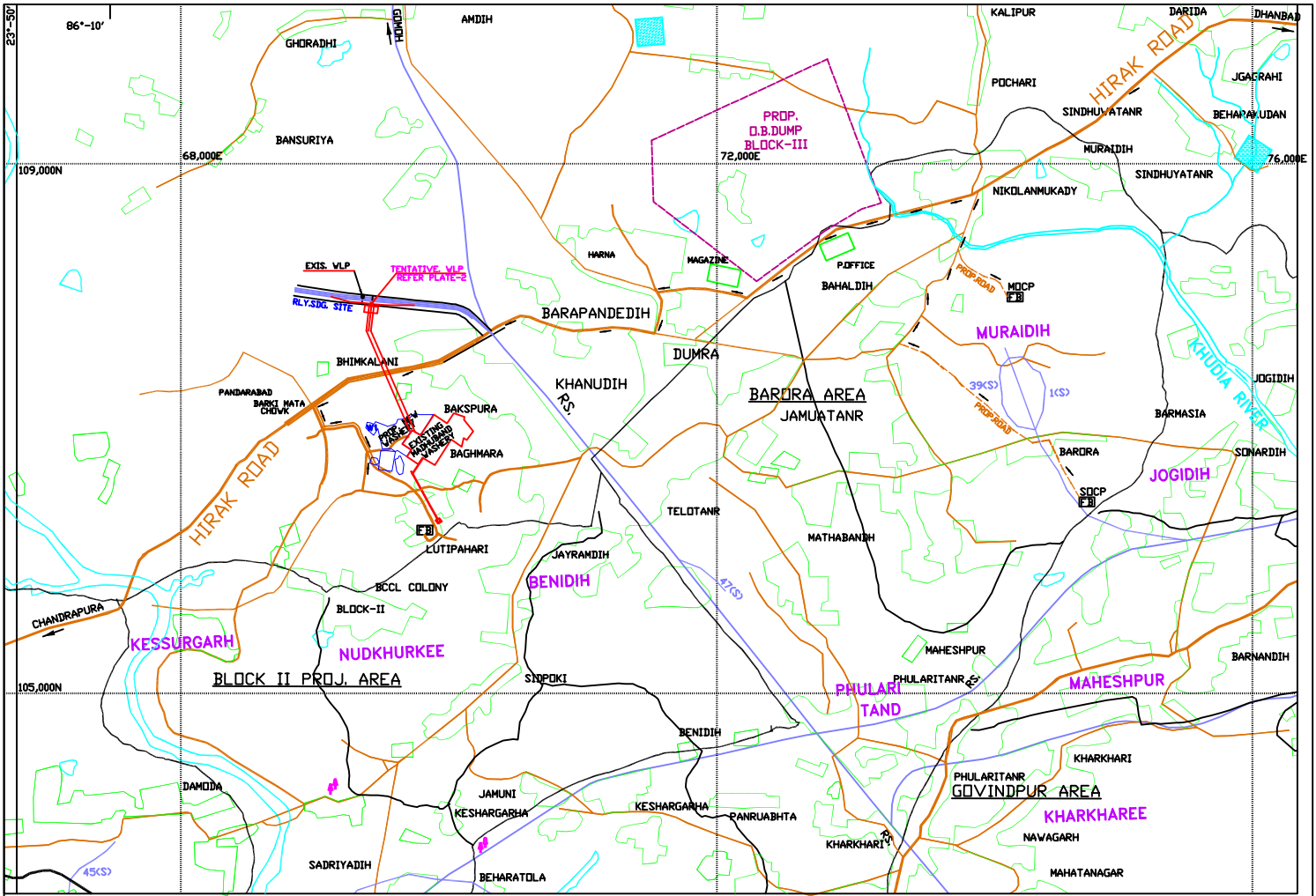
-
- | | |
|-----------------|---|
| 22) Fixing | : |
| 23) Protections | : |
| 24) Standards | : |
| 25) Make | : |

SUB-SECTION-7.6

LIST OF DRAWINGS

LIST OF DRAWINGS

Sl. No.	Subject	Plate No.	Drawing No.
1	Location plan showing washery, roads, siding and mines	1	R2/E&M/300083
2	Location of loading point	2	R2/E&M/100099
3	Plan and sectional elevation of loading point	3	R2/E&M/300077
4	Schematic Single Line Diagram of Power Supply Arrangement	4	R2/E&M/300092

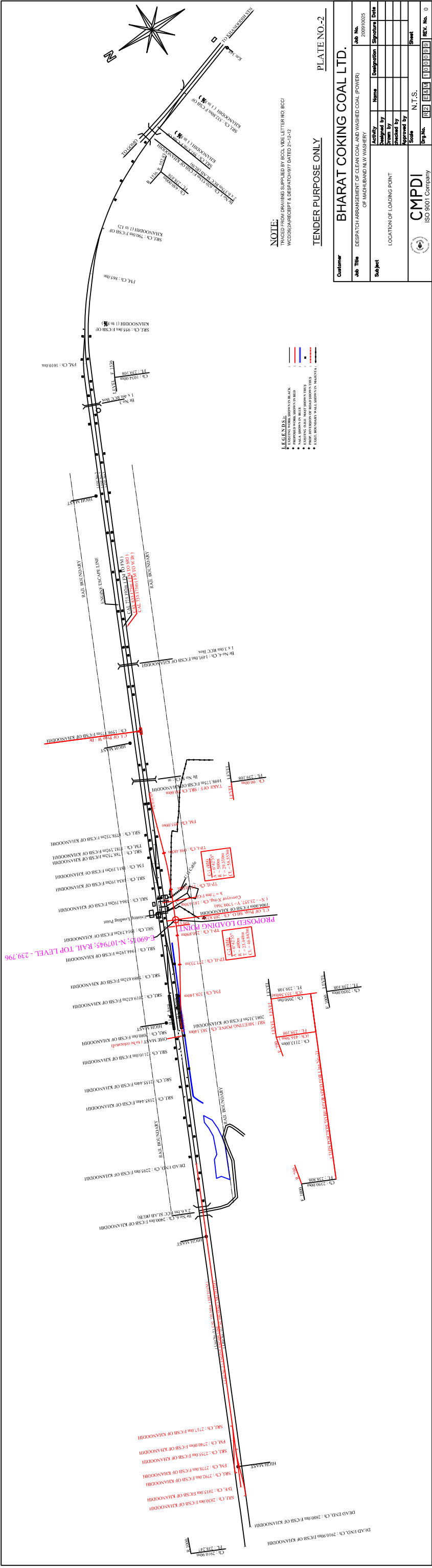


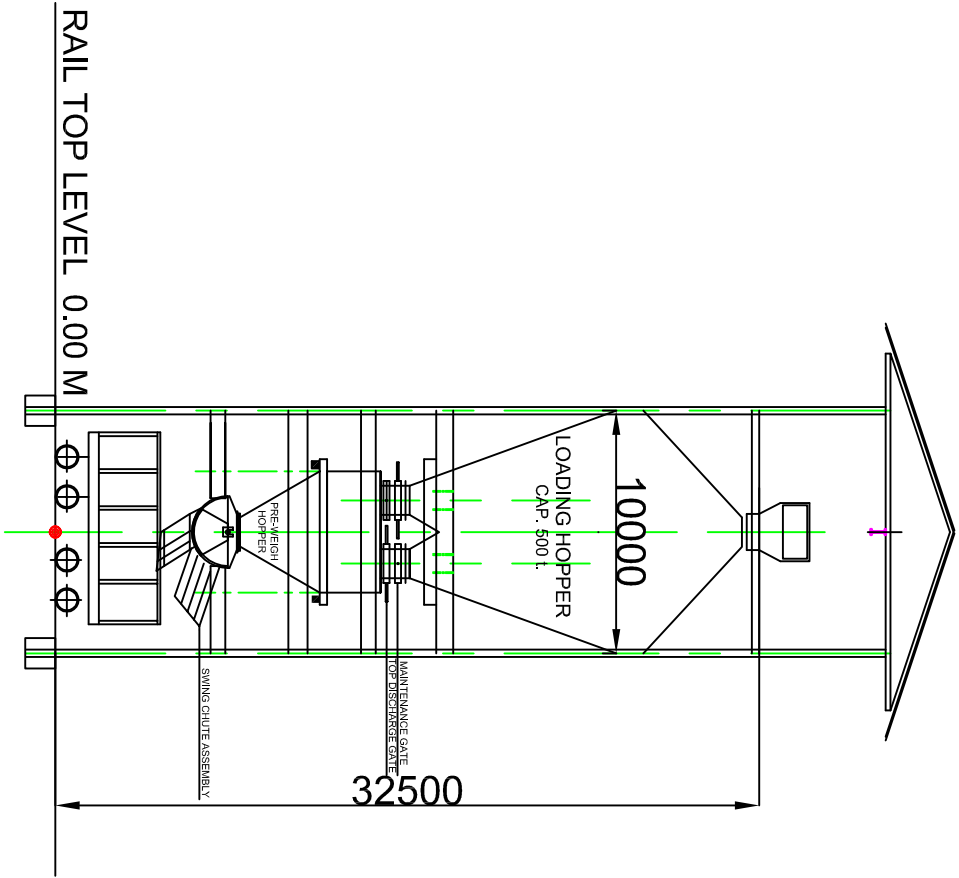
NOTE
1) LOCATIONS OF DIFFERENT STRUCTURES ARE SHOWN INDICATIVE/TENTATIVE.

TENDER PURPOSE ONLY **PLATE NO.1**

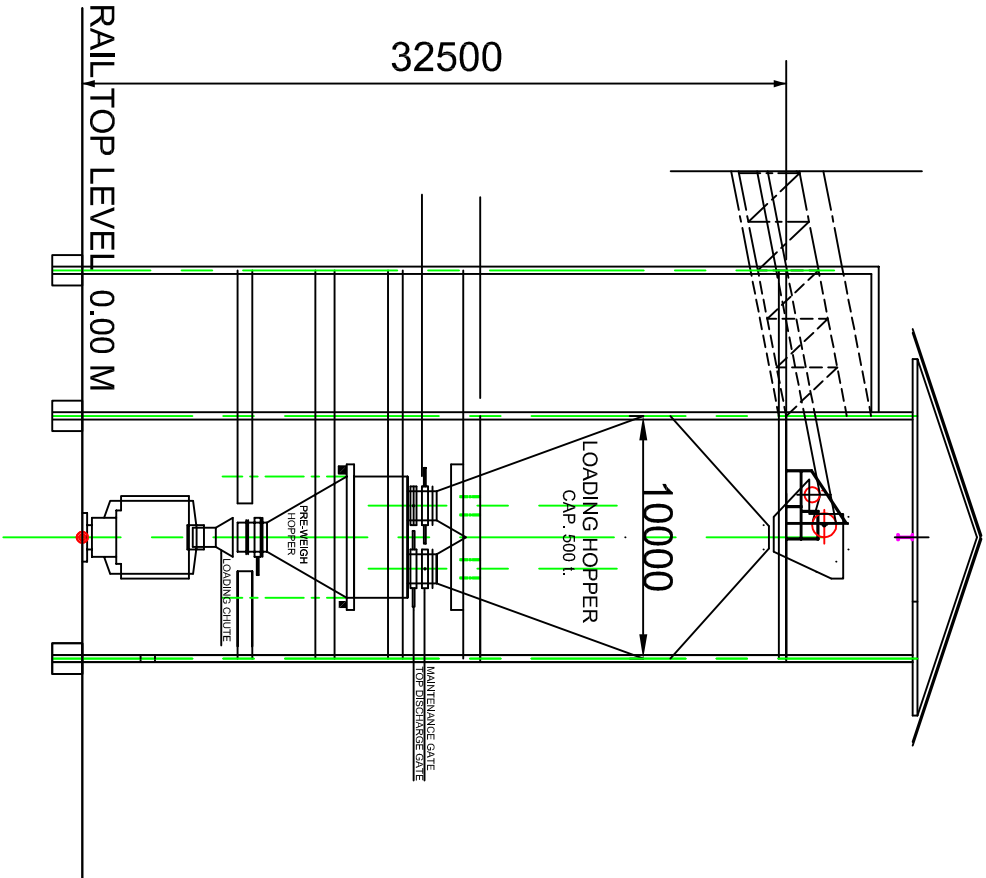
Customer BHARAT COKING COAL LIMITED			
Job Title	DESPATCH ARRANGEMENT OF CLEAN COAL AND WASHED COAL (POWER) OF MADHUBAND NLW WASHERY		Job No. 200910026
Subject	Activity	Name	Designation
	Prepared by	A. Mahapatra	G. MEENA
	Checked by	P. J. Kumar	G. MEENA
	Drawn by	S. J. Kumar	G. MEENA
Subject	Approved by	P. J. Kumar	PROBAND
	Scale	1 : 30000	
Drg. No. R2 ESN 000000		Sheet	1 OF 1
REV. No. 0			



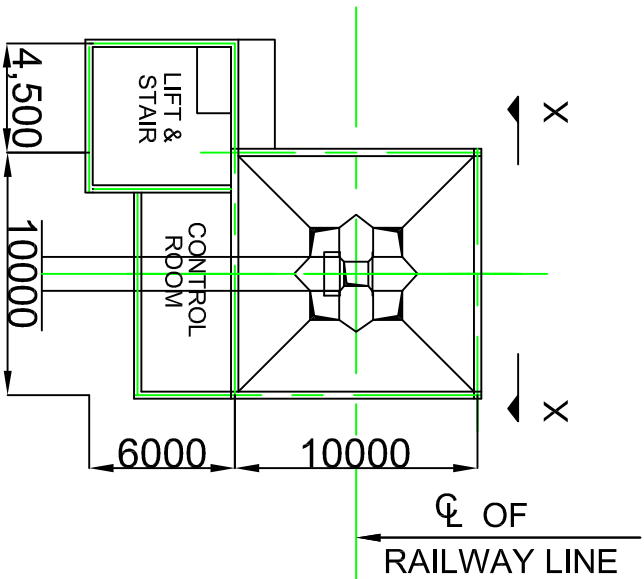




SECTIONAL ELEVATION
X-X



SIDE ELEVATION



PLAN

- NOTE :
- DIMENSIONS AND LEVELS SHOWN ARE TENTATIVE AND ARE SUBJECT TO CHANGE DURING DETAIL ENGINEERING BASED ON ACTUAL SITE CONDITION & EQUIPMENT DETAILS
 - DIMENSIONS SHOWN ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
 - PRELIMINARY DRAWING. NOT TO BE USED FOR CONSTRUCTION PURPOSES
 - CONTROL ROOM, LIFT AND STAIR SHALL BE SUITABLY LOCATED CONSIDERING THE ALIGNMENT OF RAILWAY LINE & CONVEYOR STRUCTURE

TENDER PURPOSE ONLY

PLATE NO.3

Customer BHARAT COKING COAL LIMITED				Job No.
Job Title DESPATCH ARRANGEMENT OF CLEAN COAL AND WASHED COAL (POWER) OF MADHUBAND NLW WASHERY				200910025
Subject PLAN AND SECTIONAL ELEVATION OF LOADING POINT	Activity	Name	Designation	Signature
	Prepared by	A.Mukhopadhyay	G.M(E&M)	
	Checked by	P.Majumdar	G.M(E&M)	
	Drawn by	M.N.Haque	Cs.D/Man	
Approved By P.Majumdar				HOD(E&M)
Scale NTS				Sheet 1 OF 1
Drg.No. R2 E&M 3000077				REV. No. 0



EXISTING MCC OF THE SUB-STATION NEAR EXISTING OLD WAGON LOADING POINT

OUTGOING-I
AT 415 VOLTS

OUTGOING-II
AT 415 VOLTS

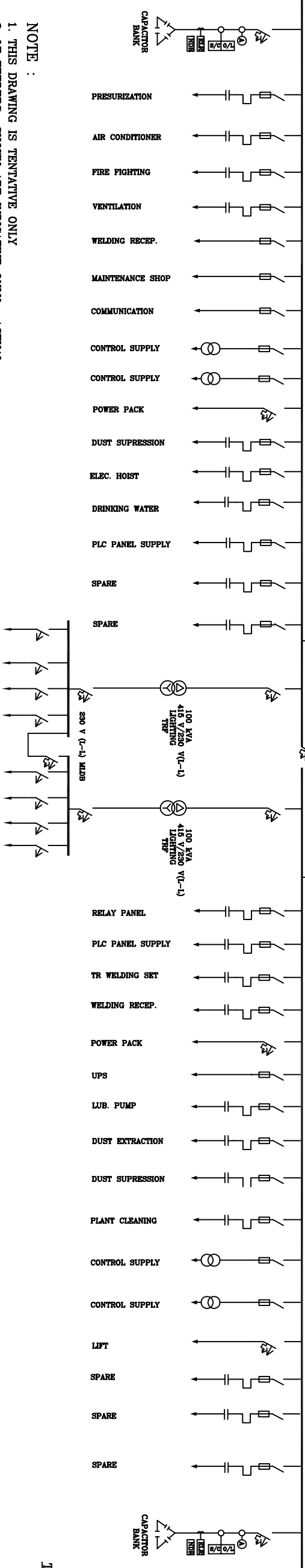
PROPOSED ADDITION

MOTOR CONTROL CENTRE

415 V, 3 PHASE, 50 Hz, 31 MVA, 4 WIRE SYSTEM

INCOMING-I

INCOMING-II



NOTE :
1. THIS DRAWING IS TENTATIVE ONLY
2. LT FEEDERS SHOWN ARE INDICATIVE ONLY, ACTUAL
TO BE DECIDED DURING DETAILED DESIGN STAGE

LEGEND

Sl. NO	SYMBOL	DESCRIPTION	Sl. NO	SYMBOL	DESCRIPTION
1		VOLTMETER	11		OVER LOAD RELAY
2		AMMETER	12		AIR CIRCUIT BREAKER
3		NEUTRAL DIS-PLACEMENT RELAY	13		CONTACTOR
4		KWH METER	14		MOULDED CASE CIRCUIT BREAKER
5		KWH INDICATOR	15		CT
6		TRANSFORMER	16		INTERLOCKING
7		EARTHING	17		SWITCH FUSE
8		EARTH SWITCH	18		THERMAL O/L WITH SPF
9		EARTH LEAKAGE RELAY	19		MCCB
10		SHORT CIRCUIT RELAY			

TENDER PURPOSE ONLY

NOTE :
1. THIS DRAWING IS TENTATIVE ONLY
2. LT FEEDERS SHOWN ARE INDICATIVE ONLY, ACTUAL
TO BE DECIDED DURING DETAILED DESIGN STAGE

Customer		Bharat Coking Coal Ltd.		Job No.	2001/0025
Job Title		DESIGN ARRANGEMENT OF CLEAN COAL AND WASHED COAL POWER OF HADHURAND NLM WASHERY		2001/0025	
Subject		ESTIMATING SINGLE LINE DIAGRAM OF POWER SUPPLY ARRANGEMENT		2001/0025	
Designed by		N. J. S.		2001/0025	
Checked by		N. J. S.		2001/0025	
Approved by		N. J. S.		2001/0025	
Scale		N. J. S.		2001/0025	
Date		N. J. S.		2001/0025	
ISO 9001 Company		CMPDI		2001/0025	
Job No.		2001/0025		2001/0025	
Job Title		DESIGN ARRANGEMENT OF CLEAN COAL AND WASHED COAL POWER OF HADHURAND NLM WASHERY		2001/0025	
Subject		ESTIMATING SINGLE LINE DIAGRAM OF POWER SUPPLY ARRANGEMENT		2001/0025	
Designed by		N. J. S.		2001/0025	
Checked by		N. J. S.		2001/0025	
Approved by		N. J. S.		2001/0025	
Scale		N. J. S.		2001/0025	
Date		N. J. S.		2001/0025	
ISO 9001 Company		CMPDI		2001/0025	
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Job Title		DESIGN ARRANGEMENT OF CLEAN COAL AND WASHED COAL POWER OF HADHURAND NLM WASHERY		2001/0025	
Subject		ESTIMATING SINGLE LINE DIAGRAM OF POWER SUPPLY ARRANGEMENT		2001/0025	
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