



HINDUSTAN COPPER LIMITED
(A Government of India Enterprise)

VOL - I

NIT FOR

**DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI
AND
PRODUCTION OF ORE FROM STOPES,
INDIAN COPPER COMPLEX, JHARKHAND**

NIT No.: HCL/CO/M&C/CHAPRI/ICC/2018 Dated : 22.09.2018

HINDUSTAN COPPER LIMITED
(A Government of India Enterprise)
‘Tamra Bhawan’
1, Ashutosh Chowdhury Avenue
KOLKATA 700019

GLOBAL TENDER ENQUIRY

NOTICE INVITING TENDER

Tender Notice No.: HCL/ HCL/CO/M&C/CHAPRI/ICC/2018 Dated 22/09/2018

Hindustan Copper Limited (HCL), a Public Sector Undertaking under the administrative control of the Ministry of Mines, was incorporated on 9th November 1967. It is the only vertically integrated copper producing company in India with presence in mining, beneficiation, and smelting, refining and downstream saleable products. HCL holds all the operating mining leases of copper in India.

HCL invites e-Tenders from experienced **Global bidders** under two bid systems for **DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, at INDIAN COPPER COMPLEX, JHARKHAND**, India over a period of **Sixty (60) months**. The interested contractors are requested to note the following:

1. The bid will consist of two parts, i.e. Part- I (Techno Commercial bid) and Part – II (Price bid). Under two bid system, the first bid (the “Techno Commercial Bid”) of the process involves qualification of interested bidders in accordance with the provisions of the pre-qualification criteria (PQC) stipulated in the tender and the second bid is the “Price Bid”. **The offers are to be submitted on line at URL <https://eps.buyjunction.in> of M/s. Mjunction Services Limited, Kolkata, who are our service provider for Enterprise Procurement System.** The documents pertaining to “Techno Commercial Bid” (only Part I Bid) are to be submitted in sealed packet at address mentioned in Tender. The price bid at above e- procurement portal will be opened only of those bidders who qualify techno commercially. Please refer clause no. 2.6 for detailed procedure for submission of offers.
2. The Tender document can be purchased from the office of the Executive Director (Materials & Contracts), HCL, Kolkata as per clause 1.13 on any working day on payment of Rs 5000/- (Rupees Five Thousand only) **inclusive of 18% GST** through non refundable demand draft/banker’s cheque in favor of “Hindustan Copper Limited”, payable at Kolkata. The bidders purchasing the document from HCL shall submit along with the Part-I bid of the tender, the original receipt for payment of Rs. 5000/- (Rupees Five Thousand only) to HCL towards the cost of the tender document. Tender document can also be downloaded from the HCL website (<http://www.hindstancopper.com>). Bidders who download the tender document from the HCL website must submit a tender document fee of the same amount (Rs 5000/-) **inclusive of 18% GST** in the form of a non-refundable demand draft/banker’s cheque drawn on any schedule commercial bank payable at Kolkata along with their Part-I bid of the tender. The tenders not accompanied by the tender document fee as specified above shall be considered as non-responsive and summarily rejected. Tender documents are strictly non-transferable. i.e. offer can be submitted only by the bidders to whom tender documents have been issued.

It will be presumed that the bidder have gone through the entire bidding documents available in the website which shall be binding on them.

3. Addresses for Communication:

- a. Interested bidders may obtain further information from:

Executive Director (Materials & Contracts)
Hindustan Copper Limited
'Tamra Bhawan'
1, Ashutosh Chowdhury Avenue
Kolkata – 700 019
Email dkmahajan@hindustancopper.com
Tel: +91 33 22900397
Mobile: +91 94330 01147

- b. The e-bids (including the Part – II Price Bid) have to be submitted in the e tendering portal and the documents pertaining to Part – I (Techno Commercial Bid) of the tender must be submitted on or before as per schedule mentioned in **clause 1.13** at the above mentioned address or dropped in the tender box located on the 3rd floor of 'Tamra Bhawan'.

The Tenders shall be opened as per schedule mentioned in **clause 1.13**. However, in the eventuality of the day of opening of the tenders becomes a non-working day due to a force majeure event, the date of opening of the tenders will shift to the next working day at the same time.

- c. All communications, including the tenders should have the following information super scribed at the top of the packet in bold letters:

“TENDER No: HCL/CO/M&C/CHAPRI/ICC/2018 Dated 22/09/2018

For DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, at INDIAN COPPER COMPLEX, JHARKHAND.”

The name and address of the bidders should be clearly mentioned at the left side of the packet.

- d. Official website for notices:

All notice related to this tender including Clarifications / Amendments / Corrigendum to the tender document shall be available on HCL website <http://www.hindustancopper.com> under the heading “Tenders”.

(D K Mahajan)
Executive Director (Materials & Contracts)
For Hindustan Copper Limited

DISCLAIMER

The information contained in this tender document or subsequently provided to bidder(s), whether verbally or in documentary or in any other form by or on behalf of Hindustan Copper Limited ("HCL") or any of its employees or advisors, is provided to bidder(s) on the terms and conditions set out in this tender and such other terms and conditions subject to which such information is provided.

This tender is not an agreement and is neither an offer nor invitation by HCL to the prospective bidders or any other person. The purpose of this tender is to provide interested parties with the information that may be useful to them in making their offers pursuant to this tender (the "Bid"). This tender includes statements, which reflect various assumptions and assessments arrived at by HCL in relation to the Work (as defined in the tender). Such assumptions, assessments and statements do not purport to contain all the information that each bidder may require. This tender may not be appropriate for all persons, and it is not possible for HCL, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this tender. The assumptions, assessments, statements and information contained in this tender may not be complete, accurate, adequate or correct. Each bidder should, therefore, conduct its own investigations and analysis if any required with respect to the tender and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this tender and obtains independent advice from appropriate sources.

Information provided in this tender to the bidder(s) is on a wide range of matters, some of which depends upon interpretation of law. The information given is not an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. HCL accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

HCL, its employees and advisors make no representation or warranty and shall have no liability to any person, including any bidder or bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this tender or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the tender and any assessment, assumption, statement or information contained therein or deemed to form part of this tender or arising in any way in the bid stage.

HCL also does not accept liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any bidder upon the statements contained in this tender.

HCL may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this tender. The issue of this tender does not imply that HCL is bound to select a Bidder or to appoint the selected bidder for the work and HCL reserves the right to reject all or any of the bidders or bids without assigning any reason whatsoever.

The bidder shall bear all its costs associated with or relating to the preparation and submission of its bid including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by HCL or any other costs incurred in connection with or relating to its bid. All such costs and expenses will remain with the bidder and HCL shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a bidder in preparation or submission of the bid, regardless of the conduct or outcome of the bidding process.

The bidders are prohibited from any form of collusion or arrangement by a bidder (or its advisers or consultants) in an attempt to influence the selection and award process. Giving or offering of any gift, bribe or inducement or any attempt to do any such act on behalf of the bidder towards any officer/employee of HCL or to any other person in a position to influence the decision of HCL for showing any favour in relation to this tender or any other contract, shall render the bidder liable to such penalty as applicable under applicable law and as HCL may deem proper, including but not limited to rejection of the bid and forfeiture of its bid security (as defined in the tender).

This tender shall be governed by the laws of India.

Each bidder's acceptance of delivery of this tender constitutes its agreement to, and acceptance of, the terms set forth in this disclaimer. By acceptance of this tender, each bidder agrees that this tender and any information herewith supersedes document(s) or earlier information, if any, in relation to the subject matter hereof.

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HINDUSTAN COPPER LIMITED
(A GOVT OF INDIA ENTERPRISE)

TENDER DOCUMENT

SECTION I –TENDER INVITATION

1. INTRODUCTION

1.1 HCL, a public sector undertaking under the administrative control of the Ministry of Mines, Govt. of India, was incorporated on November 09, 1967. It is the only vertically integrated copper producing company in India with presence in mining, beneficiation, smelting, refining and downstream saleable products.

1.2 BRIEF DESCRIPTION OF CHAPRI MINE:

HCL has decided to develop an underground mine at Chapri at Indian Copper Complex (ICC), Singhbhum district Jharkhand. The major facilities to be developed / installed are decline development upto 6th level, underground development upto 6th level, widening & deepening of existing eastern shaft alongwith commissioning of men winding system ,electrical substation at surface and underground substations and UG pumping station at 4L & 6 L, Compressor house at surface etc.

Chapri copper deposit which falls under the Rakha mining lease of HCL, is located 15.0 km away from Ghatsila Railway station on Howrah – Mumbai main line and about 11 km from Moubhandar Smelter and township of HCL. The mine is well connected by blacktopped road with Kolkata – Ranchi NH No. – 33 (distance from Kolkata about 230 km).

1.3 SCOPE OF WORK & METHOD OF WORKING:

1.3.1 The Selected Bidder shall be responsible for the **engineering, procurement, construction, mine development, ore production and execution of all the facilities in relation to the Project as defined in technical specification** and in accordance with the provisions of the Contract to be entered into between the Selected Bidder and HCL in the form provided by HCL.

The brief Scope of Work will broadly include:

- i) Dewatering of existing waterlogged working of Chapri block
- ii) Design & Engineering
- iii) Decline drivage
- iv) Underground development
- v) Stripping, sinking and Equipping of Eastern Shaft (2nd Outlet)
- vi) Excavation of ventilation raises
- vii) Production of ore from stopes
- viii) Supply of different items / equipments, their erection & commissioning shall be carried by bidder as per TS.
- ix) Underground definition drilling
- x) 100m³ (Live capacity) ore Bin, Grizzly with 0.45m X 0.45m Opening, Bin Lining & Rock Breaker
- xi) Ore transportation from ore bin at mines to Mosabani concentrator plant

- xii) Transportation of tailing from tailing paddock at Mosabani to tailing yard at Chapri mine and underground back filling.
- xiii) Supply, erection and commissioning of electrical facilities
- xiv) Mine dewatering system
- xv) Construction of various civil and industrial buildings viz. Substation, compressor house, winder house, fan house etc.

The Detailed Scope of Work is given in Volume - II (Technical Specification).

- 1.3.2 (a) The Bidder can formulate a Project implementation strategy as per the best international practices and in conformity to Indian Mining Legislation. Bidder can, while drawing mining scheme as per 1.3.1, propose optimum mining layout including, location of ventilation raises, stope design and other relevant parameters/layouts for approval by HCL before execution.
- (b) Bidder can use permanent headgear and winders for striping, sinking, widening & lining of eastern ventilation shafts on the following conditions:
- i. Warrantee of winder and spare parts shall be applicable from the date of handing over the winders.
 - ii. Ropes and worn out parts will be replaced by the contractor free of cost before handing over the winder.
 - iii. Any damage is to be repaired.
- (c) Successful bidder can use pumps, compressors, ventilation fans, electrical control panels and cables during construction works subject to the condition that these items are put in operating circuit instead of keeping in reserve. The warrantee of the above items and spares shall be applicable from the date of handing over to HCL. The worn out parts will be replaced by the contractor free of cost and rectification of any damage of pumps, compressors, ventilation fans, electrical control panels before handing over to HCL.

1.4 SPECIAL CONDITIONS OF THE CONTRACT:

- 1.4.1 The successful bidder shall ensure safe working of man & machinery and HCL shall in no way be held responsible for any damage/loss/accident etc of any type and/or reason including blasting operations.
- 1.4.2 The successful bidder will be liable for any damage caused to the HCL's equipment/property etc. due to negligence of his employees.

The successful bidder shall not be entitled to any additional cost on account of shifting of equipment from one place to another place.

The successful bidder shall ensure reliability/availability of all equipment and drilling equipment for working at Chapri Mine during the contract period. In case of any break down of the equipment, the same should be intimated to the Engineer-in-Charge or his representative immediately and also immediate action is to be taken to rectify/replace the equipment to achieve the monthly target.

The successful bidder should employ only skilled and authorized manpower for operation and maintenance of the equipment. In case of new appointment of manpower, they should undergo vocational training as per statute for working in mines and must undergo Initial Medical Examination and PME.

For carrying out work on Sundays/holidays, the successful bidder will approach the Engineer-in-Charge or his representatives at least two days in advance and obtain permission in writing.

1.5 PRE-QUALIFICATION

- 1.5.1 Scope of Bid/Offer: HCL wishes to select experienced bidder for Construction of underground Chapri mines covering excavation like horizontal drives and cross cut, inclined raise, vertical raise by drop raise technique, shaft sinking, decline development, stoping, stowing, including design & engineering, supplies, erection & commissioning etc. and Ore transportation from Chapri to Mosabani (18km) and transporting back tailings to Chapri, etc as per enclosed Technical specifications detailed in the Tender on **Item Rate basis**.
- 1.5.2 Integrity Pact: Bidders shall execute an Integrity Pact Agreement with HCL in the format annexed as **Appendix - VA** as a pre-qualification to the submission of their bids in accordance with the tender. The duly executed Integrity Pact in original on non-judicial stamp paper of appropriate value (Rs. 50/-) shall have to be submitted to HCL along with Techno-commercial bid.
- 1.5.3 Eligibility of Bidders: The bidder should have to fulfill the following qualification criterion:

1.5.3.1 Financial Eligibility: The prospective bidder should fulfill the following financial eligibility criteria:

- i. The average annual financial turnover of the bidder during the last three (3) audited consecutive financial years ending 31.03.2018, shall not be less than Rs. 79,00,00,000/- (Rupees Seventy Nine Crores only) or its equivalent value in foreign currency as per the audited annual accounts ending on 31.03.2018. In case of foreign Bidder having calendar year as the financial year for accounting, average annual turnover of last three financial years ending 31.12.2017 shall be considered.

Relevant documentary evidence including copies of Annual Report, containing Profit & Loss Statement and Balance Sheets for immediately preceding three (3) consecutive accounting years shall be furnished together with the Bid. Documentary evidence for the above shall be annexed to the Offer in the form of a certificate from Chartered Accountant within the meaning of the Chartered Accountants Act, 1949 (38 of 1949). TT selling rate of State Bank of India (SBI) as on the last working day of the respective financial year/calendar year, as applicable shall be utilized for conversion of foreign currencies into INR.

In case of a Consortium, the Lead member of the consortium must have minimum 50% of the Turnover specified in Eligibility Criteria i.e. Rs 39,50,00,000/- (Rupees Thirty Nine Crores Fifty Lacs only) or more.

Net Sales shall be considered for the purpose of determination of Turnover.

- ii. The Bidder (in case of consortium, the consortium) shall have positive net worth as per their latest audited financial statement. Relevant documentary evidence in the form of a certificate from a chartered accountant within the meaning of the Chartered Accountants Act, 1949 (38 of 1949), shall be furnished together with the bid A Bidder (in case of consortium, the consortium) not having positive net worth as per their latest audited financial statement is ineligible to participate in the tender. The net worth shall be positive for the last one financial year which shall be calculated based on the subscribed paid up share capital plus Share Premium Plus Free Reserve Plus unallocated Balance/ Surplus amount of profit and loss account, less (a) expenses not written off, (b) Accumulated losses in Profit and Loss account, if not reduced from reserves and surplus. The Revaluation Reserves, capital reserves and amount of intangible assets like goodwill etc. will not be taken into account while calculating the net worth.

The Bidder shall have to submit copies of relevant documents/evidences, duly certified by a Chartered Accountant as indicated above, in support of their financial eligibility along with their Techno-commercial bid.

1.5.3.2 Technical Eligibility: The prospective bidder should fulfill the following technical eligibility criteria:

The bidder should have experience of successful completion of the following works (1) and (2) mentioned below during the last seven (7) years ending 31.07.2018.

1. Sinking of one vertical shaft of minimum 150 meter depth and minimum 9 m² in cross-section.

And

2. Should have completed minimum 4000 meter of mine development in an underground metal mining in a single year (Consecutive 12 months) during the last 7 years from a single work.

And Should have produced minimum 1,90,000 tonne of ore III any year (consecutive 12 months) from stopes from any underground metal mine.

Or

Should have achieved excavation of 1000000 (Ten Lakh) Cubic meter of rock in open cast/open pit metalliferous mine under MMR 1961 in a single year (consecutive 12 months).

And Should have the experience of drilling and blasting minimum 115mm / 165mm Diameter hole for 30,000 m in a year in a open pit metalliferous mine.

In case, for a consortium to qualify, one of its member or combinations of members must

meet the above eligibility requirements as per (1) and (2) above.

For compliance of S No.1 of the Technical eligibility PQC, bidder shall be allowed to associate with some competent agency for the job, in the form of either Consortium or Sub-contractor. Credentials of proposed agency to be associated, shall be assessed by HCL in line with Technical eligibility PQC at S No.1.

In case bidder himself does not have experience in Shaft sinking, the bidder shall submit credentials of possible Sub-contractor(s) whom they can engage, along with their credentials for Shaft sinking, which will be evaluated against S No. 1 of Technical PQC. Along with the same, the bidder shall also have to submit an acceptance / understanding with the proposed subcontractor that he is willing to do the job.

One Sub-contractor can give consent for working with multiple bidders and the same shall not be reason for disqualification of the tender.

Price bid of only those bidders, with / without consortium, who successfully qualify S No. 2 of Technical eligibility PQC and have produced documents regarding engagement of possible Sub-contractor who satisfy S No. 1 of Technical eligibility PQC (if the bidder / Consortium does not have sufficient experience in this respect), shall be opened.

Document to be enclosed

- (a) Certificate(s) from the client of the Bidder/Consortium Member, based on the Client certificate and as per Appendix VII to be submitted, to showcase relevant experience in **underground decline & mine development, sinking of shaft and open pit excavation** projects in the specified period, to fulfil the technical criteria.
- (b) Certified copy of proof of production from the employer shall be enclosed for meeting eligibility criteria for item iv mentioned above.

1.6 The bidders shall enclose the following in their offer as per the forms prescribed in this tender:

- a. Certificate(s) from the statutory auditors of the bidder / Chartered Accountant, as per **Appendix VI**, specifying the turnover of the bidder as per the audited annual accounts of the consecutive preceding three financial years ending on 31.03.2018 or 31.12.2018 (for foreign bidders having calendar year as financial year) as the case may be, and also specifying that the methodology adopted for calculating such Turnover conforms to the provisions of tender.
- b. The bidders should submit a **Power of Attorney in non-judicial stamp paper, strictly as per Appendix IV, duly notarized**, authorizing the signatory of this tender to commit the bidder.
- c. The following conditions shall be adhered to while submitting the tender:

In responding to the tender submissions, bidders should submit the required documentary evidence demonstrating their capabilities in accordance with the relevant applicable clauses of the tender.

1.6.1 Individual bidders / Consortium are eligible to participate in tender. The definition of consortium is as given in Article 1, i.e. Definitions and Interpretation chapter of NIT of Section II. In case of a Foreign Listed Company, bidding as a Consortium Lead Member, it must have an Indian Company, registered under the Company's Act, as one of the Consortium Members.
No Foreign Listed Company will be allowed to bid as an individual.

1.6.2 Any entity (consortium or individual members of consortium in case of consortium) which has been barred by HCL and the bar subsists as on the date of the tender by HCL, would not be eligible to submit an offer. **The bidder should submit an Affidavit declaring that no such bar has been implied by HCL.**

1.6.3 A bidder (consortium or individual members of consortium in case of consortium) should, in the last 3 (three) years, have neither failed to perform on any contract related to HCL, as evidenced by an arbitral or judicial authority, a judicial pronouncement or arbitration award against the bidder. **The bidder should submit an Affidavit declaring that no arbitration case is filed against them in this respect.**

1.6.4 The following conditions shall be adhered to while submitting the Tender:

- (a) Bidders should attach clearly marked and referenced continuation sheets in the event that the space provided in the prescribed forms is insufficient. Alternatively, bidders may format the prescribed forms making due provisions for incorporation of the requested information;
- (b) Information supplied by a Bidder;
- (c) In responding to the tender submissions, Bidders should demonstrate their capabilities in accordance with Clause 3.1 below.

1.6.5 **Additional Requirements for a Consortium**

In case the Bidder is a Consortium, it shall comply with the following additional requirements:

- (a) Number of members in a Consortium shall not exceed 4 (four) members including leader of the consortium;
- (b) Subject to provisions of sub-clause (a) above, the Application should contain the information required for each member of the Consortium;
- (c) Members of Consortium shall nominate the member who satisfies financial eligibility criteria as prescribed in the NIT, as the lead member (the **“Lead Member”**) of the Consortium, who shall hold minimum 50% of the specified Turnover as specified in Clause 1.5.3.1 above and as per Article 1 of Definitions and Interpretations of Section II. The nomination(s) shall be supported by a Power of Attorney, as per Appendix IV B, duly signed by all members of the Consortium.
- (d) The Bid should include a brief description of the roles and responsibilities of individual members, particularly with reference to their financial and technical obligations;

- (e) An individual Bidder cannot at the same time be a member of a Consortium applying for pre-qualification. Further, a member of a particular Applicant Consortium cannot be a member of any other Applicant Consortium applying for pre-qualification;
- (f) Members of the Consortium shall enter into a binding Joint Bidding Agreement/Consortium Agreement, substantially in the format specified at Appendix IV C (the **“Joint Bidding Agreement” or “JBA”/ “Consortium Agreement” or “CA”**), for the purpose of submitting the Bid and execute the Project in case they have been selected as the successful Bidder. The JBA/CA, to be submitted along with the Part-I Bid, shall, *inter alia*:
 - i. convey the intent to enter into the Agreement and subsequently perform all the obligations of the selected Bidder in terms of the Agreement, in case the Project is awarded to the Consortium;
 - ii. clearly outline the proposed roles and responsibilities, if any, of each member;
 - iii. include a statement to the effect that all members of the Consortium shall be liable jointly and severally for all obligations of the selected Bidder in relation to the Project in accordance with the Agreement;
 - iv. commit that its Members would fulfill the eligibility conditions as laid down in Clause 1.5.3; and
- (g) except as provided under this NIT and the Bidding Documents, there shall not be any amendment to the JBA/CA.
- (h) The permissible amendments to the JBA/CA under the NIT and bidding documents shall be only with prior written consent of HCL.
- (i) The Consortium Agreement shall be signed so as to be legally binding on all members.
- (j) The leader shall be authorised to incur liabilities and receive instructions and payment for and on behalf of any & all members of the consortium.
- (k) Leader of the consortium shall be overall responsible for the execution of the Contract. The Leader and other Members of the Consortium shall be jointly and severally liable for the execution of the Contract, but will be liable for damages in proportion of the respective Contract Price. Each Member shall have a price for his scope of work.
- (l) A copy of the **“Consortium Agreement/Joint Bidding Agreement” or “CA/JBA”** entered into by the consortium members **prior to stipulated due date of submission of bids** and valid till Time for Completion of work plus Defect liability Period for the work shall be submitted.

- (m) For the purpose of formation of consortium, a member shall be an independent and single legal entity as per laws of India or as per laws in the country of such member and should have its own independent financial accounting system as per laws of India or as per laws in the country of such member.
- (n) The “**Consortium Agreement/Joint Bidding Agreement**” or “**CA/JBA**” shall clearly outline the proposed roles & responsibilities of each member. Each member of consortium must have the experience for the component of the contract that they are designated to perform. Failure to comply with this requirement may result in rejection of the Consortium’s bid.

1.6.6 The following conditions shall be adhered to while submitting the Bid:

- (a) The Bidder should attach clearly marked and referenced continuation sheets in the event that the space provided in the prescribed forms is insufficient. Alternatively, Bidders may format the prescribed forms making due provisions for incorporation of the requested information;
- (b) In case the Bidder is a Consortium, each member should substantially satisfy the pre-qualification requirements to the extent specified herein.

1.6.7 **Change in composition of the Consortium:** Change in the composition of a Consortium will not be permitted by HCL after opening of Part-I bid and during any of its evaluation stage.

1.7 Number of Tender/Offer and cost thereof

The bidders shall be responsible for all the costs associated with the preparation of their tenders and their participation in the bidding process. HCL will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the bidding process.

No Bidder shall submit more than one offer. A bidder applying individually or as a member of a Consortium shall not be entitled to submit another Application either individually or as a member of any Consortium, as the case may be.

- 1.8 The Contract sets forth the detailed terms and conditions for the work, including the scope of the selected bidder’s services and obligations.
- 1.9 The statements and explanations contained in this tender are intended to provide a better understanding to the bidders about the subject matter of this tender and should not be construed or interpreted as limiting in any way or manner the scope of services and obligations of the Contactor set forth in the Contract.
- 1.10 Any omissions, conflicts or contradictions in the bidding documents including this tender are to be noted, interpreted and applied appropriately to give effect to this intent, and no claims on that account shall be entertained by HCL.

- 1.11 HCL shall receive bids pursuant to this tender in accordance with the terms set forth hereunder and other documents that may be provided by HCL pursuant to this tender, including any modification, alteration, amendment or clarification that may be issued by HCL from time to time (collectively the "Bidding Documents"), and all bids shall be prepared and submitted in accordance with the terms of the bidding documents within the due date of submission.

1.12 Brief description of Bidding Process

- 1.12.1 HCL has adopted a two-part process (collectively referred to as the "Bidding Process") for the selection of the bidder for award of the work. The first bid (the "Techno Commercial Stage") of the process involves the qualification of interested bidders in accordance with the provisions of the pre-qualification criteria and the second bid is the "Price bid". Both the bids have to be submitted on or before the date of tender submission.

The second bid will be opened only for those bidders who have qualified techno-commercially in the first bid. In case it necessitates any change in the scope of work or change in the terms & conditions on the tender for some valid reasons, after opening of the tender i.e. first bid (Part I), HCL at its sole discretion reserves the right to give an equal opportunity to the bidders to revise price bid (Part-II) of their offers, if they so desire, depending on the change in the scope of work/terms & conditions. At the bid stage, the aforesaid qualified bidders (hereinafter referred to as the "Bidders") are being called upon to witness price bid opening. The bid shall be valid for a period of not less than 180 (one hundred and eighty) days from the bid due date, and may be extended further for a period of 30 days, if required by HCL. If a bidder extends the period of validity of bid, the EMD/Bid Security shall also be extended by the bidder accordingly. A bidder accepting such request, shall not modify its bid on its own.

- 1.12.2 The bidding documents include the Contract as well as all the other appendices as annexed to this tender and all the aforesaid documents and any addenda issued subsequent to the issue of this tender, but before the bid due date, will be deemed to form part of the bidding documents.
- 1.12.3 The bidder is required to deposit, along with its bid, a bid security as per Clause 2.14. The bid shall be summarily rejected if it is not accompanied by the Bid Security.
- 1.12.4 **Site visit:** Site visit is mandatory before submission of bid. Bidders have to submit a certificate confirming to have visited the site, duly countersigned by HCL or his representative in the prescribed format as appendix VIII C.
- 1.12.5 Any query or request for additional information concerning this tender shall be submitted by e-mail to the officer designated at clause 2.6.4.

1.13 Schedule of Bidding Process:

HCL shall endeavor to adhere to the schedule provided for under this clause. However, in case HCL in its sole discretion undertakes any modification in the schedule specified below, the same will be conveyed through HCL website only. Hence, bidders are requested to periodically visit

HCL website for any notification.

Sl.	Event Description	Dates
1.	Issuance of tender	22.09.2018 between 10.00 am to 5.00 pm
2.	Pre Bid Meeting	10.10.2018 At 15:00 Hrs.
3.	Issue of Amendments, if any	To be published in HCL website
4.	Closing date of issuance of Tender	13.11.2018 by 5.00 pm
5.	Due date of bid submission	13.11.2018 Up to 15:00 Hrs.
6.	Opening of Part-I bid	13.11.2018 At 15:30 Hrs.
7.	Opening of Price Bid (Part II)	To be intimated to the qualified bidders
8.	Issue of LOI / WO	To the successful bidder

1.14 LANGUAGE OF BID

The bid prepared by the bidder and all correspondence & documents related to the bid exchanged by the bidder and the employer, shall be written in the English language. Bid submitted in any other language is liable to be rejected. In case any printed literature furnished by the bidder, is written in another language, it must be accompanied by a translation of its pertinent passages in the English language and for the purposes of interpretation of the bid, such translation shall govern.

2. INSTRUCTIONS TO BIDDERS

a. GENERAL

2.1 Site visit and verification of information:

2.1.1 Bidders must visit the work site and ascertain for themselves the site conditions, location, surroundings, climate, availability of power, water and other utilities for construction, access to site, handling and storage of materials, weather data, applicable laws and regulations, and any other matter considered relevant by them before submission of bid.

2.1.2 For this purpose, bidders shall communicate to HCL via notice/ e-mail indicating their intention to visit the site along with the intended date of visit and the details of their visiting representatives at least 3 (three) days before their intended visit.

HCL shall communicate its response to the interested bidders who are planning to visit the work site at the earliest approving the date of visit or may specify another date as it may consider suitable.

2.1.3 It shall be deemed that by submitting a bid, the bidder has complete understanding of the work and only after that the bidder has :

- a) Made a complete and careful examination of the bidding documents;
- b) Received all relevant information requested from HCL;
- c) Satisfied itself about all matters, things and information
- d) Acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in the bidding documents or ignorance of any of the matters shall not be a basis for any claim for compensation, damages, extension of time for performance of its

obligations, loss of profits etc. by the bidders from HCL, or a ground for termination of the Contract;

- e) Acknowledged that it does not have a Conflict of Interest; and
- f) Agreed to be bound by the undertakings provided by it under and in terms hereof.

- 2.1.4 HCL shall not be liable for any omission, mistake or error on the part of the bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to tender, or the bidding process, including any error or mistake therein or in any information or data given by HCL.

2.2 Verification and Disqualification

- 2.2.1 HCL reserves the right to verify all statements, information and documents submitted by the bidder in response to the tender or the other bidding documents and the bidder shall, when so required by HCL, make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification by HCL shall not relieve the bidder of its obligations or liabilities hereunder nor will it affect any rights of HCL there under.
- 2.2.2 HCL reserves the right to reject any bid and appropriate the bid security if:
 - a. at any time, a material misrepresentation is made or uncovered, or
 - b. the bidder does not provide, within the time specified by HCL, the supplemental information sought by HCL for evaluation of the Bid.
 - c. No deviations shall be mentioned in the price bid or any part of the tender document, otherwise the offer will be summarily rejected.

Such misrepresentation/improper response shall lead to the disqualification of the bidder.

In case it is found during the evaluation or at any time before signing of the Contract or after its execution and during the period of subsistence thereof, that one or more of the pre-qualification conditions have not been met by the bidder or the bidder has made material misrepresentation or has given any materially incorrect or false information, the bidder shall be disqualified forthwith if LOI has not been issued to such bidder, and if the selected bidder has already been issued the LOI or the selected bidder has entered into the Contract, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this tender, be liable to be terminated, by a communication in writing by HCL to the selected bidder, without HCL being liable in any manner whatsoever to the selected bidder. In such an event, HCL shall forfeit, invoke and appropriate the Bid Security, or the Performance Security and/or the payments made by the selected bidder as per the Contract, as the case may be, as damages, without prejudice to any other right or remedy that may be available to HCL under the bidding documents and/or the Contract, or otherwise. Forfeiture of bid Security or the Performance Security is liable to GST at applicable rate.

- 2.2.3 The Contract to be executed by successful bidder as given in section II as part of the Bidding documents shall be deemed to be part of this tender.

2.3 Clarifications

- 2.3.1 HCL shall endeavor to respond to the questions raised or clarifications sought by the bidders. However, HCL reserves the right not to respond to any question or provide any clarification, and nothing in this clause shall be taken or read as compelling or requiring HCL to respond to any

question or to provide any clarification.

- 2.3.2 HCL may, if deemed necessary by HCL, issue interpretations and clarifications to all bidders. All clarifications and interpretations issued by HCL shall be deemed to be part of the bidding documents. Verbal clarifications and information given by HCL or its employees or representatives shall not in any way or manner be binding on HCL.

2.4 Amendment of Tender

- 2.4.1 Before bid due date, HCL may, for any reason, whether at its own initiative or in response to clarifications requested by a bidder, modify the tender by the issuance of addendum/corrigendum.
- 2.4.2 Any addendum/corrigendum thus issued will be intimated to the bidders by uploading on HCL website only.
- 2.4.3 In order to afford the bidders a reasonable time for taking an addendum /corrigendum into account, or for any other reason, HCL may, extend the bid due date.

b. PREPARATION AND SUBMISSION OF BIDS

- 2.5 Online offers are invited through Enterprise Procurement System (EPS) of M/s. Mjunction Services Limited (MJ), who is the service provider to HCL, under two-part bid system. All vendors are requested to contact M/s. Mjunction Services Limited, Kolkata at the following address for registration and obtaining user id and password to access and quote for the tender enquiry online.

The offers are to be submitted online at URL <https://eps.buyjunction.in> of M/s. Mjunction Services Limited, Kolkata, who are our service provider for Enterprise Procurement System.

Registration Procedure:

1. Please visit the Link <https://eps.buyjunction.in>
2. Click on Register button.
3. Put your Company PAN No.
4. Click on INTERESTED Button on behalf of respective organization. It would be HCL in your case.
5. Fill up the Form, click on the next button, fill your preferred procurement category and click on submit button.
6. Download the pdf Form and take a printout of the same on your Organizational Letterhead.
7. Duly Sign & Stamp on each page of the form
8. Attach One (1) Photocopy of your Organization PAN Card
9. Scan and email the same to eps.customercare@mjunction.in or Fax us at - 033 66106345.
10. Courier the hard copy to the below mentioned address
11. MJ New Office Address:
Godrej Waterside
Tower-I, 3rd floor, Plot No. 5,
Block-DP, Sector-V, Salt Lake City, Kolkata – 700091

NB: You do not require registering again for different tender enquiries of HCL. Registration on the website is free of cost.

MJ Contact Person:

Important 1: For Registration related issues, all tenderers are requested to contact M/s. Mjunction services limited, Kolkata, for free registration and obtaining User ID and Password. Please feel free to call at 033 66106426 (9.30 AM to 5.30 PM) or mail us at eps.customercare@mjunction.in for any assistance.

Important 2: For Bidding related issues, please call Mjunction on their Toll Free Helpline at 1800-419-20001 (9.30 AM to 5.30 PM). You can also use their Customer Complaint Handling Portal and log in your suggestions and complaints, if any, through this portal. You need to click on “Query” or “Complaint”, which is available in the home page. Your issues will be resolved through the CCHP portal itself.

For Urgent Escalation on EPS please contact:

Mr. Indranil Banerjee / Ms. Sakshi Saxena

Client Relationship Manager (CRM)

Mjunction services ltd

Landphone: +91 33 66106015 (Direct)

Landphone: +91 33 66106100 (Board)

Handphone: +8584008224

Facsimile: +91 33 66011719

Email: indranil.banerjee@mjunction.in / sakshi.saxena@mjunction.in

For any further details on the tender, the interested parties may contact HCL office at (033)2283-2228.

NOTE:

1. All entries in the quotation should be entered at on-line submission form without any ambiguity and can be corrected by the vendor till the date and time of closing. The last modified quotation will be taken into consideration only.
2. Quotation cannot be accessed on-line after the DUE DATE.
3. Any order resulting from this enquiry shall be governed by the following terms and conditions in addition to those mentioned in order.
4. **PRICE:** Price Bid shall be submitted through Enterprise Procurement System through Internet. Price bid of Techno-commercially acceptable tenderers ONLY as assessed by HCL shall only be evaluated. The schedule and details of e-procurement event shall be communicated by HCL/Service Provider (Mjunction Services Ltd.) to the techno-commercially accepted bidders. During the online Enterprise Procurement System, Price to be submitted in the Price Bid format On-line. The interested parties should go through Terms and Conditions of the tender before submitting their offer on-line.

The bidders should carry out mock submission of e-bid at Mjunction and screen shot of the same should be submitted in Techno Commercial bid documents.

The bidder shall fill vendor registration form in HCL's website www.hindustancopper.com and indicate the vendor code in Appendix II.

5. The bidders who strictly fulfill the Pre-qualification criteria should only submit their offer on-line on EPS mode in two parts. The Part-I shall consist of "Techno Commercial Bid" and Part-II shall be "Price Bid". The bidders, in proof of their fulfillment of Pre-qualification criteria, have to furnish the required documents off-line. The relevant documents along with the required EMD, cost of tender and a copy of tender document duly signed and stamped on each page in acceptance of all terms and conditions and relevant Annexures as mentioned in the Appendices, duly filled shall have to be sent in a sealed packet to Executive Director (Materials & Contracts), Hindustan Copper Limited, "Tamra Bhawan", 1, Ashutosh Choudhury Avenue, Kolkata – 700 019, super scribing tender enquiry no. The bidders must ensure that the above details and EMD are received by HCL before the due date of opening of bids (Part I) on EPS.

Key features in Purchase Procedures:

- Use of On-Line Enterprise Procurement System for price bid.
- Vendors can access the evaluation statement on-line after the bid evaluation is over.
- Once the Enterprise procurement is closed, tenderers shall not be allowed to revise their price and/or withdraw their offer for any reason whatsoever.

Format and Signing of Techno Commercial Bid (Part – I)

The bidder shall provide all the information sought under this tender. HCL will evaluate only those bids that are received in the prescribed formats and complete in all respects.

The bid shall be typed or written in indelible ink and signed by the authorized signatory of the bidder who shall also sign each page. The bid shall be submitted in hard bound form. In case of printed and published documents, only the cover shall be initialed. All the alterations, omissions, additions or any other amendments made to the bid shall be initialed by the person(s) signing the bid.

2.6 Sealing and Marking of Techno Commercial Bid (Part-I)

2.6.1 The bidder shall submit the following documents of **Techno Commercial Bid (Part-I)** bid in a packet bearing the TENDER no. “HCL/CO/M&C/CHAPRI/ICC/2018 Dtd 22/09/2018”:

- i. Covering letter in the format specified under the schedule as **Appendix-I**
- ii. Details of the bidder in the format prescribed at **Appendix-II**
- iii. The Bid Security in the format prescribed at **Appendix-III**, and marked as ‘**Bid Security**’ on the packet.
- iv. Power of Attorney for signing of bid in the prescribed format (**Appendix-IV A**).
- v. Power of Attorney for Lead Member of Consortium in the prescribed format (**Appendix-IV B**)
- vi. Joint Bidding Agreement/Consortium Agreement in the prescribed format (**Appendix-IV C**)
- vii. Integrity Pact Agreement (**Appendix-V & VA**)
- viii. Proof of eligibility criteria in the format prescribed at **Appendix-VI & VII**
- ix. Statement of Legal Capacity of the bidder in the format prescribed at **Appendix-VIII A**
- x. Proposed Site Organization in the format prescribed at **Appendix-VIII B**
- xi. Certificate of Site visit in the format prescribed at **Appendix-VIII C**
- xii. Screen shot of mock submission of e-bid at Mjunction at **Appendix-VIII D**.
- xiii. A copy of the tender document with each page initialed by the person signing the bid in pursuance of the power of attorney.

Part II (Price Bid) consisting of the quotation of prices shall only be done in the e tendering Portal and no packet consisting hard copy of the Price Bid shall be sent to HCL office.

2.6.2 The documents (original and/or true copy) accompanying the bid, shall be placed in hard binding and the pages shall be numbered serially. Each page thereof shall be initialized by the authorized

signatory.

- 2.6.3 The packet shall clearly bear the following identification:

“For DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPEs, at INDIAN COPPER COMPLEX, JHARKHAND, India”

and shall clearly indicate the name and address of the bidder. In addition, the bid due date should be indicated on the right hand top corner of the packet.

- 2.6.4 The packet shall be addressed to:

ATTN. OF: Executive Director (Materials & Contracts)

ADDRESS: Hindustan Copper Limited

‘Tamra Bhawan’

1, Ashutosh Chowdhury Avenue

Kolkata – 700 019

Email: dkmahajan@hindustancopper.com

- 2.6.5 If the packet is not sealed and marked as mentioned above, HCL shall not assume any responsibility for the misplacement or premature opening of the bid submitted and consequent losses, if any, suffered by the bidder.

- 2.6.6 Bids submitted by fax, telex, telegram or e-mail shall not be entertained and shall be rejected.

2.7 Bid Due Date

- 2.7.1 Due date of submission of Bid Documents is as per clause 1.13 in the e tendering portal and at the address mentioned above and in the manner and form as detailed in this TENDER.

- 2.8** HCL may, in its sole discretion, extend the bid due date by issuing an addendum/corrigendum.

2.9 Late Bids

Bids received by HCL after the **Bid Due Date** shall not be eligible for consideration and shall be summarily rejected.

2.10 Modifications/Substitution/Withdrawal of Bids

- 2.10.1 Except where expressly permitted by these instructions, the bidder shall not make or cause to be made any alteration, erasure or obliteration to the text of the documents prepared by HCL and submitted by the bidder with or as part of his bid.

- 2.10.2 No bid shall be modified, substituted or withdrawn by the bidder on its submission on the bid due date.

- 2.10.3 Withdrawal of a bid during the interval between the deadline for submission of bids and expiration of the period of bid validity specified in the bid shall result in the forfeiture of Bid Security. Forfeiture of bid security is liable to GST at applicable rate.

2.11 Rejection of Bids

- 2.11.1 Notwithstanding anything contained in the tender, HCL reserves the right to reject any bid and to annul the bidding process and reject all the bids at any time without any liability or any obligation for such rejection or annulment. In the event that HCL rejects all the bids or annuls the bidding

process, it may, in its discretion invite fresh bids.

- 2.11.2 HCL reserves the right not to proceed with the bidding process at any time, without notice or liability, and to reject any bid without assigning any reasons.

2.12 Confidentiality: Information relating to the examination, clarification, recommendation and evaluation of the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising HCL in relation to or matters arising out of, or concerning the bidding process. HCL will treat all information, submitted as part of the bid, in confidence and will require all those who have access to such material to treat the same in confidence. HCL may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/or HCL or as may be required by law or in connection with any legal process.

2.13 Correspondence with the Bidder: Save and except as provided in this tender, HCL shall not entertain any correspondence with any Bidder in relation to acceptance or rejection of any Bid.

c. BID SECURITY

2.14 Bid Security

2.14.1 The Bidder shall have to furnish Rs. 50,00,000/- (Rs.Fifty Lacs) only as part of its bid, a Bid Security in the form of a Demand Draft/Pay Order/Banker's Cheque or a bank guarantee issued by any scheduled commercial bank, drawn in favour of Hindustan Copper Limited and payable at Kolkata, in the format at **Appendix III** (in case of "**Bank Guarantee**") and having a validity period of not less than 180 (one hundred eighty) days from the Bid Due Date, inclusive of a claim period 60 (sixty) days, and which may be extended for a maximum period of another 30 (thirty) days, if required by HCL.

2.14.2 HCL shall not be liable to pay any interest on the Bid Security so made and the same shall be interest free.

2.14.3 Any bid not accompanied by the Bid Security shall be summarily rejected by HCL as non-responsive subject to exemptions, if any, indicated in the tender documents.

2.14.4 HCL shall be entitled to forfeit, invoke and appropriate the Bid Security as damages inter alia in any of the events specified below. The bidder, by submitting its bid pursuant to this tender, shall be deemed to have acknowledged and confirmed that HCL will suffer loss and damage on account of withdrawal of its bid or for any other default by the bidder during the Bid validity period as specified in this tender. No relaxation of any kind on Bid Security shall be given to any bidder. Forfeiture of bid security is liable to GST at applicable rate.

2.14.5 Under the following conditions, the Bid Security shall be forfeited, invoked as damages without prejudice to any other right or remedy that may be available to HCL under the bidding documents and/or under the Contract, or otherwise,:

- (a) If a bidder engages in a corrupt practice, fraudulent practice, coercive practice, undesirable practice.

- (b) If a bidder withdraws its bid during the period of validity of bids as specified in this tender and as extended on instructions of HCL;
- (c) In the case of selected bidder, if it fails within the specified time limit -
 - (i) to sign and return the duplicate copy of the LOI; and/or
 - (ii) To do all such acts as are required under this tender or before signing of the Contract ; and/or
 - (iii) To furnish the Performance Security within the period prescribed there for.

2.14.6 The following are exempted from submission of Cost of tender document and Bid Security:

- Public Sector Undertakings /Govt. Dept/Govt. Institutions
- Micro and Small Enterprises registered with Districts Industries Centers (DICs) / Khadi & Village Industries Commissions (KVIC) / Khadi & Village Industries Board (KVIB) / Coir Board/NSIC/Directorate of Handicrafts and Handloom or any other body specified by Ministry of Micro, Small & Medium Enterprises (MoMSME).

Documentary evidence for the above should be submitted by the bidder for availing the exemption.

In case bid is submitted by a Consortium not having all the members as mentioned above, no benefit for exemption from payment of cost of tender and EMD shall be extended.

2.14.7 Refund of Bid Security

The EMD provided by the Bidders along with the Bids should be returned to the unsuccessful Bidders within 30 days from the date of opening of price Bid / placement of purchase order / signing of the job contract, whichever is earlier.

In case of selected Bidder, Bid security will be retained till Performance Security as per Contract is submitted, subject to extension of the validity as per the requirement.

In the event of the Bid of any party is rejected during the course of Techno-Commercial scrutiny and evaluation, the EMD should be returned to such Bidder immediately within seven days from the date of rejection of their offer.

2.15 **BID PRICES**

In the price bid, the bidder shall include all elements of cost strictly as per the scope of work specified in technical specification. The price shall be item wise in accordance with and as stated in the specification. The bidder will be responsible for complete execution of the job as specified in the scope of work. The rate quoted should be valid for 180 days.

The bidder shall give the detail price schedule taking into consideration of all the element of work and services as covered under the scope of work.

Quoted Price should be in figure.

The Contract Price is in accordance with commercial terms & conditions, stipulations, specifications, requirements and other conditions of the Contract for the estimated quantities of work and firm unit rates as given in Schedule of items.

Total Quoted Price of bidder shall include basic price, all taxes & duties, levies, freight, Insurance etc. as applicable on base date but excluding GST.

Bidders shall quote for the entire scope on a “single responsibility” basis such that the total bid price covers all the Contractor’s obligations mentioned in or to be reasonably inferred from the tender documents in respect of the **engineering, procurement, erection, testing, commissioning, construction, Insurance, mine development, ore production and execution of all the facilities in relation to the Project as defined in technical specification.** This includes all requirements under the Contractor’s responsibilities for testing, pre- commissioning and commissioning of the equipment, insurance, training of Purchaser’s personnel, commissioning spares, initial fill and Lubricants, special tools and tackles, where so required by the tender documents, the acquisition of all permits, approvals and licenses, etc. up to commissioning and such other items and services as may be specified in the tender documents. Items against which no price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items. The bidder will execute/supply such item(s) without claiming any extra amount.

Bidders are required to quote the price for the commercial and technical obligations outlined in the bidding documents. Deviations shall not be allowed for this package.

Bidders must clearly mention their Income Tax Permanent Account Number (PAN) and Bank Account Number in the offer.

Supplies & Services quoted in Indian Rupee shall be quoted on “**HCL, Chapri Site**” basis. **Base Date of the Contract Price shall be the date of opening of Part I (Techno Commercial Bid) of the tender.**

Bidders to quote in the “Price Schedule” in Indian Rupees only.

3. EVALUATION OF BIDS

3.1 Opening and Evaluation of Bids

- 3.1.1 HCL shall open the Techno Commercial Bid (Part – I) on e-tendering portal and hard copy documents of Part I received by post at HCL, as per schedule given in clause 1.13 in the presence of the bidders who choose to attend. However, in the eventuality that the day of opening of the bids becomes a non-working day due to a force majeure event, the date of opening of the bids will shift to the next working day at the same time.

Part II of the bid (“Price Bid”) shall be opened in the e-tendering portal for those bidders who qualify techno-commercially as per qualifying criteria of the tender. The date and time of opening of Price Bid (Part – II) shall be communicated in due course of time.

- 3.1.2 To facilitate evaluation of bids, HCL may, in its sole discretion, seek clarifications in writing from any / all Bidder(s) regarding its Bid.

3.2 Selection of Bidder

- 3.2.1 The bidder whose bid is adjudged as responsive and quoting the lowest Contract Price evaluated on the basis of quantities in Schedule of Quantity and rate, for implementation of the Work shall be declared as the selected bidder (the “**Selected Bidder**”).

Bids will be invited for the Project on the basis of the **lowest total lump sum fee** (“Contract Price”) required by a Bidder for executing the Project. Bidders shall be required to quote in the Price Bid the Contract Price that shall be charged by them for the execution of the Project. The Contract Price amount shall constitute the sole criteria for evaluation of Bids. The Project shall be awarded to the Bidder quoting the lowest Contract Price. In this tender document, the term “**Lowest Bidder**” shall mean the Bidder seeking the lowest Contract Price.

Bidder shall quote for total/all items of price schedule.

Bidder to quote in the “Price Schedule” in Indian Rupees only.

Evaluation shall be done on Total Quoted price of Price Schedule which includes Basic price, all taxes & duties, levies, freight, Insurance etc. but excluding GST.

Price for Open items shall not be considered for Evaluation of Price bids.

- 3.2.2 After selection, a Letter of Intent (the “**LOI**”) shall be issued, in duplicate, by HCL to the selected bidder and the selected bidder shall, within 7 (seven) days of the receipt of the LOI, sign and return the duplicate copy of the LOI in acknowledgement thereof. In the event the duplicate copy of the LOI duly signed by the selected bidder is not received within the stipulated time, HCL may, unless it consents to extension of time for submission thereof, appropriate/invoke the Bid Security of such bidder as damages on account of failure of the selected bidder to acknowledge the LOI. No correspondence will be entertained by HCL from the unsuccessful bidders. Forfeiture of bid security is liable to GST at applicable rate.
- 3.2.3 After acknowledgement of the LOI as aforesaid by the selected bidder, it shall cause the selected bidder to execute the Contract within the period of thirty (30) days. The Selected Bidder shall not be entitled to seek any deviation, modification or amendment in the Contract.
- 3.2.4 Upon “Letter of Intent” being signed and returned by the successful Bidder, HCL will discharge/return bid security to other unsuccessful bidders.
- 3.2.5 The selected bidder shall, for the due and proper performance and fulfillment of its obligations during the contract period of the Work, provide an irrevocable and unconditional bank guarantee from any scheduled commercial bank in India, in favour of HCL, for a sum equivalent to 10 (ten) % of the total contract amount in the form set-forth in the Contract (the “**Performance Security Deposit**”). Performance Security Deposit in any other format is not acceptable. Payment shall not be released if PSD has not been deposited in totality. The Performance Security Deposit(PSD) shall remain valid for a period of **76 months** from the Appointed date and will be renewed subsequently as per Article 6 of NIT. The selected bidder shall further extend the validity of its Performance Security Deposit, if so required by HCL.

The said Performance Security Deposit shall be provided by the selected bidder within **30 (thirty) days** of the Appointed date. In the event, the selected bidder fails to provide the said Performance Security within the time period stipulated herein, HCL may forfeit the Bid Security submitted by the selected bidder along with their bid. Forfeiture of bid security is liable to GST at applicable rate.

4. FRAUD AND CORRUPT PRACTICES

- 4.1 The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process and subsequent to the issue of the LOI and during the subsistence of the Contract. Notwithstanding anything to the contrary contained herein, or in the LOI or the Contract, HCL shall reject a Bid, withdraw the LOI, or terminate the Contract, as the case may be, without being liable in any manner whatsoever to the Bidder or Selected Bidder, as the case may be, if it determines that the Bidder or Selected Bidder, as the case may be, has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process. In such an event, HCL shall forfeit and appropriate the Bid Security or Performance Security, as the case may be, as damages, without prejudice to any other right or remedy that may be available to HCL under the Bidding Documents and/or the Contract, or otherwise. Forfeiture of bid security or Performance Security is liable to GST at applicable rate.
- 4.2 Without prejudice to the rights of HCL under clause 4.1 hereinabove and the rights and remedies which HCL may have under the LOI or the Contract, if a Bidder or Selected Bidder, as the case may be, is found by HCL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bidding Process, or after the issue of the LOI or the execution of the Contract, such Bidder or Selected Bidder shall not be eligible to participate in any tender or request for proposal issued by HCL during a period of 2 (two) years from the date such Bidder or Selected Bidder, as the case may be, is found by HCL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.
- 4.3 For the purposes of this clause 4, the following terms shall have the meaning hereinafter respectively assigned to them:
- (a) “corrupt practice” means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of HCL who is or has been associated in any manner, directly or indirectly with the Bidding Process or the LOI or has dealt with matters concerning the Contract, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of HCL, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process); or (ii) engaging in any manner whatsoever, whether during the Bidding Process or after the issue of the LOI or after the execution of the Contract, as the case may be, any person in respect of any matter relating to the Project or the LOI or the

Contract, who at any time has been or is a legal, financial or technical adviser of HCL in relation to any matter concerning the Project;

- (b) “fraudulent practice” means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process ;
- (c) “coercive practice” means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person’s participation or action in the Bidding Process;
- (d) “undesirable practice” means (i) establishing contact with any person connected with or employed or engaged by HCL with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and
- (e) “restrictive practice” means forming a cartel or arriving at any understanding or arrangement among the Bidders with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

5. PRE-BID CONFERENCE

5.1 Pre-Bid conference of the Bidders shall be convened at a designated date, time and at the Corporate office of HCL at Kolkata, as per schedule specified at clause 1.13. A maximum of two representatives of each Bidder shall be allowed to participate.

5.2 During the course of the pre-Bid conference, the Bidders will be free to seek clarifications and make suggestions for consideration of HCL. HCL shall endeavour to provide clarifications and such further information as it may, in its sole discretion, consider appropriate for facilitating a fair, transparent and competitive Bidding Process.

5.3 The Bidders are requested to submit any question/query by email to reach HCL as per 1.13 Schedule of Bidding Process. Bidders desirous of obtaining clarifications on clauses of the tender enquiry (Technical as well as Commercial) are requested to send their questions/queries for clarifications at least 5 days prior to date of pre-bid conference and also ensure their participation in the pre bid conference. The purpose of the pre-bid conference will be to clarify the issues raised by the bidders. However, HCL shall not be obliged to respond any queries which it receives after above deadline. Any modifications of the tender document which may become necessary as a result of Pre-bid conference shall be made exclusively through the issue of Addendum/Corrigendum, if any, and will be uploaded on websites of www.hindustancopper.com and it shall become part of the bidding documents. However, in case any query remains un-replied, it shall be construed that in respect of those queries, the respective stipulation of the tender document shall continue to apply and/or no new stipulations made w.r.t. those queries.

5.4 Non-attendance at the pre-bid conference will not be a cause for disqualification of a Bidder.

6.0 MISCELLANEOUS

- 6.1 The Bidding Process shall be governed by and construed in accordance with the laws of India and the courts at Ghatsila, Jharkhand shall have exclusive jurisdiction over all disputes arising under, pursuant to and/ or in connection with the Bidding Process.
- 6.2 HCL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to;
- (a) suspend and/or cancel the Bidding Process and/or amend and/or supplement the Bidding Process or modify the dates or other terms and conditions relating thereto;
 - (b) consult with any Bidder in order to receive clarification or further information;
 - (c) retain any information and/ or evidence submitted to HCL by, on behalf of, and/ or in relation to any Bidder; and/ or
 - (d) independently verify, disqualify, reject and/ or accept any and all submissions or other information and/ or evidence submitted by or on behalf of any Bidder.
- 6.3 It shall be deemed that by submitting the Bid, the Bidder agrees and releases HCL, its employees, agents and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/ or performance of any obligations hereunder, pursuant hereto and/ or in connection herewith and waives any and all rights and/ or claims it may have in this respect, whether actual or contingent, whether present or future.

APPENDIX - I
Covering Letter
(To be placed in Part I of the Bid)

Date:

Executive Director (Materials & Contracts)

Hindustan Copper Limited
1, Ashutosh Chowdhury Avenue
Kolkata – 700019

Sub: Bid For DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND

Dear Sir,

With reference to your tender no. dated xx.xx.2018, I/We, having examined the Bidding Documents and understood their contents, hereby submit my/our Bid for the aforesaid Work in prescribed format. The Bid is unconditional and unqualified.

1. I/We acknowledge that HCL will be relying on the information provided in the Bid and the documents accompanying the Bid for selection of the Selected Bidder for the aforesaid Work, and we certify that all information provided therein is true and correct and nothing has been omitted which renders such information misleading and all documents accompanying the Bid are true copies of their respective originals.
2. This statement is made for the express purpose of qualifying as a Selected Bidder for the implementation of the aforesaid Work.
3. I/ We shall make available to HCL any additional information it may find necessary or require to supplement or authenticate the Bid.
4. I/ We acknowledge the right of HCL to reject our Bid without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.
5. I/ We declare that:
 - (a) I/ We have examined and have no reservations to the Bidding Documents, including any addendum issued by HCL; and
 - (b) I/ We do not have any Conflict of Interest and
 - (c) I/We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, in respect of any tender or request for proposal issued by or any agreement entered into with HCL or any other public sector enterprise or any government, Central or State; and
 - (d) I/ We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf has engaged or will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.
 - (e) the undertakings given by me/us along with the offer in response to the Tender for the Work were true and correct as on the date of making the Tender and are also true and correct as on the Bid Due Date and I/we shall continue to abide by them.

6. I/ We understand that you may cancel/annul the Bidding Process at any time and that you are neither bound to accept any Bid that you may receive nor to invite the Bidders to Bid for the Work, without incurring any liability to the Bidders.
7. I/ We certify that in regard to matters other than security and integrity of the country, have not been convicted or indicted by a court of law and no adverse orders have been passed by a regulatory authority which could cast a doubt on our ability to undertake the Work or which relates to a grave offence that outrages the moral sense of the community.
8. I/ We further certify that in regard to matters relating to security and integrity of the country, we have not been charge-sheeted by any agency of the government or convicted by a court of law for any offence committed by us or by any of our Associates.
9. I/ We further certify that no investigation by a regulatory authority is pending either against us or against our Associates or against our CEO or any of our Directors/ managers/ employees.
10. I/ We undertake that in case due to any change in facts or circumstances during the Bidding Process the provisions of disqualification in terms of the guidelines referred to above are attracted, we shall intimate HCL of the same immediately.
11. We further agree and acknowledge that the aforesaid obligations shall be in addition to the obligations contained in the Contract.
12. I/We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by HCL in connection with the selection of the Bidder, or in connection with the Bidding Process itself, in respect of the above mentioned Work and the terms and implementation thereof.
13. In the event of my/our being declared as the Selected Bidder, I/We agree to enter into a Contract in accordance that has been provided to me/us prior to the Bid Due Date. We agree not to seek any changes in the aforesaid Contract and agree to abide by the same.
14. I/We have studied all the Bidding Documents carefully and have also surveyed the Work site. We understand that except to the extent as expressly set forth in the tender and/or Contract, we shall have no claim, right or title arising out of any documents or information provided to us by HCL or in respect of any matter arising out of or concerning or relating to the Bidding Process including the award of the Contract.
15. The Contract Price has been quoted by me/us after taking into consideration all the terms and conditions stated in the tender, Contract, our own estimates of costs and after a careful assessment of the site and all the conditions that may affect the work cost and implementation of the Work.
16. I/We offer a bid security of Rs. 50,00,000/- only to HCL in accordance with the tender.
17. The Bid security in the form of a Demand Draft/Pay Order/Banker's Cheque/Bank Guarantee (strike out whichever is not applicable) is attached.
18. In the event of I/We being declared as Selected Bidder, I/We hereby undertake and agree to provide an irrevocable and unconditional bank guarantee as Performance Security Deposit in favour of HCL within 30 (thirty) days from the Appointed date as per the tender.

19. I/ We agree and understand that the Bid is subject to the provisions of the Bidding Documents. In no case, I/we shall have any claim or right of whatsoever nature if the Work is not awarded to me/us or our Bid is not opened or rejected.
20. I/We agree to keep this offer valid for 180 (one hundred and eighty) days from the Bid Due Date specified in the tender and may be extended by another 30 (thirty) days, if required by HCL.
21. I/ We hereby submit our Bid for undertaking the aforesaid work in accordance with the Bidding Documents and the Contract. The prices of each item aggregating to the Contract Price are quoted by me/us as provided in the schedule annexed hereto. The said Contract Price shall be payable over the execution period and as set out in Contract. The RA bills can be payable only after receipt of security deposit.
22. I/We hereby confirm that no change has been made in any of the formats attached with tender.
23. I/We agree and undertake to abide by all the terms and conditions of the tender and confirm that there is no deviation in the terms and conditions.

In witness whereof, I/we submit this Bid under and in accordance with the terms of the tender.

Yours faithfully,

Date:

(Signature of the Authorized signatory)

Place:

(Name and designation of the of the Authorized signatory)
Name and seal of Bidder

APPENDIX - II
DETAILS OF BIDDER

(In case of Consortium, details of the Lead Member & other Members of the Consortium to be given in separate sheets)

1. IN CASE OF INDIVIDUAL:

- 1.1 Name
- 1.2 Registration details, if any
- 1.3 Date of commencement of business
- 1.4 Permanent Account Number (PAN)
- 1.5 GST registration number
- 1.6 Copies of Balance sheet and Profit & loss account
- 1.7 Vendor registration number at HCL website

2. IN CASE OF PARTNERSHIP:

- 2.1 Name of Partners
- 2.2 Whether the Partnership is registered or not.
- 2.3 Date of establishment of firm
- 2.4 Permanent Account Number (PAN)
- 2.5 GST registration number
- 2.6 Copies of Balance sheet and Profit & loss account
- 2.7 Vendor registration number at HCL website

3. IN CASE OF LIMITED COMPANY:

- 3.1 Amount of paid-up capital
- 3.2 Name of Directors
- 3.3 Date of Registration of Company
- 3.4 Permanent Account Number (PAN)
- 3.5 GST registration number
- 3.6 Copies of the Balance sheet and Profit & loss account
- 3.7 Vendor registration number at HCL website

(Signature, name and designation of the Authorized Signatory)

Place:

Date:

Name and Seal of the Bidder

APPENDIX – III

Bank Guarantee for Bid Security (To be placed in Part I of the Bid)

In consideration of you, Hindustan Copper Limited, having its office at 1, Ashutosh Chowdhury Avenue, Kolkata – 700019 (hereinafter referred to as “**HCL**”, which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns) having agreed to receive the Bid of _____ a Company registered under the provision of the Companies Act, 1956 and having its registered office at _____ (and acting on behalf of its consortium, if applicable) (hereinafter referred to as the “**Bidder**” which expression shall unless it be repugnant to the subject or context thereof include its/their executors, administrators, successors and assigns), for _____, (name of the work) _____ in accordance with the tender (hereinafter referred to as “the **Work**”) pursuant to the tender dated _____ issued in respect of the Work and other related documents (hereinafter collectively referred to as “Bidding Documents”), we, _____ (indicate the name of the bank), (hereinafter referred to as the “**Bank**”) at the request of _____ (Bidder), do hereby undertake to pay HCL an amount not exceeding Rs. _____ (**Rupees** _____ **only**) against any loss or damage caused to or suffered or would be caused to or suffered by HCL by reason of any breach by the said Bidder of any of the terms or conditions contained in the Bidding Documents.

1. We _____ (indicate the name of the bank) do hereby undertake to pay the amount due and payable under this guarantee without any demur, merely on a demand from HCL stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by HCL by reason of breach by the said Bidder of any of the terms or conditions contained in the Bidding Documents or by reason of the Bidder’s failure to fulfill or comply with all or any of the terms and conditions contained in the said Bidding Documents. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs _____ (**Rupees** _____ **only**). The Bank shall be liable to pay the said amount or any part thereof only if HCL serves a written claim on the Bank, on or before _____ (indicate date falling 240 days after the Bid Due Date).
2. We, the Bank, further agree that HCL shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfillment and compliance with the terms and conditions contained in the Bidding Documents including, inter alia, the failure of the Bidder to keep its Bid open during the Bid validity period set forth in the said Bidding Documents, and the decision of HCL that the Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any differences between HCL and the Bidder or any dispute pending before any court, tribunal, arbitrator or any other authority. Further, we undertake to pay to HCL any money so demanded notwithstanding any dispute or disputes raised by the Bidder(s) in any suit or proceeding pending before any court or tribunal/relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Bidder shall have no claim against us on making such payment.

3. We, _____ (indicate the name of the bank) further agree that the guarantee herein contained shall be irrevocable and remain in full force and effect for a period of 240 (two hundred and forty) days from the Bid Due Date inclusive of a claim period of 60 (Sixty) days or as extended for a maximum period of another 90 (Ninety) days as required by HCL and shall continue to be enforceable till all the dues of HCL under or by virtue of the said Bidding Documents have been fully paid and its

claims satisfied or discharged or the _____ (office/Department) certifies that the terms and conditions of the said Bidding Documents have been fully and properly carried out by the said Bidder and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ we shall be discharged from all liability under this guarantee thereafter.

4. We, _____ further agree with HCL that HCL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms & conditions of the said Bidding Documents or to extend the validity period of this guarantee or to postpone for any time or from time to time any of the powers exercisable by HCL against the said Bidder and to forebear or enforce any of the terms and conditions relating to the said Bidding Documents and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Bidder or for any forbearance, act or commission on the part of HCL or any indulgence by HCL to the said Bidder or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
5. This guarantee will not be discharged due to the change in the constitution or winding up of the Bidder or the Bank or any absorption, merger or amalgamation of the Bidder or the Bank with any other person.
6. It shall not be necessary for HCL to proceed against the said Bidder before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which HCL may have obtained from the said Bidder or any other person and which shall, at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealized.
7. We, _____ (indicate the name of the Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of HCL in writing.

Dated the _____ Day of _____

For _____
(Indicate the name of bank)

APPENDIX – IV A
Power of Attorney for signing of Bid
(To be placed in Part I of the Bid)

Know all men by these presents, We, _____ (name of the company and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorize Mr. / Ms _____, son/daughter/wife of _____ and presently residing at _____, who is holding the position of _____], as our true and lawful attorney (hereinafter referred to as the “Attorney”) to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Bid for the “ [insert name of the work]” proposed by the Hindustan Copper Limited (“HCL”) including but not limited to signing and submission of all Tenders, Bids and other documents and writings, participation in Bidders' and other conferences and providing information / responses to HCL, representing us in all matters before HCL, signing and execution of all contracts including the Contract and undertakings consequent to acceptance of our Bid, and generally dealing with HCL in all matters in connection with or relating to or arising out of our Bid for the said Work and/or upon award thereof to us and/or till the execution of the Contract with HCL.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this power of attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, _____, THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ____DAY OF _____, 2018.

For _____

(Signature)

(Name, Title and Address)

Witnesses: 1.
 2.

Accepted

[Notarized]

(Signature)

(Name, Title and Address of the Attorney)

Notes:

- *The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executants (s) and when it is so required, the name should be under common seal affixed in accordance with the required procedure.*
- *Also, wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a resolution/power of attorney in favour of the person executing this power of attorney for the delegation of power hereunder on behalf of the Bidder.*

APPENDIX – IV B

Power of Attorney for Lead Member of Consortium

(To be placed in Part I of the Bid)

Whereas the Hindustan Copper Limited (“HCL”) has invited Bids from bidders for DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND

Whereas, _____, and _____ (collectively the “Consortium”) being members of the Consortium are interested in bidding for the Project in accordance with the terms and conditions of the NIT and other connected documents in respect of the work, and

Whereas, it is necessary for the members of the Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium’s Bid for the entire work and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, M/s-----, having our registered office at _____ and M/s. _____, having our registered office at _____, [the respective names and addresses of the registered office] (hereinafter collectively referred to as the “Principals”) do hereby irrevocably designate, nominate, constitute, appoint and authorise M/s _____, having its registered office at _____, being one of the members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the “Attorney”) and hereby irrevocably authorise the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Consortium and any one of us during the Bidding Process and, in the event the Consortium is awarded the Contract, during the execution of the entire work, and in this regard, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the submission of its Bid for the entire work, including but not limited to signing and submission of all applications, Bids and other documents and writings, participation in Bidders’ and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the Bid of the Consortium and generally to represent the Consortium in all its dealings with HCL, and/ or any other government agency or any person, in all matters in connection with or relating to or arising out of the Consortium’s Bid for the entire work and/ or upon award thereof till the Contract is entered into with HCL.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this power of attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ Consortium.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS _____ DAY OF _____ 20**.

For _____

(Name & Title)

For _____

(Name & Title)

Witnesses:

1.

2.

(Executants)

(To be executed by all the Members of the Consortium)

Notes:

- 1) The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.
- 2) Also, wherever required, the Consortium members should submit for verification the extract of the charter documents and documents such as a resolution/ power of attorney in favour of the person executing this power of attorney for the delegation of power hereunder on behalf of the Consortium members.

APPENDIX – IV C

Joint Bidding Agreement /Consortium Agreement

(To be placed in Part I of the Bid)

(To be executed on Non-Judicial Stamp Paper of appropriate value)

This Joint Bidding Agreement /Consortium Agreement (the “AGREEMENT”) made at _____ on this ____ day of _____, 2018

AMONGST

{_____ Limited, a company incorporated under the companies Act, 1956} and having its registered office at _____ (herein after referred to as “**First Part**”, which expression shall unless repugnant to the context include its successors and permitted assigns)

AND

{_____ Limited, a company incorporated under the companies Act, 1956} and having its registered office at _____ (herein after referred to as “**Second Part**”, which expression shall unless repugnant to the context include its successors and permitted assigns)

The above mentioned parties of the FIRST and SECOND PART are collectively referred to as the “**Parties**” and each is individually referred to as a “**Party**”.

WHEREAS:

- A. **Hindustan Copper Limited (HCL)**, invites applications by its NIT for short-listing of bidders For **DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND**, (hereinafter referred to as the “work”)
- B. The Parties are interested in jointly bidding for the work as members of a Consortium and in accordance with the terms and conditions of the NIT, and
- C. It is necessary condition under the NIT that the members of the Consortium shall enter into a Joint Bidding Agreement and furnish a copy thereof with the Application.

NOW IT IS HEREBY AGREED as follows:

1. Definitions and Interpretations

In this Agreement, the capitalised term shall, unless the context otherwise requires, have the meaning ascribed thereto under the bidding document .

2. Consortium

- a) The Parties do hereby irrevocably constitute a consortium (the “**Consortium**”) for the purpose of jointly participating in the Bidding Process for the Project
- b) The Parties hereby undertake to participate in the Bidding Process only through this Consortium and not individually and/ or through any other Consortium constituted for this Project, either directly or indirectly or through any of their Constituents.

3. Covenants

The Parties hereby undertake that in the event the Consortium is declared the selected Bidder and awarded the Work, it shall enter into an Agreement with HCL and for performing all its obligations as the developer in terms of the Agreement for the work.

4. Roles of the Parties

The Parties hereby undertake to perform the roles and responsibilities as described below:

- a. Party of the First Part shall be the Lead member of the Consortium and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Consortium during the Bidding Process and under the Agreement when all the obligations under the agreement shall become effective. The role of First Part shall (in the event that it is a technical member) be _____, or (in the event that it is a financial member) be _____.
- b. Party of the Second Part shall be the Financial / Technical Member {delete as appropriate, based on who is being nominated as the Lead Member} and the role of Second Part shall be _____.

5. Joint and Several Liability

The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the work and in accordance with the terms of the NIT and the Agreement.

Leader of the consortium shall be overall responsible for the execution of the Contract. The Leader and other Members of the Consortium shall be jointly and severally liable for the execution of the Contract, but will be liable for damages in proportion of the respective Contract Price. Each Member shall have a price for his scope of work.

The leader shall be authorised to incur liabilities and receive instructions and payment for and on behalf of any & all members of the consortium.

6. Representation of the Parties

Each Party represents to the other Parties as of the date of this Agreement that:

- a) Such Party is duly organized, validly existing and in good standing under the laws of its incorporation and has all requisite power and authority to enter into this Agreement;
- b) The execution, delivery and performance by such Party of this Agreement has been authorised by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution/ power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Consortium member is annexed to this Agreement, and will not, to the best of this knowledge
 - i. require any consent or approval not already obtained;
 - ii. violate any Applicable Law presently in effect and having applicability to it;

- iii. violate any clearance, permit, concession, grant, license or other governmental authorisation, approval, judgement, order or decree or any mortgage agreement, indenture or any other instrument to which such Party is a party or by which such Party or any of its properties or assets are bound or that is otherwise applicable to such Party; or
- iv. create or impose any liens, mortgages, pledges, claims, security, interests, charges or Encumbrances or obligations to create a lien, charge, pledge, security interest, encumbrances or mortgage in or on the property of such Party, except for encumbrances that would not, individually or in the aggregate, have a material adverse effect on the financial condition or prospects or businesses of such Party so as to prevent such Party from fulfilling its obligations under this Agreement;
- v. this Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and
- vi. there is no litigation pending, or to the best of such Party's knowledge, threatened to which it or any of its Affiliates is a party that presently affects or which would have a material adverse effect on the financial condition or prospects or business of such Party in the fulfillment of its obligations under this Agreement

7. Termination

In case the work is awarded to the Consortium, this Agreement shall be effective from the date hereof and shall continue in full force and effect till the execution of the Completion of the work plus defect liability period as specified under the Agreement. However, in case the Consortium does not get selected for award of the work, the Agreement will stand terminated and Bid Security will be returned by HCL to the Bidder.

8. Miscellaneous

- a) This Joint Bidding Agreement shall be governed by laws of India.
- b) The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior written consent of HCL.

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED

For and on behalf of Lead Member by:

Signature:

Name & Designation:

Address:

For and on behalf of Second Part by: _____
Signature: _____
Name & Designation: _____
Address: _____

Note:

- *The mode of execution of the Consortium Agreement/Joint Bidding Agreement should be in accordance with the procedure, if any laid down by the applicable law and the charter documents of the executants(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*

APPENDIX – V

(To be placed in Part I of the Bid)

INTEGRITY PACT

The Integrity Pact (“**Pact**”) essentially envisages an agreement between the Bidder and the owner (“**HCL**”), committing the persons/officials of both the parties, not to exercise any corrupt influence on any aspect of the Contract. Only those Bidders who have entered into such a Pact with the HCL would be qualified to submit their bids. In other words, entering into this Pact would be a preliminary qualification. The Pact shall be effective from the stage of invitation of Bids till the execution of the Contract. Thereafter, the Selected Bidder shall be required to execute a separate Integrity Pact, which shall form part of, and be appended to the Contract.

The Pact envisages a panel of Independent External Monitors (“**IEM**”) approved for HCL. The IEM is to review independently and objectively, whether and to what extent the parties have complied with their obligations under the Pact. It has right of access to all Work documentation. The IEM may examine any complaint received by it and submit a report to the CMD of HCL, at the earliest. He may also submit a report directly to the Chief Vigilance Officer and the Central Vigilance Commission, in case of suspicion of serious irregularities attracting the provisions of the Prevention of Corruption Act. However, even though the Contract may be covered by the Pact, the Central Vigilance Commission may, at its discretion, have any complaint received by it relating to such a Contract, investigated.

The IEM on the advice of CVC has been appointed by HCL, who has been assigned by HCL to oversee implementation of the Pact relating to the Contract, in line with the terms and conditions of the Integrity Pact Agreement, to be signed between the Bidder and HCL.

APPENDIX - VA
INTEGRITY PACT AGREEMENT

Between

Hindustan Copper Limited (HCL) hereinafter referred to as “the Principal”

and

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

Preamble

The Principal intends to award, under laid down organizational procedures, Contract/s of “[insert name of the work]”. The Principal values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relations with its Bidder(s).

In order to achieve these goals, the Principal has appointed Sri M.K.Deshmukh and Sri Narendra Kothari an Independent External Monitors (IEMs), who will monitor the tender Process and the execution of the Contract for compliance with the principles mentioned above.

Section I – Commitments of the Principal

- (1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-
 - a. No employee of the Principal, personally or through family members, will in connection with the bidding , or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - b. The Principal will, during the Bidding Process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the Bidding Process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/additional information through which the Bidder(s) could obtain an advantage in relation to the Bidding Process or the Contract execution.
 - c. 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 Indian Penal Code / Prevention of Corruption Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)

- (1) The Bidder(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Bidding Process and during the Contract execution.

The Bidder(s) will not, directly or through any other person or company, offer, promise or give to any of the Principal’s employees involved in the Bidding Process or the execution of the Contract

- a. or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Bidding Process or during the execution of the Contract.
- b. The Bidder(s) 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 cartelization in the Bidding Process.

- c. The Bidder(s) will not commit any offence under the Indian Penal Code / Prevention of Corruption Act; further the Bidder(s) 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.
 - d. The Bidder(s) 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(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from Bidding Process and exclusion from future contracts

If the Bidder(s), before award or during execution has committed a transgression through a violation of Section 2, above or in any other form such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s) from the Bidding Process or take action as per the procedure mentioned in the “Guidelines on Banning of Business Dealings”.

Section 4 – Compensation for damages

- a. If the Principal has disqualified the Bidder(s) from the Bidding Process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Bid Security.
- b. 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 Bidder, liquidated damages/penalties of the Contract value or the amount equivalent to Performance Security.

Section 5 – Previous transgression

- a. The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti corruption approach or with any other public sector enterprise in India that could justify his exclusion from the Bidding Process.
- b. If the Bidder makes incorrect statement on this subject, he can be disqualified from the Bidding Process or action can be taken against them as per the procedure mentioned in “Guidelines on Banning of Business Dealings”.

Section 6 - Equal treatment of all Bidders

- a. The Bidder(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact Agreement, and to submit it to the Principal before execution of the Contract.
- b. The Principal will enter into agreements with identical conditions as this one with all Bidders,
- c. The Principal will disqualify from the Bidding Process all Bidders who do not sign this Integrity Pact Agreement or violate its provisions.

Section 7 – Criminal charges against violating Bidder(s)

If the Principal obtains knowledge of conduct of a Bidder or of an employee or a representative or an Associate of a Bidder which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer of the same.

Section 8 - Independent External Monitor/Monitors

- a. The Principal has appointed competent and credible Independent External Monitor (“IEM”) for this Integrity Pact Agreement. The task of the IEM is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- b. The IEM is not subject to instructions by the parties/ their representatives and performs its functions neutrally and independently. It reports to the Chairman- cum-Managing Director of HCL.
- c. The Bidder(s) accepts that the IEM has the right of access without restriction to all Work documentation of the Principal .The Bidder will also grant the IEM, upon its request and demonstration of a valid interest, unrestricted and unconditional access to his Work documentation. The same is applicable to Subcontractors. The IEM is under a contractual obligation to treat the information and documents of the Bidder(s) with confidentiality.
- d. The Principal will provide to the IEM sufficient information about all meetings among the parties related to the Work provided that such meetings could have an impact on the contractual relations between the Principal and the Bidders. The parties offer to the IEM the option to participate in such meetings.
- e. As soon as the IEM notices, or believes, that there is a violation of this Integrity Pact Agreement, it will so inform the management of the Principal and request the management to discontinue or take corrective action, or to take other relevant action. The IEM can, in this regard, submit non-binding recommendations. Beyond this, the IEM has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- f. The IEM will submit a written report to the Chairman-cum-Managing Director of HCL 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.
- g. The IEM shall be entitled to compensation on the same terms as being extended to/provided to Independent Directors of HCL.
- h. If the IEM has reported to the Chairman-cum-Managing Director of HCL, a substantiated suspicion of an offence under relevant Indian Penal Code/PC Act, and the Chairman-cum-Managing Director of HCL has not, within reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the IEM may also transmit this information directly to the Central Vigilance Commissioner.

Section 9 - Pact Duration

This Integrity Pact Agreement begins when both parties have legally signed it. It expires for the Selected Bidder 12 (twelve) months after the last payment under the Contract, and for all other Bidders 6 (six) 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 Integrity Pact Agreement as specified above, unless it is discharged/determined by Chairman-cum-Managing Director of HCL.

Section 10 - Other provisions

- a. This agreement is subject to Indian laws. Place of performance and jurisdiction is the registered office of the Principal, i.e. Kolkata.
- b. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- c. 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 as to their original intentions.

(For & On behalf of the Principal)
(Office Seal)

(For & On behalf of the Bidder)
(Office Seal)

Witness 1: _____
(Name & Address) _____

Witness 2: _____
(Name & Address) _____

GUIDELINES FOR INDIAN AGENTS OF FOREIGN SUPPLIERS

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with HCL Plants/Units shall apply for registration in the prescribed Application –Form.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/remuneration/salary/ retainer ship being paid by the principal to the agent before the placement of order by HCL Plants/Units.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order

2.0 DISCLOSURE OF PARTICULARS OF AGENTS/ REPRESENTATIVES IN INDIA. IF ANY.

- 2.1 Tenderers of Foreign nationality shall furnish the following details in their offer:
- 2.1.1 The name and address of the agents/representatives in India, if any and the extent of authorization and authority given to commit the Principals. In case the agent/representative be a foreign Company, it shall be confirmed whether it is real substantial Company and details of the same shall be furnished.
- 2.1.2 The amount of commission/remuneration included in the quoted price(s) for such agents/representatives in India.
- 2.1.3 Confirmation of the Tenderer that the commission/ remuneration if any, payable to his agents/representatives in India, may be paid by HCL in Indian Rupees only.
- 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
- 2.2.1 The name and address of the foreign principals indicating their nationality as well as their status, i.e, whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/representatives.
- 2.2.2 The amount of commission/remuneration included in the price (s) quoted by the Tenderer for himself.
- 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/remuneration, if any, reserved for the Tenderer in the quoted price (s), may be paid by HCL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items .
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission /remuneration, if any payable to the agents/representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph-2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by HCL. Besides this there would be a penalty of banning business dealings with HCL or damage or payment of a named sum.

GUIDELINES ON BANNING OF BUSINESS DEALINGS

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6.	Ground on which Banning of Business Dealing can be initiated
7.	Banning of Business Dealings
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10.	Appeal against the Decision of the Competent Authority
11.	Review of the Decision by the Competent Authority
12.	Circulation of the names of Agencies with whom Business Dealings have been banned

1. Introduction

- 1.1 Hindustan Copper Limited (HCL), being a Public Sector Enterprise and 'State', within the meaning of Article 12 of Constitution of India, has to ensure preservation of rights enshrined in Chapter III of the Constitution. HCL has also to safeguard its commercial interests. HCL deals with *Agencies*, who have a very high degree of integrity, commitments and sincerity towards the work undertaken. It is not in the interest of HCL to deal with Agencies who commit deception, fraud or other misconduct in the execution of contracts awarded / orders issued to them. In order to ensure compliance with the constitutional mandate, it is incumbent on HCL to observe principles of natural justice before banning the business dealings with any Agency.
- 1.2 Since banning of business dealings involves civil consequences for an Agency concerned, it is incumbent that adequate opportunity of hearing is provided and the explanation, if tendered, is considered before passing any order in this regard keeping in view the facts and circumstances of the case.

2. Scope

- 2.1 The General Conditions of Contract (GCC) of HCL generally provide that HCL reserves its rights to remove from list of approved suppliers / contractors or to ban business dealings if any Agency has been found to have committed misconduct and also to suspend business dealings pending investigation. If such provision does not exist in any GCC, the same may be incorporated.
- 2.2 Similarly, in case of sale of material there is a clause to deal with the Agencies / customers / buyers, who indulge in lifting of material in unauthorized manner. If such a stipulation does not exist in any Sale Order, the same may be incorporated.
- 2.3 However, absence of such a clause does not in any way restrict the right of Company (HCL) to take action / decision under these guidelines in appropriate cases.
- 2.4 The procedure of (i) Removal of Agency from the List of approved suppliers / contractors; (ii) Suspension and (iii) Banning of Business Dealing with Agencies, has been laid down in these guidelines.
- 2.5 These guidelines apply to all the Plants / Units and subsidiaries of HCL.
- 2.6 It is clarified that these guidelines do not deal with the decision of the Management not to entertain any particular Agency due to its poor / inadequate performance or for any other reason.
- 2.7 The banning shall be with prospective effect, i.e., future business dealings.

3. Definitions

In these Guidelines, unless the context otherwise requires:

'Party / Contractor / Supplier / Purchaser / Customer/Bidder/Tenderer' shall mean and include a public limited company or a private limited company, a firm whether registered or not, an individual, a cooperative society or an association or a group of persons engaged in any commerce, trade, industry, etc. *'Party / Contractor / Supplier / Purchaser / Customer/ Bidder / Tenderer'* in the context of these guidelines is indicated as *'Agency'*.

'Inter-connected Agency' shall mean two or more companies having any of the following features:

If one is a subsidiary of the other.

If the Director(s), Partner(s), Manager(s) or Representative(s) are common;

If management is common;

If one owns or controls the other in any manner;

'Competent Authority' and *'Appellate Authority'* shall mean the following:

For Company (entire HCL) Wide Banning

The Director (Technical) shall be the *'Competent Authority'* for the purpose of these guidelines. Chairman, HCL shall be the *'Appellate Authority'* in respect of such cases except banning of business dealings with Foreign Suppliers of imported coal/coke.

For banning of business dealings with Foreign Suppliers of imported coal/coke, HCL Directors' Committee (SDC) shall be the *'Competent Authority'*. The Appeal against the Order passed by SDC, shall lie with Chairman, as First Appellate Authority.

In case the foreign supplier is not satisfied by the decision of the First Appellate Authority, it may approach HCL Board as Second Appellate Authority.

For Plants / Units only

Any officer not below the rank of General Manager / Addl Director appointed or nominated by the Unit Head of concerned Plant / Unit shall be the *'Competent Authority'* for the purpose of these guidelines.

The Unit Heads of the concerned Plants / Unit shall be the '*Appellate Authority*' in all such cases.

For Corporate Office only

For procurement of items / award of contracts, to meet the requirement of Corporate Office only, Head of M&C shall be the "Competent Authority" and Director (Technical) shall be the "Appellate Authority".

Chairman, HCL shall have overall power to take suo-moto action on any information available or received by him and pass such order(s) as he may think appropriate, including modifying the order(s) passed by any authority under these guidelines.

'*Investigating Department*' shall mean any Department or Unit investigating into the conduct of the Agency and shall include the Vigilance Department, Central Bureau of Investigation, the State Police or any other department set up by the Central or State Government having powers to investigate.

'*List of approved Agencies - Parties / Contractors / Suppliers / Purchasers / Customers / Bidders / Tenderers*' shall mean and include list of approved / registered Agencies - *Parties/ Contractors / Suppliers / Purchasers / Customers / **Bidders / Tenderers***, etc.

4. Initiation of Banning / Suspension

Action for banning / suspension business dealings with any Agency should be initiated by the department having business dealings with them after noticing the irregularities or misconduct on their part. Besides the concerned department, Vigilance Department of each Plant / Unit /Corporate Vigilance may also be competent to initiate such action.

5. Suspension of Business Dealings

- 5.1 If the conduct of any Agency dealing with HCL is under investigation by any department (except Foreign Suppliers of imported coal/coke), the Competent Authority may consider whether the allegations under investigation are of a serious nature and whether pending investigation, it would be advisable to continue business dealing with the Agency. If the Competent Authority, after consideration of the matter including the recommendation of the Investigating Department, if any, decides that it would not be in the interest to continue business dealings pending investigation, it may suspend business dealings with the Agency. The order to this effect may indicate a brief of the charges under investigation. If it is decided that inter-connected Agencies would also come within the ambit of the order of suspension, the same should be specifically stated in the order. The order of suspension would operate for a period not more than six months and may be communicated to the Agency as also to the Investigating Department. The Investigating Department may ensure that their investigation is completed and whole process of final order is over within such period.
- 5.2 The order of suspension shall be communicated to all Departmental Heads within the Plants / Units. During the period of suspension, no business dealing may be held with the Agency.
- 5.3 As far as possible, the existing contract(s) with the Agency may continue unless the Competent Authority, having regard to the circumstances of the case, decides otherwise.
- 5.4 If the gravity of the misconduct under investigation is very serious and it would not be in the interest of HCL, as a whole, to deal with such an Agency

pending investigation, the Competent Authority may send his recommendation to Chief Vigilance Officer (CVO), HCL Corporate Office alongwith the material available. If Corporate Office considers that depending upon the gravity of the misconduct, it would not be desirable for all the Plants / Units and Subsidiaries of HCL to have any dealings with the Agency concerned, an order suspending business dealings may be issued to all the Plants / Units by the Competent Authority of the Corporate Office, copy of which may be endorsed to the Agency concerned. Such an order would operate for a period of six months from the date of issue.

- 5.6 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.
- 5.7 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension. However, if investigations are not complete in six months time, the Competent Authority may extend the period of suspension by another three months, during which period the investigations must be completed.

6. Ground on which Banning of Business Dealings can be initiated

- 6.1 If the security consideration, including questions of loyalty of the Agency to the State, so warrants;
- 6.2 If the Director / Owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises or HCL, during the last five years;
- 6.3 If there is strong justification for believing that the Directors, Proprietors, Partners, owner of the Agency have been guilty of malpractices such as bribery, corruption, fraud, substitution of tenders, interpolations, etc;
- 6.4 If the Agency continuously refuses to return / refund the dues of HCL without showing adequate reason and this is not due to any reasonable dispute which would attract proceedings in arbitration or Court of Law;
- 6.5 If the Agency employs a public servant dismissed / removed or employs a person convicted for an offence involving corruption or abetment of such offence;
- 6.6 If business dealings with the Agency have been banned by the Govt. or any other public sector enterprise;
- 6.7 If the Agency has resorted to Corrupt, fraudulent practices including misrepresentation of facts **and / or fudging /forging /tampering of documents;**
- 6.8 If the Agency uses intimidation / threatening or brings undue outside pressure on the Company (HCL) or its official in acceptance / performances of the job under the contract;
- 6.9 If the Agency indulges in repeated and / or deliberate use of delay tactics in complying with contractual stipulations;
- 6.10 Willful indulgence by the Agency in supplying sub-standard material irrespective of whether pre-despatch inspection was carried out by Company (HCL) or not;
- 6.11 Based on the findings of the investigation report of CBI / Police against the Agency for malafide / unlawful acts or improper conduct on his part in matters relating to the Company (HCL) or even otherwise;
- 6.12 Established litigant nature of the Agency to derive undue benefit;
- 6.13 Continued poor performance of the Agency in several contracts;

- 6.14 If the Agency misuses the premises or facilities of the Company (HCL), forcefully occupies, tampers or damages the Company's properties including land, water resources, forests / trees, etc.

(Note: The examples given above are only illustrative and not exhaustive. The Competent Authority may decide to ban business dealing for any good and sufficient reason).

7. Banning of Business Dealings

- 7.1 Normally, a decision to ban business dealings with any Agency should apply throughout the Company including Subsidiaries. However, the Competent Authority of the Plant / Unit except Corporate Office can impose such ban unit-wise only if in the particular case banning of business dealings by respective Plant / Unit will serve the purpose and achieve its objective and banning throughout the Company is not required in view of the local conditions and impact of the misconduct / default to beyond the Plant / Unit. Any ban imposed by Corporate Office shall be applicable across all Plants / Units of the Company including Subsidiaries.

- 7.2 For Company-wide banning, the proposal should be sent by the Plant / Unit to the CVO through the Head of the Plant / Unit setting out the facts of the case and the justification of the action proposed alongwith all the relevant papers and documents except for banning of business dealings with Foreign Suppliers of imported coal/coke.

The Corporate Vigilance shall process the proposal of the Plant / Unit for a prima-facie view in the matter by the Competent Authority nominated for Company-wide banning.

The CVO shall get feedback about that agency from all other Plants / Units. Based on this feedback, a prima-facie decision for banning / or otherwise shall be taken by the Competent Authority.

If the prima-facie decision for Company-wide banning has been taken, the Corporate Vigilance shall issue a show-cause notice to the agency conveying why it should not be banned throughout HCL.

After considering the reply of the Agency and other circumstances and facts of the case, a final decision for Company-wide banning shall be taken by the Competent Authority.

- 7.3 There will be a Standing Committee in each Plant / Unit to be appointed by Unit Head for processing the cases of "Banning of Business Dealings" except for banning of business dealings with foreign suppliers of coal/coke. However, for procurement of items / award of contracts, to meet the requirement of Corporate Office only, the committee shall be consisting of General Manager / Dy. General Manager each from Operations, Finance, Law & M&C. Member from M&C shall be the convener of the committee. The functions of the committee shall, inter-alia include:

To study the report of the Investigating Agency and decide if a prima-facie case for Company-wide / Local unit wise banning exists, if not, send back the case to the Competent Authority.

To recommend for issue of show-cause notice to the Agency by the concerned department.

To examine the reply to show-cause notice and call the Agency for personal hearing, if required.

To submit final recommendation to the Competent Authority for banning or otherwise.

- 7.4 If the Competent Authority is prima-facie of view that action for banning business dealings with the Agency is called for, a show-cause notice may be issued to the Agency as per paragraph 9.1 and an enquiry held accordingly.

8. Removal from List of Approved Agencies - Suppliers / Contractors, etc.

- 8.1 If the Competent Authority decides that the charge against the Agency is of a minor nature, it may issue a show-cause notice as to why the name of the Agency should not be removed from the list of approved Agencies Suppliers / Contractors, etc.
- 8.2 The effect of such an order would be that the Agency would not be disqualified from competing in Open Tender Enquiries but LTE may not be given to the Agency concerned.
- 8.3 Past performance of the Agency may be taken into account while processing for approval of the Competent Authority for awarding the contract.

9. Show-cause Notice

- 9.1 In case where the Competent Authority decides that action against an Agency is called for, a show-cause notice has to be issued to the Agency. Statement containing the imputation of misconduct or mis-behaviour may be appended to the show-cause notice and the Agency should be asked to submit within 15 days a written statement in its defence.
- 9.2 If the Agency requests for inspection of any relevant document in possession of HCL, necessary facility for inspection of documents may be provided.
- 9.3 The Competent Authority may consider and pass an appropriate speaking order: For exonerating the Agency if the charges are not established;
For removing the Agency from the list of approved Suppliers / Contractors, etc.

For banning the business dealing with the Agency.

- 9.4 If it decides to ban business dealings, the period for which the ban would be operative may be mentioned. The order may also mention that the ban would extend to the interconnected Agencies of the Agency.

10. Appeal against the Decision of the Competent Authority

- 10.1 The Agency may file an appeal against the order of the Competent Authority banning business dealing, etc. The appeal shall lie to Appellate Authority. Such an appeal shall be preferred within one month from the date of receipt of the order banning business dealing, etc.
- 10.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the Agency as well as the Competent Authority.

11. Review of the Decision by the Competent Authority

Any petition / application filed by the Agency concerning the review of the banning order passed originally by Unit Head / Competent Authority under the existing guidelines either before or after filing of appeal before the Appellate Authority or after disposal of appeal by the Appellate Authority, the review petition can be decided by the Unit Head / Competent Authority upon disclosure of new facts / circumstances or subsequent development necessitating such review. The Competent Authority may refer the same petition to the Standing Committee for examination and recommendation.

12. Circulation of the names of Agencies with whom Business Dealings have been banned

- 12.1 Depending upon the gravity of misconduct established, the Competent Authority of the Corporate Office may circulate the names of Agency with whom business dealings have been banned, to the Government Departments, other Public Sector Enterprises, etc. for such action as they deem appropriate.

- 12.2 If Government Departments or a Public Sector Enterprise request for more information about the Agency with whom business dealings have been banned, a copy of the report of Inquiring Authority together with a copy of the order of the Competent Authority / Appellate Authority may be supplied.
- 12.3 If business dealings with any Agency has been banned by the Central or State Government or any other Public Sector Enterprise, HCL may, without any further enquiry or investigation, issue an order banning business dealing with the Agency and its inter-connected Agencies.
- 12.4 Based on the above, Plants / Units may formulate their own procedure for implementation of the Guidelines **and same be made a part of the tender documents.**

APPENDIX – VI
(To be placed in Part I of the Bid)

Information for Financial Qualification

Name of the Bidder: -----

S. No.	Head	Year		
		2015-16	2016-17	2017-18
1.	Net Sales (Rs.)			

Name of Statutory Auditor's firm: _____

Seal of the Statutory Auditor's firm: (Signature, name and designation of the Authorized Signatory along with Registration Number)

Dated this ____ day of _____ 2018

(Name & Signature of Authorized Signatory)_____

In the capacity of _____ (position) duly authorized to sign this Tender for and behalf of
_____ (name of the Bidder).

_____ (Address)

Instructions:

1. The Bidder shall attach copies of Audited Annual Reports for 3 (three) preceding years from the Bid Due Date. The Audited Annual Reports shall:
 - a. be audited by Statutory Auditor;
 - b. be complete, including all notes to the financial statements; and
 - c. correspond to accounting periods already completed and audited (no statements for partial period shall be requested or accepted).

APPENDIX – VII
(To be placed in Part I of the Bid)

Information For Technical Qualification

{The Applicant firm (in case of sole applicant) or a Member claiming the technical eligibility (in case of a Consortium) must submit, along with the Application, relevant experience in execution of projects (as a developer or contractor) to fulfil the technical eligibility criteria in the following format:

Note : Separate certificates each for shaft sinking, decline development & underground mine development shall be enclosed by bidder in support of meeting technical eligibility criteria as per format given below.

Name of Applicant (Sole Applicant / Member of Consortium):

S No	Particulars			Remarks (If any)
1.	Name of the Organization (Client)	:		
2.	Office in charge	:		
3.	Description of work & Quantity	:		
4.	Time Period (time period must be any period during the preceding seven year period)	:		
5.	Period for completion of work as per work order/contract	:		
6	Actual time taken for Completion	:		
7	Rate / month	:		
8	Work order proof	:	Attached Yes/no	

Certificate:

We declare that all the information stated in the table above is correct and complete in all respect. We have verified the above information after examining the relevant supporting documents.

Name of Organisation (client): _____

Seal of the Organisation (Client) : (Signature, name and designation of the Authorised Signatory)

Certificate:

We declare that all information stated in the table above is correct and complete in all respect. Any error or omission in mentioning the information shall entitle HCL, at its sole discretion, to reject our Application.

Dated this _____ day of _____ 2018
(Name & Signature of Authorised Signatory) _____

In the capacity of _____ (position) duly authorized to sign this application for and
behalf of _____ (name of Sole Applicant / Lead member of the consortium).
_____ (Address)

The Applicants are advised to use separate sheets in case there are using the experience of more than one project for satisfying Technical Eligibility Criteria

APPENDIX – VIII A
(To be placed in Part I of the Bid)

STATEMENT OF LEGAL CAPACITY

[To be printed on the authorized Letterhead of the Bidder including full postal address, telephone no., fax no. and e-mail address]

Date:

To

[Insert the name and address]

Dear Sir,

We hereby confirm that we satisfy the terms and conditions laid out in the Tender document.

We have agreed that _____ (insert individual's name) will act as our representative and has been duly authorized to submit the Tender. Further, the authorized signatory is vested with requisites power to furnish such letter and authenticate the same.

Thanking you,

Yours faithfully,

(Signatory, name and designation of the authorized signatory)

For and on behalf of _____

APPENDIX – VIII B
HINDUSTAN COPPER LIMITED
CORPORATE OFFICE
KOLKATA

Name of work: **Bid for DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND**

Name of tenderer: _____

PROPOSED SITE ORGANISATION

The tenderer is to indicate herewith proposed site organization to be set up for execution of the work which should include qualified Engineers & Mine foremen for supervision of the work as per statute. It is understood that this will be augmented from time to time depending on the requirements for timely completion of work as indicated by Engineer –in Charge.

Bio-data of Site-in-Charge and key personnel including the statutory Foremen/Mate/ Blaster etc.

NAME, ADDRESS & SIGNATURE OF THE TENDERER

APPENDIX – VIII C
HINDUSTAN COPPER LIMITED
CORPORATE OFFICE
KOLKATA
CERTIFICATE OF SITE VISIT

Name of work: **Bid for DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPEs, INDIAN COPPER COMPLEX, JHARKHAND**

Name of tenderer: _____

This is to certify that the authorised representatives of M/s..... have visited the site on / from to understand the work for the purpose participating the above tendering process.

NAME, ADDRESS & SIGNATURE OF THE TENDERER

COUNTER SIGNATURE OF UNIT HEAD OR HIS REPRESENTATIVE

APPENDIX – VIII D
HINDUSTAN COPPER LIMITED
CORPORATE OFFICE
KOLKATA
SCREEN SHOT OF MOCK SUBMISSION OF E-BID AT MJUNCTION

Name of work: **Bid for DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND**

Name of tenderer: _____

NAME, ADDRESS & SIGNATURE OF THE TENDERER

APPENDIX - IX
(Part II OF THE BID)

(To be filled in e-tendering portal)
(Not to be filled in hard copy)

SCHEDULE OF RATES:

*** The above rate is inclusive of Basic price, all taxes & duties, levies, freight, Insurance etc. but excluding Goods and Services Tax (GST) . Applicable GST shall be payable by the successful bidder as per clause 8.9 a) and 8.9 b) and shall be reimbursed to bidder by HCL based on documentary evidence.*

Quoted rates should be in figures.

(Signature of the Authorized signatory)
(Name and designation of the of the Authorized signatory)
Name and seal of Bidder

SECTION II
CONTRACT
BETWEEN
HINDUSTAN COPPER LIMITED
AND
[Please Insert the name of the Contractor]
(CONTRACTOR)
FOR
DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE
FROM STOPEs, INDIAN COPPER COMPLEX, JHARKHAND

Contract For **DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPEs, INDIAN COPPER COMPLEX, JHARKHAND** for a period of 60 (sixty) months from..... tois entered into on this the [●] day of [●] 2018 at [●] (hereinafter referred to as the “**Contract**”)

BETWEEN:

HINDUSTAN COPPER LIMITED, a company incorporated under the Indian Companies Act 1956 (hereinafter referred to either as the “**Employer** or **HCL**” which expression shall include its successors and permitted assigns) having its registered office at 1, Ashutosh Chowdhury Avenue, Kolkata – 700019 India of the **FIRST PART**;

AND

[Please Insert the Name of the Contractor], a company incorporated under the provisions of the Indian Companies Act, 1956, having its registered office at *[Please Insert the Address of the Contractor]* or, in case of a Consortium, *[please insert the details of the consortium members]*, who have, vide a power of attorney, duly authorized *[Please Insert the Name of the Contractor]*, a company incorporated under the provisions of the Indian Companies Act, 1956, having its registered office at *[Please Insert the Address of the Contractor]*, to execute this Contract for and on their behalf collectively, hereinafter referred to as the “**Selected Bidder** or **Contractor**” (which expression shall unless repugnant to the subject or the context include its successors and permitted assigns) of the **OTHER PART**.

WHEREAS:

- (A) HCL is a public sector undertaking under the administrative control of the Ministry of Mines.
- (B) For undertaking the Work (as defined hereinafter), the Employer has conducted a competitive bidding process for inviting tenders from eligible bidders. HCL, after evaluating the tender submitted by the bidders, selected *[Please Insert the details of the Selected Bidder]* or Consortium comprising *[Please insert the details of the consortium members]* (“**Contractor**”) and issued a Letter of Intent (“**LOI**”) for the Work which was duly accepted by the Selected Bidder.
- (C) The Contractor has represented that it has the experience, expertise, capability and know-how to ensure that the Works are executed and completed in accordance with the terms of the Contract in a safe and environmentally responsible manner and that the Works will be capable of seamless integration with Related Works and be carried out on, under and over the Work Site (as defined

hereinafter).

- (D) Relying upon the representations in Recital C, the Employer appoints the Contractor for execution of the Work, and the Contractor agrees to carry out and complete the Works and remedy any defects therein, on the terms and conditions of the Contract.
- (E) The Contractor acknowledges that the Employer has entered into or will enter into other contracts with other contractors and/or parties for elements of the Work (as defined hereinafter) (and not comprised in the Works) and that the Employer will have Related Works performed and that it is of paramount importance that the Works are fully and completely co-ordinated with the Related Works in view of their concurrent and sequential nature.
- (F) This Contract has been executed and delivered in accordance with the laws of India.
- (G) The terms and conditions of this Contract have been fully negotiated between the Employer and the Contractor as parties of competent capacity and equal standing.

NOW THEREFORE in reliance of the mutual covenants and agreements, HCL is desirous of regulating its relationship with the Contractor in accordance with and subject to the terms hereof and in the manner set forth herein.

NOW THIS CONTRACT WITNESSETH AS FOLLOWS:

ARTICLE - 1

DEFINITIONS AND INTERPRETATION

1.1 Definitions

In this Contract or any documents either issued or that may be issued in connection with this Contract, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them:

"Applicable Laws" means all laws in force and effect as of the date hereof and which may be promulgated or brought into force and effect hereinafter in India including any revisions, amendments or re-enactments including without limitation, the Mines Act, 1952, The Mines Rules, 1955, Mines and Minerals (Development and Regulations) Act, the Metalliferous Mines Regulations, 1961, Minimum Wages Act, and Workmen Compensation Act, PF Act including any rules, regulations and notifications made there under and judgments, decrees, injunctions, writs, orders and notifications issued by any court of record or any appropriate authorities, as may be in force and effect during the subsistence of the Contract.

"Applicable Permits" means any clearance, permit, authorization, consent, license, lease, ruling, exemption, filing, agreements, or approval, required to be obtained and maintained by the Employer and/or the Contractor from time to time, in order to implement the Work and/or to design and execute the Works in accordance with this Contract.

"Appointed Date" means the date of issue Letter of Intent (LOI).

"Approved" shall mean approved in writing including subsequent written confirmation of previous verbal approval.

"Bidder" means Bidding Company or Bidding Consortium, as defined below.

Bidding Company: If the bid is made by a single corporate entity.

Bidding Consortium: If the bid is made jointly by corporate entities with suitable consortium agreement amongst them.

"Bid Security" shall mean the bid security as furnished by the Contractor in response to the tender in the format attached at Appendix III.

"Business Day" means a day other than a Sunday or a public holiday on which scheduled commercial banks are open for business in Jharkhand, India.

"Change in Law" means (i) any enactment or issuance of any new Applicable Law; (ii) any change in the interpretation or Tender of an existing Applicable Law by any Government Agency having direct authority for such interpretation or Tender; (iii) any amendment, alteration or modification of an existing Applicable Law by any Government Agency having direct authority for the enactment, enforcement or interpretation, thereof; or (iv) the repeal and re-enactment of any existing Applicable Law.

"Commencement Date" shall mean the date falling on the expiry of the mobilisation period of 4 months (120 days) from the date of issue of LoI.

"Company" means Hindustan Copper Limited (HCL) having its registered office at 1, Ashutosh Choudhury Avenue, Kolkata 700 019, West Bengal, including its successor and assignees or its representatives. Company shall also mean the owner wherever the context so requires.

“Completion” means the completion of the entire scope of Work herein specified to the required standards in accordance with this Contract to the satisfaction of the Engineer-in-Charge, and the terms "Complete" "Completed" "Completion" and "Completing" shall be construed accordingly.

“Completion Certificate” means the certificate to be issued by the Engineer-in-Charge in accordance with provision of Article 6.4 certifying Completion of the awarded Work.

"Confidential Information" means the Contract and everything contained therein, all documentation, data, particulars of the Works and technical and/ or commercial information made by (or on behalf of) the Employer or obtained directly or indirectly from the Employer or the Employer's Representative by the Contractor or which is generated by the Contractor or any information or data that the Contractor receives or has access to as a result of the Contract, other than information which is generally available in the public domain other than by any unauthorized actions or fault of the Contractor; or which is in the possession of the Contractor with a right to disclose.

“Consortium” means the consortium consisting of members only as mentioned below. The consortium consists of (i) _____ and (ii) _____ formed/ acting pursuant to the joint bidding agreement dated _____.

“Contract” means the agreement to be entered into between HCL and the successful bidder, as recorded in the Contract Form signed by the parties, including all annexure thereto and all documents incorporated by reference therein.

“Contract Agreement” means the written agreement, which the contractor shall enter into the company, pursuant to the acceptance of the Tender.

"Contractor's Documents" means those documents to be prepared by the Contractor under the Contract including without limitation, such data, Drawings, designs, design information, descriptions, calculations, schedules, specifications, plans, samples, patterns, models, mock-ups, computer software drawings, inspection and test plans, manuals, programmes, erection and test data and all other information and documents including all eye readable or computer/other machine readable data relating to the design (to the extent required under the Contract) for execution of the Works or otherwise for the performance of the Contract.

“Contract Period” means the period of 60 (sixty) months from Appointed date or completion of the contractual obligations, whichever is earlier, excluding 120 days of mobilization period.

“Contract Price” shall have the meaning ascribed in the applicable clauses in the tender.

“Contract Payment Due Date” means **credit period of 30 days** from the receipt of the bill for the month of completion of the job, after deduction of LD, if any.

“Contract Payment Period” means the period within which, payment is to be made by HCL to the Contractor for the actual work done by the Contractor during the month for which payment is sought.

“Contractual Quantity” means the quantity for which contract has been entered into.

“Contract value” means total value of the contract on date of agreement and not of date of bidding.

“Day” means the twenty four hours period ending at 24.00 midnight (Indian Standard Time).

“DGMS” means Directorate General of Mines Safety, Government of India.

“Dispute” shall have the meaning ascribed thereto in applicable clauses in the tender.

“Drawings” shall include maps, plans, sections, and tracings or prints thereof with any modifications approved in writing by the Engineer-in-charge and such other drawings as may, from time to time, be furnished or approved in writing by the Engineer-in-charge during the currency of the contract.

“Emergency” means a condition or situation that is likely to endanger the Mine safety as per Good Industry Practice on or about the Work Site/Work Facilities including safety of users thereof or which poses an immediate threat of material damage to any of the Work Site/Work Facilities.

“Emergency Works” shall mean and include all such works necessary to be undertaken to prevent the occurrence/ happening/ further deterioration/ damage/ disaster/ accident/ incident anticipated by the Engineer-in-Charge that could seriously affect the safety of persons/production of Mine or part thereof.

“Encumbrance” means any encumbrance such as mortgage, charge, pledge, lien, hypothecation, security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations and shall include without limitation any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Work, physical encumbrances and encroachments on the Work Site/Work Facilities.

“Engineer-in-Charge/HCL’s Representative” shall mean such officer or officers having such rights and obligations set out in **Schedule I**, to be designated, deputed or authorized, by HCL for the purpose of this Contract and shall include Engineer-in-Charge’s authorized representatives.

“Event of Default” shall have the meaning ascribed thereto in applicable clauses in the tender.

“Final Certificate” in relation to a work means the certificate issued by Engineer-in-Charge after the period of liability is over.

“Force Majeure Event” shall have the meaning ascribed thereto in Article 9.

“Force Majeure Period” means, as determined by the Engineer-in-Charge, the period commencing from the date of occurrence of a Force Majeure Event and ending on (i) the date on which the Affected Party acting in accordance with the Good Industry Practice, resumes or should have resumed such of its obligations the performance of which was excused as per terms mentioned elsewhere in the tender or (ii) the Termination Date, as applicable.

“Good Industry Practice” means those practices, methods, techniques, standards, skills, diligence and prudence which are generally and reasonably expected of and accepted internationally from a reasonably skilled and experienced operator engaged in the same type of undertaking as envisaged under this Contract and acting generally in accordance with the provisions of all Applicable laws, and would mean good engineering and mining practices in the design, engineering, expansion, construction and work management and which would be expected to result in the performance of its obligations by the Contractor and in the operation and maintenance of the Mining Facilities, in accordance with this Contract, Applicable Laws, Applicable Permits, reliability, safety, environment protection, economy and efficiency. For avoidance of doubt, it is clarified that in the event of a conflict between any Good Industry Practice and any requirement and/or standard prescribed by the DGMS, the latter shall prevail and the Contractor shall have to oblige with the provisions of the latter.

“Gol” means the Government of India and includes any agency, authority (including any regulatory authority) department, inspectorate, ministry or statutory person (whether autonomous or not) under the control and direction of the Government of India.

“GOJ” means the Government of Jharkhand and any agency, authority (including any regulatory authority) department, inspectorate, ministry or statutory person (whether autonomous or not) (including any successor there for) under the control and direction of the Government of Jharkhand

“Government Agency” means GoI, GOJ, HCL or any state government or governmental department, commission, board, body, bureau, agency, authority, instrumentality, court or other judicial or administrative body, central, state, or local, having jurisdiction over the Contractor, the Work Site/ Work Facilities or any portion thereof, or the performance of all or any of the services or obligations of the Contractor under or pursuant to this Contract.

“HCL” means Hindustan Copper Limited.

“HCL’s Requirements” means the document or documents identified as such and included in the Contract and any modifications thereof or addition thereto as may from time to time be issued by (or on behalf of) the Engineer-in-Charge in accordance with the Contract.

“Joint Measurement Certificate” shall have the meaning as mentioned in the NIT.

“Lead Member” The Lead Member, in case of a Bidding Consortium, is a member company that is responsible for execution, accountable, commission of the contract on behalf of consortium. The Lead member of the consortium must have minimum 50% of the Turnover specified in Eligibility Criteria at clause no 1.5.3.1. HCL will have all dialogue with the Lead member only during the currency of the contract, as and when required.

“Material Adverse Effect” means material adverse effect on (a) the ability of the Contractor to exercise any of its rights or perform/discharge any of its duties/obligations under and in accordance with the provisions of this Contract and/or (b) the legality, validity, binding nature or enforceability of this Contract.

“Material Breach” means a breach by either Party of any of its obligations under this Contract which has or is likely to have a Material Adverse Effect on the Work and which such Party shall have failed to cure.

“Mine” means Chapri Copper Mine at Indian Copper Complex, Ghatshila, Jharkhand, India.

“Mine Manager” means a person authorized in writing by Owner under Section 17 of Mines Act, 1952 to be in-charge of the Mine who is responsible for the overall management, control, supervision and direction of the Mine.

“Mobilization Period” means the period of 4 months (120 days) from the date of issue of Letter of Intent, during which, the Contractor is required to mobilize his resources and commence the Works at the Site.

“Modification / Alteration Order” means an order given in writing by the Engineer-in-Charge to effect additions to or deletion from and alterations in the work.

“Month” means a period beginning at 00-00 hours (Indian Standard Time) on the first day of a given English calendar month and ending at 00-00 hours (Indian Standard Time) on the first day of the next succeeding English calendar month.

“Mtpa”, means million tonne per annum.

“Open Item” means such items for which bidder shall provide unit rate price for the mentioned quantities and the supply of the same shall be done after receiving separate written communication / order from HCL.

“Owner” means the Director (Mining) of HCL.

“Parties” means the parties to this Contract collectively and **“Party”** means either of the Parties to this Contract individually.

“Period of Liability” in relation to a Work means a period of twelve (12) months from the date of Completion, during which the Contractor stands responsible for rectifying all defects that may appear in the Work.

“Person” means (unless otherwise specified or required by the context), any individual, company, corporation, partnership, joint venture, trust, unincorporated organization, government or Government Agency or any other legal entity.

“Preliminary Notice” means the notice of intended Termination by the Party entitled to terminate this Contract to the other Party setting out, inter alia, the underlying Event of Default.

“Project Manager” means any person appointed and authorized by the Contractor, who will take decision at Work Site independently and on behalf of the Contractor during the implementation of the Contract.

“Related Works” means works other than the Works, performed or undertaken by the Employer or other contractors or suppliers of the Employer or any contractor employed in connection with the Work and/or services related thereto or by public or private utilities or by any Government Agency or other authorities or by any relevant authority, either prior to, concurrently or sequentially with the Works at, on, over or adjacent to the Work Site in connection with or related to the Work and which may be connected to, associated with, ancillary to or otherwise related to or relevant to the Works.

“Representative” means either the HCL’s representative or the Contractors representative.

“Retention money” means the money which is hold by HCL for successful performance of the contract.

“Rs” or “Rupees” refers to the lawful currency of the Republic of India

“Security Deposit” means the deposit for security of performance of its obligations during the Contract Period to be provided by the Contractor in accordance with relevant applicable clause/clauses mentioned in the tender.

“Shift” means the eight hours period consisting three shifts in a day of 24 hours (Indian Standard Time).

“Site” shall mean the lands and other places on, under, in or through which the permanent works are to be carried out and any other lands or places provided by HCL for the purpose of the contract.

“Specifications” shall mean all directions, various technical specification, provisions and requirements attached to the contract, which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the contract.

“Successful Bidder” means the bidder / consortium of bidders who has been awarded the work.

“Supervision” means and shall include the successive control and directions given by the Contractor in relation to contract work, during the execution of the work and services.

“Tax” means and includes all taxes, fees, cesses, levies that may be payable by the Contractor under any Applicable Law.

Tax shall not include any penalty, interest or other penal sum levied on or payable by the Contractor on account of non-payment, short payment or delayed payment of Tax or on account of any other default.

“Technical Assistance” means the provision by the Bidder for technical supervision and assistance for maintenance, operation etc. of the Equipment after the commissioning and up to the Contract Period.

"Temporary Works" shall mean every work which is of a temporary nature, and which the Contractor shall remove, or at the option of HCL, hand over to HCL, upon such temporary works having fulfilled the reason for which they were required by the Contractor.

“Tender” means collectively the tender issued to bidders including any supplements/amendments thereto and other documents, drawings, specifications, agreed variations, if any.

“Termination” means early termination of this Contract pursuant to Termination Notice or otherwise in accordance with the provisions of this Contract but shall not, unless the context otherwise requires, include the expiry of this Contract due to efflux of time in the normal course.

“Termination Date” means the date specified in the Termination Notice as the date on which Termination occurs.

“Termination Notice” means the notice of Termination by either Party to the other Party, in accordance with the applicable provisions of this Contract

“Tests” means the tests to be carried out by Contractor to ascertain the safety and reliability of the Works carried out by the Contractor for the Work.

“Tonnes” or “tonne” or abbreviations “te” or “Te” or “T” or “t” or “MT” used in Tender in suffix of a quantity means a metric tonne of 1000 (One thousand) kilograms.

“Work Agreements” means collectively this Contract and any other material contract entered into or may hereafter be entered into by the Contractor in connection with the Work.

“Work/ Works/ Job” shall mean all or any portion of the entire activities to be performed in relation to DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND, and/or as otherwise specified under the Contract in accordance with the Project Plan, Drawings and Specifications, whether supplemented or not by HCL or the Engineer-in-Charge during the progress of execution of the activities by the Contractor by explanatory instructions.

“Work Site / Site” means Chapri Copper Mine at Indian Copper Complex, Ghatshila, Jharkhand, India.

where the Work is to be implemented by the Contractor in accordance with the Work Requirements or provision of any Temporary Work or for any other purpose for execution of Work.

“Year” year shall mean 12 months, normally financial year starting on the 1st of April of each calendar year and closing on the 31st March of the subsequent Calendar year.

1.2 Interpretation

In this Contract, unless the context otherwise requires,

- a) any reference to a statutory provision shall include such provision as is from time to time modified or re-enacted or consolidated so far as such modification or re-enactment or consolidation applies or is capable of applying to any transactions entered into hereunder;

- b) references to Applicable Law shall include the laws, acts, ordinances, rules, regulations, notifications, guidelines or byelaws which have the force of law in any State or Union Territory forming part of the Union of India;
- c) the words importing singular shall include plural and vice versa, and words denoting natural persons shall include partnerships, firms, companies, corporations, joint ventures, trusts, associations, organizations or other entities (whether or not having a separate legal entity);
- d) the headings are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Contract;
- e) the words "include" and "including" are to be construed without limitation;
- f) references to "construction" include investigation, design, engineering, procurement, delivery, transportation, installation, processing, fabrication, testing, commissioning and other activities incidental to the construction;
- g) any reference to any period of time shall mean a reference to that according to Indian Standard Time;
- h) the Schedules to this Contract form an integral part of this Contract and will be in full force and effect as though they were expressly set out in the body of this Contract;
- i) any reference at any time to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference;
- j) references to recitals, Articles, sub-articles, Clauses, or Schedules in this Contract shall, except where the context otherwise requires, be deemed to be references to recitals, Articles, sub-articles, Clauses and Schedules of or to this Contract;
- k) any agreement, consent, approval, authorization, notice, communication, information or report required under or pursuant to this Contract from or by any Party or the Engineer-in-Charge shall be valid and effectual only if it is in writing under the hands of duly authorized representative of such Party or the Engineer-in-Charge, as the case may be, in this behalf and not otherwise;
- l) Unless otherwise stated, any reference to any period commencing "from" a specified day or date and "till" or "until" a specified day or date shall include both such days and dates.

1.3 Measurements and Arithmetic Conventions

All measurements and calculations shall be in metric system and calculations done to 2 decimal places, with the third digit of 5 or above being rounded up and below 5 being rounded down.

1.4 Ambiguities and Discrepancies

In case of ambiguities or discrepancies within this Contract, the following shall apply:

- a) Between two Articles of this Contract, the provisions of specific Articles relevant to the issue under consideration shall prevail over those in other Articles;
- b) Between the written description on the Drawings and the Specifications, the latter shall prevail;
- c) Between the dimension scaled from the Drawing and its specific written dimension, the latter shall prevail;
- d) Between any value written in numerals and that in words, the latter shall prevail.

1.5 Resolution of Inconsistencies in Contract Documents

The provisions of the various Articles of this Contract shall prevail over those of any other documents forming part of the Contract. Should there be any discrepancy, inconsistency, error and omission or any of them arises in the Contract, the matter may be referred to the Engineer-in-Charge, who shall give his decision and issue instructions to the Contractor, directing the manner in which the work is to be carried out. The decision of the Engineer-in-Charge shall be conclusive and final and the Contractor shall carry out the work in accordance with the decision of the Engineer-in-Charge.

1.6 Background Information and the manner in which discrepancies are resolved

1.6.1 The Employer gives no warranty or undertaking as to the completeness, accuracy or fitness for purpose of any of the Background Information or the various documents that together comprise the Contract. Subject to the express provisions of the Contract, neither the Employer nor any of its agents or servants shall be liable to the Contractor in contract, tort (including negligence or breach of statutory duty), statute or otherwise as a result of:

- a) Any inaccuracy, omission, unfitness for purpose or inadequacy of any kind whatsoever in the Background Information;
- b) Any failure to make available to the Contractor any materials, documents, drawings, plans or other information relating to the Works or the Work;
- c) Any ambiguities, discrepancies, inconsistencies, divergences, design or construction impracticalities or omissions from, within, or between the documents which comprise the Contract.

1.6.2 The Contractor warrants and represents to the Employer that:

- a) it has conducted its own analysis and review of the Background Information and that it has satisfied itself as to the accuracy, fitness for purpose and completeness of all such Background Information; and
- b) the Contractor has thoroughly examined the documents comprising the Contract and is satisfied that there are no ambiguities, discrepancies, inconsistencies, divergence, design or construction impracticalities or omissions from, within and between such documents and that such documents are accurate, complete and sufficient in all respects for the purposes of the design and execution of the Works; and
- c) after a complete and careful examination, it has made an independent evaluation of the scope of the Works required and has determined the nature and extent of the difficulties, risks and hazards that are likely to arise or may be faced by it in or about of the performance of all its obligations in the Contract. The Contractor hereby acknowledges its responsibility in respect of all such risks and hazards and agrees that the Employer shall not be liable in respect of the same in any manner whatsoever to the Contractor whether in contract, tort, statute or otherwise.

1.6.3 Without prejudice if, notwithstanding the Contractor's analysis and examination of the documents comprising the Contract, any ambiguities, discrepancies, inconsistencies, divergence, design or construction impracticalities or omissions from, within or between any of the documents comprising the Contract, come to the attention of either Party, that Party shall immediately notify the other Party and HCL' Representative, specifying the ambiguity, discrepancy, inconsistency, divergence, design or construction impracticality or omission (as the case may be) and HCL's Representative shall issue instructions in regard thereto.

- 1.6.4** The Parties agree that any ambiguity, discrepancy, inconsistency, divergence, design or construction impracticality or omission as aforesaid shall not vitiate the Contract. No instruction given by HCL's Representative, shall amount to a change and the Contractor shall not be entitled to any extension of time or additional payment in respect thereof.
- 1.6.5** HCL's Requirements shall remain in the sole custody of HCL's Representative but two copies thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make at its own expense any further copies required by it.

ARTICLE - 2 CONTRACT

2.1 Grant of Contract

Subject to and in accordance with the terms and conditions set forth in this Contract, HCL hereby grants and authorizes the Contractor to investigate, study, design, engineer, procure, and carry out construction, ventilation, shaft widening & deepening underground mine development & operation and any other work related to the awarded work in accordance with the provisions of the Contract and Good Industry Practices and to exercise and/or enjoy the rights, powers, benefits, privileges, authorizations and entitlements as set forth in this Contract.

2.2 Contract Period

Duration of contract is **60 (sixty) months** from the Appointed date excluding four (4) months for mobilization. The Contract Period may be extended further as stipulated under Article 8.8 hereunder, provided that the period of any such extension shall be decided by HCL in its sole and absolute discretion.

2.3 Contractual Quantity

It shall mean the production from the stopes as per mentioned in the table 2.1 & mine development as per table 1.2 of price schedule.

2.4 Acceptance of Contract

In consideration of the Contract Price agreed to be paid by HCL and other good and valuable consideration expressed herein, the Contractor hereby accepts the Contract and agrees and undertakes to implement the Work/provide and operate Work Facilities, and to perform/discharge all of its obligations as per Good Industry Practices and in accordance with Applicable Laws and the provisions hereof.

ARTICLE - 3

CONDITIONS PRECEDENT

3.1 Conditions Precedent

The rights and obligations of the Contractor under this Contract are subject to the satisfaction in full of the following conditions precedent to be fulfilled on or before “Commencement Date” unless any such condition has been waived as provided in this Article:

- a) the Contractor shall have applied for or obtained necessary Applicable Permits unconditionally or if subject to conditions then all such conditions have been satisfied in full and such Applicable Permits are and shall be kept in full force and effect for the relevant period during the subsistence of this Contract;
- b) certified true copies of all Work Agreements have been delivered by the Contractor to HCL;
- c) the Performance Security has been provided by the Contractor to HCL and the same is in full force and effect;
- d) all of the representations and warranties of the Contractor set forth in this Contract are true and correct as on date of this Contract and as on the “Commencement Date” ;
- e) HCL shall have received from the Contractor copies (certified as true copies by an authorized officer of the Contractor) of the constitutional documents of the Contractor;
- f) HCL shall have received copies (certified as true copies by a director of the Contractor) of all resolutions adopted by the Board of Directors of the Contractor authorizing the execution, delivery and performance by the Contractor of this Contract and each of the Work Agreements;
- g) HCL shall have received from the Indian legal counsel of the Contractor a legal opinion with respect to the authority of the Contractor to enter into this Contract and the Work Agreements and the enforceability of the provisions thereof;
- h) The Contractor having executed the Integrity Pact as given in **Appendix VA**.
- i) The Contractor ensuring that its personnel have adequate insurance coverage and are medically fit (as per legal requirements for working in mines), and have adequate vocational training.

Any of the conditions precedents as set forth above may be waived fully or partially by HCL at anytime in its sole discretion.

3.2 Obligation to Satisfy the Conditions Precedent

The Contractor shall make all reasonable endeavors to satisfy the conditions precedent set out in Article 3.1 above and shall bear its respective cost and expense of satisfying such condition precedent unless otherwise expressly provided.

3.3 Termination upon failure to satisfy the Conditions Precedent

If the conditions precedent are neither fulfilled on or before the “Commencement Date” or any other later date as may have been stipulated by HCL, nor waived, then HCL shall have the right to terminate this Contract without any liability to any Party by giving thirty (30) days’ notice and Bid Security or Performance Security, as the case may be, by the Contractor shall stand forfeited.

Forfeiture of Securities is liable to GST at applicable rate.

ARTICLE - 4

WORK SITE

4.1 Handover of Work Site

- a) HCL shall assign work to the Contractor at the designated Work Site free from encumbrance together with the necessary right of access for the purpose of implementing the Work immediately after the Appointed date.
- b) Upon the Work Site or any part thereof being handed over pursuant to the Article 4.1 (a), the Contractor shall, subject to the provisions of Article 3, have the right to enter upon, occupy and use the Work Site or part thereof delivered to it by HCL and to make at its costs, charges and expenses, such investigation, expansion, excavation and improvements in the Work Site as may be necessary or appropriate to implement the Work in accordance with the provisions of this Contract.

4.2 Rights, Title and Use of the Work Site

- a) The Contractor shall have the right to the use of the Work Site in accordance with the provisions of this Contract and for this purpose it may regulate the entry and use of the same by other parties with HCL's permission. Provided that such access or use by the Contractor and/or any other party shall not result in a Material Adverse Effect and that the Contractor shall, in the event of any physical damage to the Work Site/Work Facilities on account thereof, ensure that the Work Site/Work Facilities are promptly restored at its cost and expenses.

Provided further, that to the extent such access and use allowed to the Contractor affects the performance of any of its obligations hereunder, the Contractor shall not be deemed or construed to be in breach of its obligations nor shall it incur/suffer any liability on account thereof.

- b) The Contractor shall not part with or create any Encumbrance on the whole or any part of the Work Site save and except as set forth and permitted under this Contract.
- c) The Contractor shall not without the prior written consent or approval of HCL use the Work Site for any purpose other than for the purpose of the Work/the Work Facilities and purposes incidental or necessary thereto.

4.3 Peaceful Possession

HCL hereby warrants that:

- a) The Work Site together with the necessary access to the Work Site having been acquired through the due process of law belongs to and is vested in HCL, and that HCL has full powers to hold and deal with the same consistent, inter alia, with the provisions of this Contract and that the Contractor shall, in respect of the Work Site, have no liability regarding any compensation payment on account of land acquisition or rehabilitation/resettlement of any Persons affected thereby.
- b) The Contractor shall, subject to complying with the terms and conditions of this Contract, execute work at the designated work site during the contract period. In the event the Contractor is obstructed by any Person claiming any right, title or interest in or over the Work Site or any part thereof or in the event of any enforcement action including any attachment, distain, appointment of receiver or liquidator being initiated by any Person claiming to have any interest in/ charge on the Work Site or any part thereof, HCL shall, if called upon by the Contractor, defend such claims and proceedings and also keep the Contractor indemnified against any consequential loss or damages which the Contractor may suffer, on account of any such right, title, interest or charge.

ARTICLE - 5
ENGINEER-IN-CHARGE

5.1 Nomination of Engineer-in-Charge

HCL shall immediately and in any case not later than one (1) week of the Appointed Date, nominate an officer to carry out roles and responsibilities of Engineer-in-Charge for the Work and communicate the details of the same to the Contractor.

Further, the Engineer-in-Charge shall nominate another officer who could act in his position on instances of the said officer (*i.e.* the Engineer-in-Charge) being away from the Work Site.

5.2 Rights and Obligations of Engineer-in-Charge

Engineer-in-Charge shall be the representative of HCL to review, monitor, co-ordinate activities and issue directions related to the Work.

Acts of Engineer-in-Charge as far as it is within the rights and obligations set out in **Schedule I** shall be deemed to be acts of HCL.

5.3 Notifications of change in Office of Engineer-in-Charge

In the event of change in the office of Engineer-in-Charge due to retirement/ replacement / vacation of the nominated officer, HCL shall promptly notify the details of such change to the Contractor.

ARTICLE - 6

CONTRACTOR'S OBLIGATIONS

In addition to and not in derogation or substitution of any of its other obligations under this Contract, the Contractor shall have the following obligations:

- 6.1 Performance Security Deposit (PSD):** Security deposit appearing in **Schedule VII** shall be submitted within 30 days from the Appointed date.
- a) The Contractor shall, for due and punctual performance of its obligations during the Contract Period, deposit a Performance Security which shall be equal to ten (10) per cent of the Contract Price with HCL, within thirty (30) days from the Appointed date.
 - b) The Performance Security Deposit for the complete amount, as stated in (a) above, shall be payable by the Contractor by way of Demand Draft/ Pay Order/Banker's Cheque from a schedule commercial bank in favor of "Hindustan Copper Limited", payable at Kolkata or by Bank Guarantee from a schedule commercial bank in the format prescribed under **Schedule VII**. Performance Security Deposit in any other format is not acceptable. Payment shall not be released if PSD has not been deposited in totality.
 - c) The Bank Guarantee shall be valid for a period of 76 (Seventy Six) months from the Appointed date and it is to be extended further one month prior to the expiry date till six months after the issue of completion certificate. In case of failure, HCL will have the right to encash the BG.
 - d) HCL is at liberty, after having given fourteen (14) days' written notice to the Contractor and without any further reference to the Contractor, to realize and / or forfeit the Performance Security deposit for non-fulfillment and or for unsatisfactory performance of the Contract or any clauses thereof. Forfeiture of Security is liable to GST at applicable rate.
 - e) Performance Security Deposit in the form of Bank Guarantee shall remain binding notwithstanding such variations, alterations or extensions in time as may be made, given, conceded or agreed to between the Contractor and HCL, and the Contractor agrees to extend the Bank Guarantee suitably if the Work is not completed as per the Contract Period or it is extended by the written consent of HCL.
 - f) HCL shall not be liable for payment of interest under Performance Security Deposit.
 - g) The Performance Security Deposit shall be released, on application by the Contractor within one (1) month of issue of final work completion certificate by HCL.
 - h) The Bank Guarantee shall not in any way be construed as a limitation of the Contractor's responsibility or liability pertaining to its obligation and guarantees under the Contract and shall be without prejudice to any other remedies available to HCL as expressly set out in the Contract.
 - i) The method of submission of Bank Guarantee is as below:
 - i. The bank guarantees issued by the issuing bank on behalf of the successful bidder in favour of Hindustan Copper Limited (HCL) shall be in hard copy in original on stamp paper as well as Structured Financial Messaging System (SFMS).
 - ii. HCL has chosen State Bank of India to act advising/beneficiary bank of HCL. The bank issuing the guarantee can chose this bank to send confirmation through SFMS.

- iii. The details of beneficiary (i.e. HCL) for issue of bank guarantee in SFMS platform is as furnished as below.

State Bank of India as advising bank of HCL

Name and Details of Beneficiary	I	Name	Hindustan Copper Limited
	II	Address	Tamra Bhavan, 1, Ashutosh Chowdhury Avenue, Kolkata 700019
	III	Area	Kolkata 700019
	IV	Name of Bank	State Bank of India
	V	Bank A/C No	00000010373629348
Beneficiary's Advising Bank, Branch and Address for Confirmation of BGs through SFMS	I	Name of the Bank	State Bank of India
	II	Name of the Branch of the Bank	CAG Branch Kolkata
	III	MICR Code	700002199
	IV	IFSC Code	SBIN0009998
	V	Address of the Branch of the Bank	34- J L Nehru Road. Reliance House, Kolkata 700071

- iv. The Successful bidder are required to take note of it that above particulars are to be incorporated by the issuing bank properly while issuing the Bank Guarantee under SFMS mode to avoid any future problem in accepting the BGs.
- v. The Guarantor (BG issuing bank) shall send information about issuance of this Guarantee through SFMS gateway to the State Bank of India, CAG Branch Kolkata (IFSC- SBIN0009998), to aid in the process of confirmation of Bank Guarantee.
- vi. The BG should also have a clause that “The BG shall be operable including encashment at issuing bank’s any local branch in Kolkata”.
- vii. The Original Bank Guarantee issued by the outstation bank shall be sent by the Issuing Bank to the Hindustan Copper Limited at Kolkata by Speed Post /Registered Post (AD).

6.2 Contract Execution Plan

6.2.1 Work Plan

- a) The Contractor shall, within thirty (30) days of Appointed date, in consultation with the Engineer-in-Charge finalize and submit to the Engineer-in-Charge, a Work Plan. The plan will contain resource mobilization plan giving details of manpower (statutory, supervisory, skilled, semi skilled and unskilled), machinery, equipment tools and tackles and other major materials/ consumables as required for completion of the work as per schedule.

The Engineer-in-Charge shall review the Plan submitted by the Contractor within five (5) days of the receipt thereof and convey its comments/observations to the Contractor including the need, if any, to modify the same. If the comments/ observations of the Engineer-in-Charge require, the Plan to be modified, the Contractor shall suitably modify the same and resubmit it to the Engineer-in-Charge for further review within five (5) days. The Engineer-in-Charge shall give its observations

and comments, if any, within three (3) days of receipt of such revised Plan, which shall be incorporated by the Contractor into the final Plan.

In the event that the Engineer-in-Charge is not able to review the Plan in full within the prescribed time, the Engineer-in-Charge may advise the Contractor to commence the Works. Notwithstanding any such review or failure to review by the Engineer-in-Charge, the Contractor shall be solely responsible for the adequacy of the Plan and the Contractor shall not be relieved or absolved in any manner whatsoever of any of its obligations hereunder.

6.2.2 Other submissions

The Contractor shall before the Commencement Date i.e. within 04 (four) months (120 days) from the Appointed date, will submit to HCL / Engineer-in-Charge, the following information, for the records of HCL:

- (i) Provident Fund Account Details
- (ii) Organization Structure
- (iii) Details of Work Manager, Key supervisory staff
- (iv) Contract Labour License
- (v) Medical Examination Records of the Employees as per Mines Act
- (vi) Permanent account number of Income tax (PAN)
- (vii) TIN
- (viii) GSTIN
- (ix) Other information as per requirement of contract, if any

6.3 Works

- (i) The Contractor is required to commence the Works on the Commencement Date **i.e. within 04 (four) months (120 days) from the date of issuance of LoI.**
- (ii) The Contractor shall in accordance with Good Industry Practices adhere to the Plan and complete the Works on or before the expiry of the Contract Period or as per agreed schedule.
- (iii) The Contractor shall, before commencement of the Works;
 - a) have requisite organization and designate and appoint suitable officers/ representatives as it may deem appropriate to supervise the Work, to deal with the Engineer-in-Charge /HCL and to be responsible for all necessary exchange of information required pursuant to this Contract;
 - b) construct, provide and maintain a reasonably furnished site office accommodation for its Project Manager and key supervisors at the Work Site.
 - c) have achieved Completion of Mobilization.

Failure to achieve the Completion of Mobilization before the commencement of Works shall not constitute a ground for extension of Contract Period.

- (iv) For the purposes of determining that the Works are being undertaken in accordance with the Work Requirements, the Contractor shall on its own and/or whenever directed by Engineer-in-Charge, with due diligence, carry out all necessary and periodical Tests in accordance with the instructions

and under the supervision of the Engineer-in-Charge. The Contractor shall maintain proper record of such Tests and the remedial measures taken to cure the defects or deficiencies, if any, indicated by the Test results.

- (v) On completion of the Works as per the Plan, the Contractor will notify the same to Engineer-in-Charge and ascertain the completeness and acceptability of the work.
- (vi) The Engineer-in-Charge may, by written notice, require the Contractor to suspend forthwith the whole or any part of the Works if in its reasonable opinion the same is being carried on in a manner that is not in conformity with the Work Requirements and/or Plan.
- (vii) The Successful Bidder shall not assign either in part or in whole, its obligations (without diluting any of its primary responsibility and duties) to be performed under this contract to any other party, except with HCL's prior written consent. **Contractor to note that 100% subletting of work shall not be permitted.**
- (viii) Contracts must comply with the provisions of the contract and each and every clause of scope of work will be binding upon them.

6.4 Material Breach of Work Requirements

- (i) The Contractor shall be deemed to be in Material Breach of Work Requirements if the Engineer-in-Charge acting reasonably and in accordance with the provisions of this Contract, has determined that due to breach of its obligations by the Contractor:
 - a) There has been failure/undue delay in implementation of the Works and the Works have not been carried out in accordance with the Work Requirement/ Plan;
 - b) There has been a serious or persistent default in adhering to safety requirements and standards as prescribed by DGMS and thereby the Mining Facilities or any part thereof is not safe for operations;
 - c) There has been persistent breach of Work Requirements/ Plan.

For avoidance of doubt, persistent breach shall mean:

- i. Any breach of Work Requirements by the Contractor which has not been remedied by the Contractor despite a notice to remedy in respect thereof issued by the Engineer-in-Charge/HCL; or
 - ii. Recurrence of a breach by the Contractor, during the pendency of notice to remedy by the Engineer-in-Charge/HCL requiring the Contractor to remedy a breach; or
 - iii. Repeated occurrence of a breach notwithstanding that earlier breaches have been remedied pursuant to notice to remedy or otherwise.
- (ii) **HCL's Rights**

Upon occurrence of a Material Breach of Work Requirements, HCL shall, without prejudice to and notwithstanding any other consequences provided therefore under this Contract, be entitled to terminate this Contract.

6.5 Insurance

- a) The Contractor shall at its cost and expense, purchase and maintain, during the Contract Period such insurance as are necessary including but not limited to the following:

- i. Comprehensive third party liability insurance including injury or death to personnel / representatives of Persons who may enter the Work Site;
- ii. Workmen's compensation insurance;
- iii. Automobile Liability Insurance: Covering use of vehicles / mobile equipment used by the Contractor or its Sub-Contractors (whether or not owned by them) in connection with the execution of the Contract.
- iv. Any other insurance that may be necessary to protect the Contractor, its employees and its assets against loss, damage, destruction, business interruption or loss of profit including insurance against all Force Majeure Events that are insurable.

b) Evidence of Insurance

The Contractor shall, from time to time, provide to HCL copies of all insurance policies (or appropriate endorsements, certifications or other satisfactory evidence of insurance) obtained by the Contractor in accordance with this Contract.

c) Validity of Insurance

The Contractor shall from time to time promptly pay insurance premium, keep the insurance policies in force and valid throughout the Contract Period and furnish copies thereof to HCL.

d) Application of Insurance Proceeds

Unless otherwise provided herein, the proceeds of all insurance policies received shall be promptly applied by the Contractor towards repair, renovation, restoration or re-instatement of the Work Facilities or any part thereof which may have been damaged or destroyed. The Contractor may designate the Lenders as the loss payees under the insurance policies or assign the insurance policies in their favour as security for the financial assistance provided by them to the Work. The Contractor shall carry out such repair, renovation, restoration or re-instatement to the extent possible in such manner that the Work Facilities after such repair, renovation, restoration or re-instatement be as far as possible in the same condition as it were prior to such damage or destruction, normal wear and tear excepted.

6.6 Employment of Labour

The Contractor shall, at its cost employ all necessary workmen and personnel for due and punctual performance of its obligations during the Contract Period in accordance with all Applicable Laws and the conditions specified in **Schedule II** and Good Industry Practices.

6.7 Health & Safety, Training, and Environment

- 6.7.1** The Contractor shall ensure, at its own cost, that its workers, employees and personnel are suited for undertaking the Works. Additionally, all personnel of the Contractor will have to undergo an Initial Medical Examination ("IME") before they can commence work on the Work Site. For persons above forty five (45) years of age Periodical Medical Examination ("PME") has to be conducted at the end of the third (3rd) year. IME and PME shall be carried out at Moubhandar hospital, and shall be chargeable at Rs _____ (Rupees _____ only) per person. Contractor shall also maintain complete first aid facilities for all his employees and personnel. Industrial injuries shall be reported promptly to the Engineer-in-Charge / HCL, and a copy of Contractor's report covering each personal injury requiring the attention of a physician shall be furnished to the Engineer-in-Charge.

- 6.7.2** First Aid facilities and provisions as required under Mines Rules, 1955 with latest amendments shall be kept at the work site by the Successful Bidder.
- 6.7.3** The Successful Bidder shall be responsible for and shall pay compensation to his workmen which would be payable for injuries due to accidents and/or notified and compensable disease under the Workmen's Compensation Act 1923, hereinafter called the said Act. If such compensation is paid by HCL as principal employer under sub-section (1) of the section (12) of the said Act, such compensation shall be recovered by HCL from his Security Deposit or from any sum which may be due or may become due to the Successful Bidder on any account whatsoever, the Successful Bidder should adequately insure the workers, and HCL shall not permit the Successful Bidder to start the work unless such insurance certificate is produced.
- 6.7.4** All personnel of the Contractor will be given vocational training including initial training & special training for operators etc. free of cost at the Surda Vocational Training Centre by HCL.
- 6.7.5** Additionally, the Contractor shall, at its cost, comply with all necessary environment, health and safety measures for due and punctual performance of its obligations during the Contract Period in accordance with all Applicable Laws and the conditions specified in **Schedule III** and Good Industry Practices.

6.8 Special Conditions

- a) All rock obtained from excavation at the Work Site shall remain the property of HCL and shall be disposed off at the site/location allocated by Engineer-in-Charge.
- b) All fossils, gold, coins and articles of antique value and interest found at the Work Site shall be the absolute property of HCL and the Contractor shall take reasonable precautions to prevent its workmen or any other person from removing or damaging any such articles and shall inform immediately upon finding thereof and before removal inform the Engineer-in-charge and carry out the Engineer-in-Charge's directions as to the manner of treatment of the same.
- c) Immediately, on request of HCL, carry out diligently all Emergency Works.

6.9 General Obligations

The Contractor shall at its own cost and expense:

- a) File all necessary and statutory application, returns and reports and obtains all Applicable Permits in conformity with the Applicable Laws and be in compliance thereof at all times during the Contract Period;
- b) Procure and maintain in full force and effect, as necessary, appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes and systems used in or incorporated into the Work;
- c) Endeavour to incorporate in each Work Agreement specific provisions that would entitle HCL or a nominee of HCL to step into the same at HCL's discretion, in place and substitution of the Contractor;
- d) Provide all necessary assistance to the Engineer-in-Charge as it may reasonably require for the performance of its duties and services;
- e) Appoint, supervise, monitor and control as necessary, the activities of Contractors, if any, under the respective Work Agreements;

- f) Make efforts to maintain harmony and good industrial relations among the personnel employed in connection with the performance of its obligations under this Contract;
- g) Make its own arrangements for construction materials and observe and fulfill the environmental and other requirements under the Applicable Laws and Applicable Permits;
- h) Be responsible for quality, soundness, durability, safety and the overall Work Requirements to implement and/or operate and maintain the Work/Work Facilities;
- i) Ensure that the Work Site remains free from all encroachments and take all steps necessary to remove encroachments, if any;
- j) Afford access to the Work Site to the authorized representatives of HCL, the Engineer-in-Charge and any Government Agency having jurisdiction over the Work Site, including those concerned with safety, security or environmental protection to inspect the Work and to investigate any matter within their authority and upon reasonable notice, the Contractor shall provide to such persons assistance reasonably required to carry out their respective duties and functions;
- k) Obtain at its costs and charges, special or temporary right of access, occupation or user of any property that may be required by it in connection with implementation of the Work. The Contractor shall also obtain at its cost such facilities as may be required by it for the purposes of the Work and the performance of its obligations under this Contract.
- l) As per recommendations of 10th National Conference on safety in Mines, the Contractor shall be required to adhere to the following additional responsibilities for safety in the Mine:
 - I. Prepare a written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with them
 - II. Provide a copy of the SOP to the Engineer-in-charge.
 - III. Keep an up to date SOP and provide a copy of changes to Engineer-in-charge.
 - IV. Ensure that all the Works are being carried out in accordance with the Applicable Laws and SOP and for the same, the Contractor will deploy adequate qualified and competent personnel for the purpose of carrying out the Works in a safe manner.
 - V. Ensure that every person engaged by him in the Mine must wear safety gadgets to be provided by the Contractor at his own cost and expense. If Contractor fails or is unable to provide safety gadgets, Engineer-in-charge will provide the same and the expenses accrued for the safety gadgets will be deducted from the running bill of the Contractor.
 - VI. Submit to DGMS, quarterly returns indicating:
 - i. Name of firm,
 - ii. Registration number,
 - iii. Name and address of persons heading the firm,
 - iv. Nature of work,
 - v. Type of deployment of work persons,
 - vi. Number of work persons deployed,
 - vii. Number of work persons who hold vocational training certificate,
 - viii. Number of persons who have undergone IME and
 - ix. Type of medical coverage given to the work persons.
- m) Contractor shall be responsible to establish and maintain Time Office at site as required under the statute.

n) **Fencing and barricades:**

1. Successful Bidder shall erect and maintain fencing and barricades required in connection with his operation to guard or protect-
 - i) Excavations,
 - ii) Hoisting areas,
 - iii) Areas adjudged, hazardous by Successful Bidder's or Owner's representatives,
 - iv) Owner's existing property likely to be damaged by Successful Bidder's operations,
 - v) Unloading spots, and
 - vi) Any other place as directed by the Engineer-in-charge.
 2. Successful Bidder's employees shall become acquainted with Owner's barricading practice and shall respect the provisions thereof.
- o) **Safety provisions to be displayed on notice board:** The safety provisions should be displayed on the notice board at a permanent place at the work spot. The person responsible for compliance of the safety code shall be named therein by the Successful Bidder.
- p) **Support:** Wherever necessary, temporary support shall be provided/ erected and maintained so as to keep the area in safe condition till the permanent support is provided/erected. If in the opinion of the Engineer-in-charge any other type of support is necessary, Successful Bidder shall comply with the instructions.
- q) **Alignment:** It shall be Successful Bidder's responsibility to excavate all drives, cross-cuts, and other excavations to correct alignment, gradient and dimensions. However, HCL may perform check survey as per requirement and the Successful Bidder shall render all the necessary facilities to perform the task.

6.10 No Breach of Obligations

The Contractor shall not be considered to be in breach of its obligations under this Contract nor shall it incur or suffer any liability if and to the extent performance of any of its obligations under this Contract is affected by or on account of any of the following:

- a) Force Majeure Event, subject to Article 9.2(b)
- b) HCL Event of Default,
- c) Compliance with the instructions of the Engineer-in-Charge/HCL or the directions of any Government Agency other than instructions issued as a consequence of a breach by the Contractor of any of its obligations hereunder;
- d) Emergency decommissioning of the Work or part thereof;
- e) Contractor's inability to remove any accident debris due to non-completion of any police / insurance related inquiry/survey despite prompt steps having been taken by the Contractor in that regard.

6.11 Related Works

6.11.1 Contractor's acknowledgement

The Contractor acknowledges that Related Works may be performed and that it is of paramount importance that the design and execution of the Works are fully and completely coordinated with the Related Works in view of their concurrent and sequential nature and that such coordination is of the utmost importance to the successful integration of the Works with the Related Works and to the timely completion of the Work.

6.11.2 Related Works' responsibilities

Accordingly, the Contractor shall at its own cost and expense, at all times and otherwise in accordance with the requirements and directions of HCL's Representative:

- a) Plan, programme, and perform the design and execution of the Works so as to minimize any interference with or hindrance of the performance of the Related Works; and
- b) At all times take every necessary step to protect the Works from accidental damage caused by the Related Works; and
- c) At all times co-operate with the Employer, HCL's Representative and any Related Works contractors so as to promote and foster a coordinated and integrated approach to the Works and the Related Works. The Contractor shall co-ordinate its activities with Related Works contractors so as to prevent, as far as possible, the performance of work by such Related Works contractors from impeding the performance of the Contractor or unreasonably disturbing the free movement of traffic around, on or in the vicinity of the Work Site; and
- d) Comply with all obligations as to interfacing the Works with the Related Works as are detailed in HCL's Requirements; and
- e) Advise the Employer if any plans, designs, specifications and drawings of the Related Works contractors supplied by the Employer are in any way incompatible or inconsistent with or otherwise detrimental to the Works. In the case of such incompatibility or inconsistency the Contractor shall supply the Employer with full details of the same and make appropriate recommendations as to how the incompatibility or inconsistency may be remedied; and
- f) Monitor the coordination and integration of the Works with the Related Works and advise the Employer's Representative in writing as and when it becomes apparent that execution of the Works is likely to be the subject of delay and/or disruption and recommend reasonable proposals to reduce or prevent such delay and/or disruption.

6.11.3 Co-ordination meetings

HCL's Representative shall convene regular co-ordination meetings with the Contractor and Related Works contractors in order to:

- (a) Resolve conflicts in the order and sequence of the Works and Related Works in order to effect reasonable co-ordination and integration of the execution of the Works with the execution of the Related Works; and

6.11.4 Failure to co-ordinate

In the event that the design and execution of the Work and the design and execution of the Related Works are not being coordinated and integrated to the reasonable satisfaction of the Employer's Representative, the Employer's Representative may issue such instructions as is necessary including, but not limited to:

- (a) suspending the progress of the design (to the extent required by the Contract) or execution of the Works or any part thereof; and/or
- (b) changing the Works including the omission of work from the Contract and its execution by others at the risk and cost of the contractor.

For the avoidance of doubt, where the Employer's Representative acting reasonably, determines that an instruction under the relevant clause of the contract is required as a result of a breach by the Contractor of its obligations. The Contractor shall not be entitled to any payment whatsoever in respect of any such instruction or to any extension of time in respect thereof and the costs to the Employer of such instruction including the cost of any such suspension, or removal and execution by others shall, without prejudice to the Employer's other rights under the Contract, be deducted from the Contract Price.

6.11.5 The Employer's Representative's assistance

In the event that the design and execution of the Works and the design (if any) and execution of any Related Works are unable to be coordinated and integrated in accordance with this Article 6.11 as a result of circumstances beyond the control of the Contractor, the Contractor may request the Employer's Representative:

- (a) to issue within ten (10) days of the Contractor's request, such instructions as the Employer's Representative may consider necessary to enable the Contractor to comply with its obligations under this Article 6.11; and/or
- (b) to use its reasonable endeavour to assist in procuring the removal of the hindrance or impedance preventing the Contractor from complying with its obligations under this Article 6.11.

6.11.6 Contractor to bear costs

The Contractor shall bear all costs and expenses associated with any change or remedied work rendered necessary to the design or execution of the Works or to the design or execution of work of any Related Works contractor as a result of any failure on the Contractor's part to comply with the provisions of this Article 6.11. Subject always to this Article 6.11 if in the opinion of HCL's Representative any cost is or is likely to be incurred partially as a result of a failure by the Contractor and partially as a result of a failure by a Related Works Contractor, then in the event that the Contractor and the Related Works Contractor are unable to agree on the apportionment of such costs between them, HCL's Representative may instruct the Contractor to make a change or carry out any repair it deems necessary and, notwithstanding the provisions of Article 8 in valuing such change or repair, it shall be entitled to make what it in its absolute discretion the assessment of such costs allocable to the Contractor for such change or repair as a result of the Contractor's failure to comply with the requirements of this Article 6.11.

6.11.7 Contractor's obligations

Without limiting its obligations under this Article 6.11 the Contractor shall exercise due care and diligence in the design and execution of the Works where such design and execution of the Works affects or is likely to affect the Related Works and shall bear all costs, expenses, damages and losses suffered by any Related Works Contractor as a result of its failure to comply with such obligations.

6.11.8 Contractor's Indemnities

The Contractor shall indemnify and keep indemnified the Employer against all claims, proceedings, damages, costs, losses, charges and expenses of any nature whatsoever arising from the Contractor's failure to comply with its obligations under this Article 6.11.

6.11.9 Temporary Works

The Contractor shall be fully responsible for the cost of all delays to the Works or any part where such delays have been occasioned to or in connection with Temporary Works by the defaults or omissions of any Related Works Contractor and it shall not be entitled to any extension of time or additional payment in respect thereof. Such responsibility shall in no way be in derogation of the Contractor's other obligations under this Article 6.11.

6.12 Contractor's Documents

6.12.1 The Contractor shall prepare all Contractors' Documents. The Contractor shall submit to HCL's Representative and the Engineer-in-Charge

- a) within such time as may be directed by HCL's Representative, those Contractor's Documents called for in the Contract or as HCL's Representative may require and in the numbers and format required by the Contract or, if no such number and format is stated in the Contract, as required by HCL's Representative; and
- b) during the progress of the Works such additional Contractor's Documents within such times and in such numbers and format as HCL's Representative may reasonably require.

6.12.2 HCL's Representative shall review and comment on any Contractor's Documents submitted in accordance with Article 6.12.1 within 21 (twenty-one) Business Days after receipt of the Contractor's Document ("the **Review Period**"). HCL's Representative shall signify "no comment" or "comments made" or "resubmit" and return one copy of the Contractor's Document to the Contractor. If the Employer's Representative fails to so do within the Review Period, it shall be deemed that the Employer's Representative has signified "no comment".

6.12.3 The notes "no comment" or "comments made" will enable the Contractor to proceed on the basis of the Contractor's Documents provided that the Contractor fully addresses any comments made by the Employer Representative.

6.12.4 If, before reviewing and commenting on any design contained in any Contractor's Documents, the Engineer-in-Charge considers any change or modification is necessary to such Contractor's Documents, HCL's Representative may notify the Contractor accordingly whereupon the Contractor shall effect the same and re-submit the Contractor's Documents in accordance with this Article 6.12

6.12.5 Where any Contractor's Document is marked "resubmit" the same shall be amended, modified or prepared again, as the case may be, and resubmitted by the Contractor and the procedure set out in this Article 6.12 shall apply to the re-submitted Contractor's Document.

6.12.6 Notwithstanding any of the provisions of the Contract relating to the Contractor's Documents, the Contractor shall be fully responsible for:

- a) The adequacy of the Contractor's Documents in accordance with the Contract; and
- b) any failures of any Contractor's Documents whether to comply with the Contract and/or to meet its obligations there under or otherwise and for any ambiguities, failures, discrepancies,

insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities in any such Contractor's Documents howsoever such ambiguities, failures, discrepancies, insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities may have arisen.

- 6.12.7** The Contractor shall at its own expense carry out any alterations or remedial work necessitated by reason of any ambiguities, failures, discrepancies, insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities in any Contractor's Documents and shall modify the Contractor's Documents accordingly, or if the same be done by or on behalf of the Employer, the Employer shall be entitled to recover from the Contractor all costs reasonably incurred therein and may, without prejudice to any method of recovery, deduct the same from any monies due or which may become due to the Contractor.
- 6.12.8** The Contractor is aware of the time required by HCL's Representative for the review of the Contractor's Documents and shall allow adequate time for such review. Furthermore, HCL's Representative shall not be obliged to comment upon any Contractor's Documents without first satisfying himself that to the extent required, such comment is issued with the consent, non-objection or approval of the Engineer-in-Charge or a Government Agency.
- 6.12.9** No design or execution of any part of the Works shall commence during the Review Period for those Contractor's Documents which are relevant to its design and execution except as may be expressly agreed in writing by HCL's Representative.
- 6.12.10** If the Contractor wishes to modify any Contractor's Document (including any design contained in Contractor's Documents) which has previously been reviewed by HCL's Representative, the Contractor shall immediately give notice to the Employer's Representative. Thereafter, the Contractor shall submit revised documents to HCL's Representative and the provisions of this Article 6.12 shall apply.
- 6.12.11** Save as expressly provided in this Contract, the Contractor shall not seek to recover from the Employer any loss or claim which may arise from the adoption, use or application by or on behalf of the Contractor or any other Person for whom the Contractor is responsible of the design in any Contractor's Documents.
- 6.12.12** No review, comment, suggestion, approval on any other communication by HCL's Representative made in accordance with the review procedure specified in this Article 6.12 shall relieve the Contractor of any of its obligations under the Contract.

6.13 Employment of Foreign Nationals

The Contractor shall be responsible for and bear all expenses for the employment of foreign nationals and comply with the Applicable Laws and other statutory requirements in relation to the employment of foreign nationals.

ARTICLE - 7

HCL's OBLIGATIONS

In addition to and not in derogation or substitution of any of its other obligations under this Contract, HCL shall have the following obligations:

7.1 Specific obligations

HCL shall:

- a) Appoint/nominate the Engineer-in-Charge in accordance with Article 5.1 above.
- b) Instruct Engineer-in-Charge for carrying out all the obligations and exercise all the rights set out in **Schedule I**.
- c) Ensure that Engineer-in-Charge reviews and finalizes the Plan, Drawings and other documents within a reasonable time and in any case within the respective time specified elsewhere in this Contract.
- d) Provide to Contractor in accordance with the Plan, supply of specific items set out in **Schedule IV** upon exercise of the Contractor's option to obtain these utilities from HCL.
- e) Make payment of Contract Price in accordance with the provisions of this Contract.
- f) Grant in a timely manner, all such approvals, permissions and authorizations which the Contractor may require or is obliged to seek from HCL in connection with implementation of the Work and the performance of its obligations, under this Contract.
- g) Take all steps and make all applicable applications, filings, returns and reports for a license holder of a mine in accordance with the Applicable Laws to ensure compliance, development, operations and maintenance of the Work/Work Facilities.

7.2 General obligations

HCL shall:

- a) grant or where appropriate provide necessary assistance to the Contractor in securing all Applicable Permits;
- b) ensure peaceful use of the Work Site by the Contractor under and in accordance with the provisions of this Contract without any hindrance from HCL or any Governmental Agency or persons claiming through or under it/them;
- c) pay Dead Rent / Royalty, payment to District Mineral Fund (DMF), National Mineral Exploration Trust (NMET) and surface rent;
- d) Observe and comply with all its obligations set forth in this Contract.

ARTICLE - 8

CONTRACT PRICE

8.1 Contract Price

i) PRICE BASIS

1.1 The Contract Price is inclusive of **Basic price, all taxes & duties, levies, freight, Insurance etc. but** excluding Goods and Services Tax (GST). Subject to the provisions of this Contract and in consideration of undertaking to perform and discharge its obligations in accordance with the terms, conditions and covenants set forth in this Contract, HCL agrees and undertakes to make to the Contractor, the following payments (“**Contract Price**”) as per the provisions of this Article:

(a) **Payment for work done (Including Decline Development & Underground Development, Civil works, Production from Stopes and Transportation of Ore)**

Payment for actual work done shall be for Scheduled Items and Open Items, and shall be at the rates against each respective item set out under **Schedule V** hereafter achieved and certified by Engineer-in-Charge during any Contract Payment Period. However Open items shall be paid separately as per the rate if ordered by HCL.

(b) **Payment for Design & Engineering:**

Payment for drawing and design shall be made on approval of all the drawings of respective items of Price Schedule on monthly pro rata basis.

(c) **Payment for Supply of Equipments**

Payment for the supplies/utilities/equipment/machineries and others which are required to be installed/ commissioned at the Project Site, shall be made in the following manner:

- i. Eighty percent (80%) of supply price on pro-rata basis on receipt of materials at site and certification by HCL of the utilities / equipment / machineries etc –against submission of following documents:
 - (ii) Clear lorry receipt
 - (iii) Invoice
 - (iv) Packing list
 - (v) Test certificate
 - (vi) Pre-despatch inspection certificate / waiver of inspection.
 - (vii) Warranty certificate
 - (viii) Despatch clearance certificate issued by Consultant/HCL.
- ii. Ten percent (10%) of supply price after successful Commissioning of the utilities / equipment / machineries etc at the Project Site and submission of following documents:
 - a) Signed commercial invoice- 3 copies
 - b) Successful commissioning certificate issued by Consultant/ HCL
 - c) Submission of approvals from statutory authorities, if any.
- ii) Ten percent (10%) payment of supply price shall be paid against Final Acceptance Certificate issued by the Employer and submission of all completed documentation (if any) as per the Contract.

The Contractor shall be required to raise a separate bill for HCL to make payment for utilities.

(d) **Erection Of Equipments**

- i) Eighty percent (80%) of the Erection of equipments price of the equipment shall be made as per the unit rates on pro-rata basis after issue of certificate by the Employer/ Consultant.
- ii) Ten percent (10%) of the erection of equipments price shall be made on issue of Commissioning Certificate by HCL
- iii) Ten percent (10%) of the erection of equipments price shall be made on issue of Final Acceptance Certificate by HCL

8.2 1.2 The rates for payment set out in Schedule V shall be revised after completion of every quarter of this Agreement based on the mechanism set out under Schedule VI hereafter. The Escalation formula shall remain valid for the Contract Period or the period till penalty is not imposed as per clause 8.6 whichever is later. Payment Mechanism

8.2.1 The contract price relating to each month shall be payable for actual work done by the contractor for the month through e-payment only as per format given in Schedule VIII (“contract payment period”). Contractor shall submit the bill for the actual work done during a contract payment period to the engineer-in-charge on contract payment due date.

The bill shall be based on the Joint Measurement Certificate. Joint measurements of work completed during a month and cumulative shall be made on last day of each month and the results of such joint measurements should be recorded and jointly signed in a bound book. Engineer-in-Charge shall certify the quantities and arrange for the payment of Contractor’s bill after allowing adjustments for the supplies rendered to HCL and for other deductions.

Payment of the work done shall be made by credit period of 30 days from the receipt of the bill for the month of completion of the job, after applicable deduction, if any. However no claim shall be entertained for any delay in payment. The R.A. bills should be submitted to the Engineer-in-Charge within three weeks of completion of work.

The payment for each month’s actual work done shall be made after recovery of statutory deductions if any.

The Contractor will submit proof of depositing of provident fund of the previous month with the bills.

8.2.2 Joint measurement: Successful Bidder shall submit the bill for the work done during the previous months in accordance with the joint measurement to the Engineer-in-charge in the first week of every month. The results of such joint measurements should be recorded and jointly signed in a bound book. Engineer-in-charge shall certify the quantities and arrange for the payment of Successful Bidder’s bill after allowing adjustments for the supplies and services rendered by the company and for other deductions.

All measurements shall be in metric system. All the work in progress will be measured by the representative of the Engineer-in-charge and the Successful Bidder’s authorized agent progressively. For the purpose of taking joint measurement the Successful Bidder’s representative shall be bound to be present whenever required by the Engineer-in-charge. If, however, he absents

for any reason whatsoever the measurements will be taken by Engineer-in-charge or his representative and this will be deemed to be correct and binding on the Successful Bidder.

For Ore Production from stopes the printed readings of the weigh bridge shall be final for the measurement of Ore Production.

8.3 Withholding of payments to Contractor and HCL's lien on money due to the Contractor

Payments may at any time be withheld or reduced if, in the opinion of HCL, the Contractor is not diligently and efficiently endeavoring to comply with the terms of the Contract or if the Contractor should fail to pay wages to his labour or for material.

HCL shall have a lien on all amount that may become due and payable to the Contractor under this Contract or transaction of any nature whatsoever between HCL and the Contractor and the Performance Security furnished by the Contractor under the Contract or any sum that may become due and payable to the Contractor till the Contractor pays and clears the claim immediately on demand.

8.4 Final Payment and Release

On Completion the Engineer-in-Charge will issue a Completion Certificate to the Contractor on the application of the Contractor after satisfying himself (Engineer in charge) that the work has been completed in accordance with the contract documents and verifying from the following completion documents:

- (a) All surplus materials, rubbish, equipment etc are cleaned off the site completely.
- (b) The work has been measured,
- (c) All temporary works, labour and staff colonies/camp constructed are removed.
- (d) Performance Security, if any remaining after set-off by HCL of any amounts owed by the Contractor to HCL, and which amounts not having been paid by the Contractor to HCL,

Material appropriation statement for the material, if issued by HCL for the Work and list of surplus material returned to HCL's stores duly supported by necessary documents. If the contractor fail to comply with the requirements of this clause on or before the date fixed for the completion of the work, the Engineer-in-Charge may at the expenses of the contractor remove such surplus materials and rubbish and dispose off the same as he thinks fit. The contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such surplus materials as aforesaid except for any sum actually realized by the sale thereof.

The Contractor, after obtaining the completion certificate, is eligible to present the final bill for the work executed by him under the terms of contract.

After the issue of Completion Certificate by the Engineer-in-Charge as aforesaid and on the particulars contained therein and after getting the final bill for the work executed by the contractor, HCL shall determine the total value of the Work done by the Contractor and after adjusting all sums paid to him already or due to HCL, and such further sums as HCL may require to reserve or retain under the terms of the Contract, release eighty percent (80%) of the final payment due to the Contractor subject to undertaking given by the contractor. The remaining twenty percent (20%) of the outstanding final payment shall be paid by the HCL within seven (7) days after the expiry of the Period of Liability, provided that no set-offs are required to be made by HCL, during the Period of Liability, for remedying any work done by the Contractor under the Contract. Such final

payment shall be made only when the Contractor furnishes to HCL an undertaking to the effect that Contractor has no further claim of whatever nature or description against HCL.

The Contractor should file no claim after final payment and HCL will not be liable to pay any money to the Contractor except as specifically provided for in the Contract. Acceptance by the Contractor of the final payment as aforesaid shall release HCL from all acts of omission and commission by HCL or by the Engineer-in-Charge.

8.5 Variation in Schedule Items

The quantities indicated in **Schedule V** are indicative and at this stage it is envisaged that variation in major works of shafts, declines, ore passes, raises, ramps and mine development may be within plus/minus 25%. Variation in other items may be to any extent. **However the total variation shall not exceed ± 5 percent (5%) of the total amount of the Contract price.**

8.6 Liquidated Damage (LD)

8.6.1 Liquidated Damage For Non Fulfillment of Performance

Time is the essence of the contract. Successful bidder will give quarterly target for shaft sinking, mine development (includes decline development) & ore production (from 30th month) for one year after end of mobilization period i.e four (4) months from issue of LOI which will be reviewed and approved by HCL. If the Successful Bidder fails to achieve 90% of the HCL approved target separately for shaft sinking, mine development (includes decline development) & ore production , they shall be liable to pay liquidated damages on Quarterly basis. Liquidated Damages shall be calculated in the manner specified in the Article 8.6.2.

8.6.2 Liquidated Damage will be levied on the Contractor, and calculated in the following manner:

1. Targeted shaft sinking, mine development (includes decline development) & ore production shortfall will be calculated on quarterly basis as per rates given below:

Shortfall in Quarterly Approved target	Rate of liquidated damage
<i>Up to 10%</i>	<i>NIL</i>
<i>Above 10% but less than or equal to 20%</i>	<i>10 % of the shortfall value in Quarterly target</i>
<i>Above 20% but less than or equal to 40%</i>	<i>15 % of the shortfall value in Quarterly target</i>
<i>Above 40%</i>	<i>20 % of the shortfall value in Quarterly target</i>

Any shortfall in achievement of quarterly targeted shaft sinking, mine development (includes decline development) & ore production shall be communicated by Engineer-in-Charge to the Successful Bidder and will attract liquidated damages, as the shortfall will adversely affect mining programme of HCL. Failure to achieve the said target for any performance review period by the Successful Bidder shall make him liable to pay a Liquidated Damages from their running bills at the following rates:

A delay by the Successful Bidder in the performance of its obligations under the contract shall render the Successful Bidder liable to any or all of the following consequences: damage claim by HCL, invoking of Security Deposit and/ or termination of the Contract making the Successful Bidder liable for all consequential damages suffered or sustained by HCL apart from the liquidated damages.

Also, HCL shall reconcile measurement of work done at the end of each completed year, and excess amount of LD on account of non achieving quarterly target earlier, deducted earlier from the bills of the successful bidder on quarterly basis during the completed period of 1 year, shall be refunded to the successful bidder on achievement of 100% of the annual target.

Non-achievement of targets will, however, not attract any liquidated damages in case the same is established due to force majeure conditions as stipulated under the contract.

HCL shall have the right to adjust the Liquidated Damage which HCL may become entitled to from any amount payable by HCL to the contractor under the contract and in case no payment is due from HCL to the contractor, the contractor shall promptly and without demur or protest arrange remittance to HCL on demand.

However, if there is shortfall in the achievement due to such circumstances, which are under the control of HCL, liquidated damages will not be applicable & in that case, proportionate reduction in the monthly/quarterly target will be allowed.

8.6.3 The liquidated damage will be maximum of 10% of the total awarded value (excluding GST).

8.6.4 HCL shall have the right to adjust the Liquidated Damage which HCL may become entitled to from any amount payable by HCL to the contractor under the contract and in case no payment is due from HCL to the contractor, the contractor shall promptly and without demur or protest arrange remittance to HCL on demand.

If the delay in completion of execution of job is attributable to HCL, or due to a Force Majeure event, then Competent Authority may consider waiving of LD, provided the occurrence of the event is informed by notice to HCL, immediately thereof.

8.7 Situation when Reduction not leviable:

The Contractor is not liable to Reduction, if such Reduction is triggered on account of following events:

- (i) delay in delivery of the Work Site or any part thereof by HCL,
- (ii) suspension of Works or part thereof by HCL or the Engineer-in-Charge, for reasons not attributable to the Contractor,
- (iii) Change of Scope Order
- (iv) HCL Event of Default, and
- (v) Any other event as may be expressly notified by HCL during the Contract Period.

8.8 Payments for Emergency Works

In the event the Contractor, having executed Emergency Works beyond the Works for which rate have been indicated against Scheduled Item, and such Works are not part of the work and due to the nature of work being an Emergency, a Change of Scope Order has not been issued, payments

for such works shall be arrived based on mutual discussions between the Parties subject to recording of such jobs to be done in a specified time which is to be indicated.

8.9 Taxes and Duties

- (a) The Contractor agrees to and does hereby accepts full and exclusive liability for the payment of any and all taxes including Goods and Services Tax (GST) now or hereafter imposed, increased or modified, insurance and old age pensions or annuities now or hereafter imposed by any Central or State Government which are imposed with respect to or covered by the wages/salaries or other compensations paid to the persons employed by the Contractor. The Contractor shall be responsible for the compliance with all obligations and restrictions imposed by any applicable labour law or any other law affecting employer-employee relationship and the Contractor further agrees to comply, and to secure the compliance of all Contractor(s) if any, with all applicable Central, Municipal laws and regulations and requirements of any Central, State or local Government Agency or authority.

The statutory variation in taxes and duties shall be reimbursed / adjusted at actual on submission of proof of documentary evidence.

- (b) **Taxes as applicable from time to time.**

The rates at which Contract Price is arrived under **Schedule V** are inclusive of **Basic price, all taxes & duties, levies, freight, Insurance etc. but** excluding Goods and Services Tax (GST) which shall be reimbursed on production of Bill against which Input Credit can be taken.

The statutory variation in taxes and duties shall be reimbursed at actual on submission of proof of documentary evidence.

- 8.10 Tax deduction at source:** Income Tax, Works Contract Tax or any other statutory tax will be deducted at the time of payment at the prevailing rate as applicable from time to time.

- 8.11 Currency for payment:** All payments shall be made in Indian Rupee. Payment will not be made in any other currency.

ARTICLE - 9

FORCE MAJEURE

9.1 Force Majeure Events

If at any time during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract shall be prevented or delayed by reasons of war, act of hostility of public enemy, civil disruption or sabotage, fires, floods, land slide, explosions, epidemics, quarantine restrictions, strikes, lock-outs or acts of God (here-in-after referred to as events), provided notice of the happening of any such eventuality is given by the either party to the other within 21 days from the date of occurrence thereof, neither party shall by reasons of such event be entitled to terminate this contract nor shall either party have any claim for damages against the other in respect of such non – performance or delay in performance / execution under this contract. Provided also that such performance/execution under the contract should commence as soon as practicable, after such event has come to an end or ceased to exist, and the decision of HCL as to whether the performance has been so resumed or not shall be final and conclusive. Provided further that if the performance in whole or in part or any execution under this contract is prevented or delayed by reasons of any such event for a period exceeding 60 days, either party may opt to terminate the contract. If the contract is terminated under this clause, HCL shall have liberty to take over from the contractor at a reasonable price, all unused, undamaged and acceptable materials, machinery, equipments, etc. at the site being used for the performance of the contract and in the possession of the contractor at the time of such termination of such portion thereof as HCL may deem it fit, except such materials, equipments, etc that the contractor may with the concurrence of HCL elect to retain.

9.2 Foreclosure of Contract Full or in Part

If at any time after acceptance of the TENDER, HCL shall decide to foreclose or reduce the scope of the Works and hence not require the whole or any part of the Work to be carried out, the Engineer-in-Charge shall give 10 days notice in writing to that effect to the Contractor, provided that in the event, any such action is taken by HCL, the Contractor shall be paid full amount for the up to date quantum of Work executed at Work Site as per billing schedule under the relevant items of Work under this Contract and in addition, a reasonable amount as certified by the Engineer-in-Charge or any other agency appointed by HCL for those supplied items which could not be utilized for execution of the Work to the full extent because of the foreclosure.

ARTICLE - 10

MATERIAL BREACH AND SUSPENSION

10 MATERIAL BREACH AND SUSPENSION

- 10.1** If the Contractor shall be in Material Breach of this Contract, HCL shall be entitled in its sole discretion and without prejudice to its other rights and remedies under this Contract including its right of Termination hereunder, to (i) suspend all or any of the rights of the Contractor under this Contract including payment of Contract Price by HCL and (ii) exercise the rights of the Contractor under this Contract itself or authorize any other person to exercise the same during such suspension. Such suspension by HCL shall be by a communication in writing to the Contractor and shall be effective forthwith upon the issue thereof to the Contractor. Provided, however, that the period of such suspension under this Article shall not exceed one hundred and twenty (120) days.
- 10.2** Subject to Article 10.1 above, HCL shall have the right to utilize the proceeds of Contract Price and Performance Security for meeting the costs incurred by HCL to remedy and rectify the cause of such suspension and for defraying the maintenance expenses during such suspension period. Provided, however, that if the Contractor is making diligent efforts to remedy and rectify such cause, then HCL shall allow the Contractor reasonable time and opportunity for such remedy or rectification.
- 10.3** The suspension of the rights of the Contractor by HCL pursuant to Article 10.1 above shall be revoked by HCL forthwith upon the Contractor having remedied the Material Breach during such suspension period to the satisfaction of HCL unless in the meantime this Contract has been terminated by HCL in accordance with Article 12.
- 10.4** At any time during the period of suspension under this Article, the Contractor may in writing notify to HCL that it does not intend to cure the breach or default that had caused such suspension. Within seven (7) days of receipt of such notice, HCL shall terminate this Contract as if a Material Breach of this Contract had occurred on account of a Contractor Event of Default.

ARTICLE - 11

EVENTS OF DEFAULT AND TERMINATION

11.1 Events of Default

The following events shall be termed as Events of Default:

If the Contractor shall not execute the contract in the manner as stipulated in the Contract or if the Contractor or of it, in the opinion of the HCL:

- (a) Does not execute the contract in conformity with the provisions of the Contract, or
- (b) Substantially suspends any part of its execution for a period of fourteen (14) days without authority from HCL, or
- (c) Fails to carry on and execute the Contract to the satisfaction of HCL or
- (d) Commits or permits any other breach of any of the provisions of the Contract (on the part of the Contractor to be performed or observed) or persists in any of the above mentioned breach of the Contract for fourteen (14) days, after notice in writing shall have been given to the Contractor by the HCL requiring such breach to be remedied, or
- (e) Abandon the Work(s), or
- (f) During the continuance of the Contract, becomes bankrupt, makes any arrangement or composition with its creditors, or permits any execution to be levied or goes into liquidation other than for the purpose of amalgamation or reconstruction; or
- (g) Does not perform as per the agreed programme submitted by the Contractor.

11.2 Termination due to Events of Default

- (a) If HCL decides to terminate this Contract, it shall in the first instance issue Preliminary Notice to the Contractor. Within 15 days of receipt of the Preliminary Notice, the Contractor shall submit to HCL in sufficient detail, the manner in which it proposes to cure the underlying Event of Default (the “**Contractor's Proposal to Rectify**”). In case of non submission of the Contractor's Proposal to Rectify within the said period of fifteen (15) days, HCL shall be entitled to terminate this Contract by issuing Termination Notice, and to appropriate any Security, if subsisting. Forfeiture of securities is liable to GST at applicable rate.
- (b) If the Contractor's Proposal to Rectify is submitted within the period stipulated thereof, the Contractor shall have to its disposal a further period of fifteen (15) days to remedy / cure the underlying Event of Default. If, however it fails to remedy/cure the underlying Event of Default within the stated period, HCL shall be entitled to terminate this Contract, and to appropriate the Security, if subsisting. Forfeiture of securities is liable to GST at applicable rate.

11.3 Rights of HCL on Termination

- (a) HCL shall have the power to terminate the Contract and enter upon the Work(s) and take possession thereof and of the material, Temporary Works, Construction Plant, and stock thereon, and to revoke the Contractor's license to use the same, and to complete the Work(s) by its agents, other contractor or workmen, or to re-let the same upon any terms and to such other Persons as HCL in its absolute discretion may think proper to employ and for this purpose use or authorize the use of any material, Temporary Works, Construction Plant, equipment, stock etc. as aforesaid

without making payment or allowance to the Contractor for the said material, other than such as may be certified in writing by the Engineer-in-Charge to be reasonable, and if HCL shall by reason of its taking possession of the Work(s) or of the Work(s) being completed by other contractor (due account being taken on any such extra work or Works which may be omitted) incur any extra cost then the amount of such excess as certified by the Engineer-in-Charge shall be deducted from any money which may be due for Work done by the Contractor under the Contract and not paid for and/or Performance Security. Any deficiency shall forthwith be made good and paid to HCL by the Contractor and HCL shall have power to sell in such manner and for such price as it may think fit, all or any of the Construction Plant, material etc. constructed by or belonging to and to recoup and retain the said deficiency or any part thereof out of the proceeds of the sale.

- (b) The money that may have been due to the Contractor on account of Work executed by it shall not be payable to the Contractor before the expiry of six (6) calendar months reckoned from the date of Termination of the Contract or from the taking over the Work or part thereof by HCL as the case may be, during which period the responsibility for faulty materials or workmanship in respect of such Work under the Contract will be exclusively with the Contractor and such money shall be subject to deduction of all amount due from the Contractor to HCL, whether under the terms of the Contract or otherwise, or required to be retained by HCL.
- (c) The rights and remedies of HCL as per this Article shall not constitute as limitation of Contractor's liabilities but shall be exclusive and in addition to any other rights and remedies provided under the Contract or by law for the time being in force.
- (d) Any waiver by HCL of any breach of the terms or conditions of the Contract shall not constitute a waiver of any subsequent breach of the same.
- (e) Any failure by HCL at any time or from time to time to enforce or require strict performance by the Contractor of any of the terms and conditions of the Contract, shall not constitute a waiver by HCL of a breach of any such terms or conditions and shall not affect or impair such terms or conditions in any way or the right at any time to avail himself of such remedies as it may have for any such breach or breaches of such terms or conditions.
- (f) Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breaches thereof.

11.4 Rights of Parties

Notwithstanding anything to the contrary contained in this Contract, Termination pursuant to any of the provisions of this Contract shall be without prejudice to accrued rights of either Party including its right to claim and recover money, damages and other rights and remedies which it may have in law or contract. The rights and obligations of either Party under this Contract, including without limitation those relating to Termination Payment, shall survive the Termination but only to the extent such survival is necessary for giving effect to such rights and obligations.

11.5 Termination Payments

- 11.5.1** In the event, any such action is taken by HCL, the Contractor shall be paid full amount for the up to date quantum of Work executed at Work Site as per billing schedule under the relevant items of Work under this Contract.

ARTICLE - 12

DIVESTMENT OF RIGHTS AND INTERESTS

12 DIVESTMENT OF RIGHTS AND INTERESTS

12.1 Upon Termination of this Contract, the Contractor shall comply with the following:

- (a) notify to HCL forthwith the location and particulars of all Work Facilities;
- (b) deliver forthwith actual or constructive possession of the Work Site and Work Facilities free and clear of all Encumbrances and execute such deeds, writings and documents as may be required by HCL for fully and effectively divesting the Contractor of all of the rights, title and interest of the Contractor in the Work Facilities free of any charge or cost to HCL; and
- (c) comply with the divestment requirements set out in Article 12.2 below.

12.2 Upon Termination of this Contract, the Contractor shall comply and conform to the following Divestment Requirements in respect of the Work Facilities:

- (a) all Work Facilities including the equipment, roads, pavements, shall have been renewed and cured of all defects and deficiencies as necessary so that the Facilities are compliant with the Work Requirements set forth in this Contract ;
- (b) the Contractor delivers relevant records and reports pertaining to the Work;
- (c) the Contractor executes such deeds of conveyance, documents and other writings as HCL may reasonably require to convey, divest and assign all the rights, title and interest of the Contractor in the Work Facilities free from all Encumbrances absolutely and free of any charge or tax unto HCL or its nominee; and
- (d) the Contractor complies with all other requirements as may be prescribed under Applicable Laws to complete the divestment and assignment of all the rights, title and interest of the Contractor in the Work free from all Encumbrances absolutely and free of any charge or tax to HCL or its nominee.

12.3 Not earlier than three (3) months before the expiry of the Contract Period but not later than thirty (30) days before such expiry, or in the event of earlier Termination of this Contract, immediately upon but not later than fifteen (15) days from the date of issue of Termination Notice, the Engineer-in-Charge shall verify, in the presence of a representative of the Contractor, compliance by the Contractor with the divestment requirements in relation to the Work Facilities and, if required, cause appropriate Tests to be carried out at the Contractor's cost for determining the compliance therewith. If any shortcomings in the divestment requirements are found by either Party, it shall notify the other of the same and the Contractor shall rectify the same at its cost.

12.4 Upon the Contractor conforming to all divestment requirements and handing over actual or constructive possession of the Work Site to HCL or a person nominated by HCL in this regard, HCL shall issue a certificate (the "**Vesting Certificate**") within one month of Contractor conforming to all divestment requirements and handing over actual or constructive possession of the Work Site and Work Facilities to HCL, which will have the effect of constituting evidence of divestment of all rights, title and lien in the Work Site and Work Facilities by the Contractor and their vesting in HCL pursuant hereto. Issue of the Vesting Certificate shall not be unreasonably withheld by HCL. The divestment of all rights, title and lien in the Work shall be deemed to be

complete on the date when all the divestment requirements have been fulfilled and Vesting Certificate has been issued, it being expressly agreed that any defect or deficiency in any divestment requirement shall not in any manner be construed or interpreted as restricting the exercise of any rights by HCL or its nominee on or in respect of the Work on the footing as if all divestment requirements have been complied with by the Contractor.

ARTICLE - 13

MODE OF PAYMENT BY HCL

13.1 Mode of Payment

The Contractor hereby expressly authorizes HCL to make payment of Contract Price, Termination Payment, if any, and any other payment which becomes payable by HCL to the Contractor under this Contract directly to the credit of such bank account at _____, (Designated Account), and/or to make/issue and deliver cheques, drafts or other instruments in respect of such payments in favour of a bank at _____ (Designated Bank).

Payment will be made through e-mode for which Bank Mandate Form, as given in **Schedule-VIII/VIIIA**, duly filled up has to be submitted by the successful bidder.

13.2 Valid Discharge

The Contractor hereby agrees, undertakes and confirms that;

- (a) the payment to the credit of the Designated Account or to the Designated Bank shall be made by HCL notwithstanding any instructions to the contrary issued or disputes raised by the Contractor.
- (b) any payment made in accordance with Article 13.2 (a) shall be valid and HCL shall, to the extent of the payment so made, be relieved and discharged of all its obligations in respect of such payments under this Contract, provided no such discharge shall prejudice any claim which the Contractor may have against the Lenders.

ARTICLE - 14

DISPUTE RESOLUTION

14.1 Amicable Resolution

- (a) Save where expressly stated to the contrary in this Contract, any dispute, difference or controversy of whatever nature between the Parties, howsoever arising under, out of or in relation to this Contract including disputes, if any, with regard to any acts, decision or opinion of the Engineer-in-Charge and so notified in writing by either Party to the other (the "**Dispute**") shall in the first instance be attempted to be resolved amicably in accordance with the procedure set forth in part (b) below.
- (b) Either Party may require such Dispute to be referred to the work in charge of HCL and the Contractor for amicable settlement. Upon such reference, the two shall meet at the earliest as per their mutual convenience and in any event within fifteen (15) days of such reference to discuss and attempt to amicably resolve the Dispute. If the Dispute is not amicably settled within fifteen (15) days of such meeting, either Party may refer the Dispute in accordance with the provisions of part (c) below.
- (c) In the event that any Dispute has not been resolved as per the provisions of (b) above, the same shall be referred to the director or a person of equivalent designation, of HCL and the Contractor for amicable settlement. Upon such reference, the two shall meet at the earliest as per their mutual convenience and in any event within fifteen (15) days of such reference to discuss and attempt to amicably resolve the Dispute. If the Dispute is not amicably settled within fifteen (15) days of such meeting between the two, either Party may refer the Dispute to arbitration in accordance with the provisions of Arbitration clause.

14.2 Arbitration

Any dispute(s) or difference(s) of any kind whatsoever arising between the parties out of, or relating to the construction, meaning, scope operation or effect of the contract or its validity or its breach thereof, if not settled mutually, shall be referred by the parties to this contract for Arbitration under the Arbitration and Conciliation Act, 2015 and the provisions there under, and the award made in pursuance thereof shall be binding on the parties.

The dispute may be referred to an arbitral tribunal, consisting of an Arbitrator nominated by both parties each and one Presiding arbitrator appointed by both the above nominated arbitrators. The nominated Arbitrator will be appointed within 30 days of reference to arbitration. The nominated Arbitrator will be nominated by the Chairman-cum-Managing Director of Hindustan Copper Limited (HCL), who, according to the Arbitration and Conciliation Act 2015, will not stand in conflict of interest with any to the organizations. A declaration to the effect shall be submitted by the Arbitrator, to guarantee impartially in the proceedings.

In the event of such an nominated arbitrator to whom the matter is originally referred, being transferred or has vacated his office because of retirement, or resignation or otherwise or refuses to act or is incapable of acting for any reason whatsoever, the Chairman-cum-Managing Director of HCL shall appoint another person to act as arbitrator in his place, who again would not stand in any

conflict of interest with both the parties. Such person(s) shall be entitled to proceed from the stage at which his predecessor left it.

The duration of proceedings and the fee structure will be governed by the 2015 Act. The venue of the arbitration shall be Kolkata only. The award of the arbitrator shall be final and binding on the parties. Any dispute, which arises at any point of time out of arbitration, shall have the jurisdiction of the court of Kolkata, West Bengal.

Subject to the above, the provision of Arbitration and Conciliation Act, 2015 and the rules there under and the statutory modifications thereof shall govern such arbitration proceedings and shall be deemed to apply and be incorporated in this contract.

ARTICLE - 15

MISCELLANEOUS

15.1 Assignment and Charges

- (a) Subject to Articles 15.1 (b) and Article 15.1 (c) herein below, neither Party shall assign this Contract or the rights, benefits and obligations hereunder save and except with prior consent of the other Party.
- (b) Except as provided in Article 15.1 (c) herein below, the Contractor shall not create nor permit to subsist any Encumbrance over or otherwise transfer or dispose of all or any of its rights and benefits under this Contract except with prior consent in writing of HCL, which consent HCL shall be entitled to decline without assigning any reason whatsoever.
- (c) Restraint set forth in Article 15.1 (a) and Article 15.1 (b) above shall not apply to:
 - (i) liens/Encumbrances arising by operation of law (or by an agreement evidencing the same) in the ordinary course of business of the Contractor;
 - (ii) mortgages/pledges/hypothecation of goods/assets other than Work Site, as security for indebtedness, in favour of the Lenders and working capital providers for the Work;
 - (iii) assignment of Contractor's rights and benefits under this Contract to or in favour of the Lenders as security for financial assistance provided by them.

15.2 Indemnity

- (a) The Contractor shall at all times, indemnify and keep HCL and the Engineer-in-Charge indemnified against any claim and hold them harmless from any and all liabilities for death, bodily injury and/or damages resulting from or arising out of or in any way connected with the operations covered by the Contract. The Contractor shall be responsible for all risks arising in connection with or on account of the operations covered under the Contract and it shall make good all losses and damages arising there from. In case HCL or the Engineer-in-Charge incurs any cost, expense or loss on account of any claim, demand or cause of action brought against them and arising out of the operations covered by the Contract, HCL shall recover such cost, expense or loss from the Contractor. HCL shall have power, without being bound to do so, to defend, contest or compromise any such claim, demand or cause of action and any amount that may become payable by HCL and any expense that may be incurred by HCL in this behalf, shall also be recoverable from the Contractor.
- (b) The Contractor shall, at all times, indemnify and keep indemnified HCL and the Engineer-in-Charge and hold them harmless against any claim or demand which may be made, arising out of any use of existing patents, or alleged infringement of such patent or of other patent rights committed by the Contractor in carrying out the operations covered by the Contract and against all liabilities in respect thereof, and against all acts, suit proceedings, claim, cost and expense whatsoever, which may be lodged against or incurred and become payable by HCL in respect thereof.

15.3 Period of Liability/ Defect Liability Period

The Contractor shall warrant that the work or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment, Structures supplied

and of the work executed.

If during the Defect Liability Period any defect be found in the design, engineering, materials and workmanship or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Employer and at its cost, repair, replace or otherwise make good such defect as well as any damage to the work caused by such defect.

The Contractor may, with the consent of the Employer and after submission of Bank Guarantee for the equivalent cost of Plant & Equipment, remove from the Site any Plant and Equipment or any part of the work that are defective if the nature of the defect, and / or any damage to the work caused by the defect, is such that repairs cannot be expeditiously carried out at the Site. However, in case value of such items is less than 20% of the respective performance bank guarantee, no additional bank guarantee is required to be submitted and the material can be taken out against indemnity bond. In case of defective parts not repairable at Site but become essential in the mean time for the commercial use of the plant, the Contractor shall replace at Site free of cost to the Employer, the defective parts, before the defective parts are removed from the Site.

If the repair, replacement or making good is of such a character that it may affect the efficiency of the work or any part thereof, the Employer may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.

If such part fails the tests, the Contractor shall carry out further repair, replacement or making good (as the case may be) until that part of the work passes such tests. The tests shall be agreed upon by the Employer and the Contractor.

If the Contractor does not commence the rectification either by repair or replacement of such defects within 30 (thirty) days from the date of notice by the Employer or does not complete the rectification with reasonable diligence and within a reasonable time, the Employer may, at its option, rectify the defects at the Contractor's expense. The Employer shall, in such case, deduct from payment due to the Contractor the expenses incurred by the Employer for remedy of such defects without prejudice to the other rights of the Employer under the Contract.

If the work or any part thereof cannot be used by reason of such defect and / or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the work or such part cannot be used by the Employer because of any of the aforesaid reasons.

In addition, the Contractor shall also provide an extended warranty for any such replaced or repaired component of the work for the period of minimum 12 months but not more than 24 months cumulatively. Such obligation shall be in addition to the defect liability.

- 15.4** All equipment, manpower and consumables required for executing the work shall be procured/ arranged by the successful bidder at his own cost. The successful bidder shall arrange for drilling, blasting, mucking and hauling for Mine Development and Ore production both (initial procured equipment should not be older than 2017 make and its fleet capacity should match with the target, subsequent procurements to match with the enhanced target shall also be with the new equipment only). Maintenance and procurement of all other equipment essential for their operation, maintenance and procurement of drilling accessories, spare parts and all other consumables shall be responsibility of successful bidder only. Cap lamps along with charger, racks and safety wears will also be the responsibility of the successful bidder.

15.5 LIMITATION OF LIABILITY

Except in cases of criminal negligence or willful non performance or willful default,

- a) The Contractor shall not be liable to the Employer, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs and
- b) The aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise including the cost of repairing or replacing defective equipment, shall not exceed the 100% (*Hundred Percent*) of the contract price plus escalation if applicable as per contract, provided that this limitation shall not apply to any obligation of the Contractor to indemnify the Employer with respect to copyright, patent infringement, workman compensation and statutory liabilities in general that the Employer may be required to additionally bear due to default of the Contractor.

15.6 Governing Law and Jurisdiction

This Contract shall be governed by the laws of India. The courts at _____, India shall have jurisdiction over all matters arising out of or relating to this Contract.

15.7 Waiver

- (a) Waiver by either Party of any default by the other Party in the observance and performance of any provision of or obligations under this Contract:
 - (i) shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions or obligations under this Contract;
 - (ii) shall not be effective unless it is in writing and executed by a duly authorised representative of such Party; and
 - (iii) shall not affect the validity or enforceability of this Contract in any manner.
- (b) Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Contract or any obligation hereunder nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver/breach of any terms, conditions or provisions of this Contract.

15.8 Survival

Termination of this Contract shall not relieve the Contractor or HCL of any obligations except as otherwise provided in this Contract or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of such Party prior to the effectiveness of such Termination or arising out of such Termination.

15.9 Confidentiality

The Contractor shall at all time keep confidential all oral and written information relating directly or indirectly to the Work; either disclosed to the Contractor by/or on behalf of HCL; or acquired by the Contractor during the course of performance of the Contract. The Confidential Information shall be held in strict confidence and used only for purposes of this Contract. The Contractor shall not disclose such information to any third party without HCL's prior written approval. If the Contractor is required to disclose any confidential information by operation of law, the Contractor shall notify HCL immediately and shall cooperate in seeking a reasonable protective order. Any contravention of the provision of this Article will tantamount to breach of the Contract.

15.10 No Third Party Rights

This Contract and all rights hereunder are intended for the sole benefit of the Parties hereto and, to the extent expressly provided in this Contract, for the benefit of the Lenders and, except as set forth in the Contract, it shall not imply or create any rights on the part of, or obligations to, any other entity or individual.

15.11 Amendments

This Contract and the schedules together constitute a complete and exclusive understanding of the terms of the Contract between the Parties on the subject hereof and no amendment or modification hereto shall be valid and effective unless agreed to by all the Parties hereto and evidenced in writing.

15.12 Notices

Unless otherwise stated, notices to be given under this Contract including but not limited to a notice of waiver of any term, breach of any term of this Contract and Termination of this Contract, shall be in writing and shall be given by hand delivery, recognized international courier, mail, telex or facsimile transmission and delivered or transmitted to the Parties at their respective addresses set forth below:

If to HCL

If to the Contractor

Or such address, telex number, or facsimile number as may be duly notified by the respective Parties from time to time, and shall be deemed to have been made or delivered (i) in the case of any communication made by letter, when delivered by hand, by recognized international courier or by mail (registered, return receipt requested) at that address and (ii) in the case of any communication made by telex or facsimile, when transmitted properly addressed to such telex number or facsimile number.

15.13 Severability

If for any reason whatsoever any provision of this Contract is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties shall negotiate in good faith with a view to agreeing upon one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable. Provided failure to agree upon any such provisions shall not be subject to dispute resolution under this Contract or otherwise.

15.14 No Partnership

Nothing contained in this Contract shall be construed or interpreted as constituting a partnership between the Parties. Neither Party shall have any authority to bind the other in any manner whatsoever.

15.15 Language

All notices required to be given under this Contract and all communications, documentation and proceedings which are in any way relevant to this Contract shall be in writing and in English language.

15.16 Exclusion of Implied Warranties etc.

This Contract expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties or any representation by any Party not contained in a binding legal agreement executed by the Parties.

15.17 Counterparts

This Contract may be executed in two counterparts, each of which when executed and delivered shall constitute an original of this Contract but shall together constitute one and only the Contract.

IN WITNESS WHEREOF THE, PARTIES HAVE EXECUTED AND DELIVERED THIS CONTRACT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED

For and on behalf of HCL by:

For and on behalf of CONTRACTOR by:

Signature:

Signature:

Name:

Name:

Designation:

Designation:

Seal:

Seal:

In the presence of:

In the presence of:

1)

1)

SCHEDULE - I
ENGINEER IN CHARGE

PART A - RIGHTS AND OBLIGATIONS OF ENGINEER-IN-CHARGE

Engineer-in-Charge shall be the officer as may be designated, deputed or authorized, by HCL for the purpose of the Work with the following rights and obligations:

1. Co-ordination with the various agencies/ contractors engaged in the Work Site and ensures minimum interference among such agencies/ contractor.
2. Ensure exchange of technical information with the Contractor in order to complete the Work economically with full efficiency.
3. Ensure smooth sharing of certain facilities, if any, among various contractors, inter se.
4. Take cognizance of changes (leave/travel) in Work Managers or other key personnel of the Contractor.
5. In case of emergency/ contingency situations, execute work which are under scope of Contractor and the Contractor is unwilling or unable to execute the same.
6. Review and record daily progress reports (containing details of progress of execution of the work, resources deployed, etc) prepared by Contractor.
7. Issue necessary instructions for Work for which specifications/ drawings have not been prescribed or issued by HCL. The instructions shall include execution of all details which shall cover incidental works whether temporary or permanent, which must evidently, required by reasons of the nature of the Works included in the Contract and are to be carried out by the Contractor in all respect.
8. Review and approve drawings, prints, articles, machinery or fabricated materials of work entering into or forming part of the permanent construction prepared by the Contractor, specifications/ details of which are not provided by HCL in advance.
9. Direct the Contractor to repair or replace the materials in case the same was issued by HCL and has been damaged or lost by the Contractor.
10. In case of delay in execution of Work by Contractor on account of non-procurement of certain material, issue such materials if available with HCL at the risk and cost of the Contractor.
11. Authorize the Contractor for the utility of materials for manufacturing the items which can be obtained from manufacturer in finished form.
12. Issue necessary directions to Contractor for execution of an indemnity bond in the prescribed form for the safe custody and accounting of the all materials issued by HCL.
13. Issuing materials at his own discretion from HCL's site store (however any item issued from the site store has to be recorded and regularized from the central store).
14. Inspection of the materials used by the Contractor during the work process in the Work Site.
15. For the fabrication of the items required for the work, issue prior permission to remove the materials (in case of damage or waste).

16. During the transportation of the materials to the Work Site of erection, issue instructions prior to their actual erection and ensure that the things are not left lying around indefinitely.
17. Ensure that the staff employed by Contractor are as per the technical proposal of the Contractor and have valued qualifications and are efficient to perform the work
18. Periodically reviewing on time to time basis the attendance of a Work Manager or a contactor in the site of the work.
19. Take decision on the strata whether the ground qualifies to be termed as “bad ground”, and if the ground is liable to be termed as such, then have discussions with Contractor to finalize the minimum over break.
20. Approving and ensuring the levels and alignment of grouting below base plates.
21. Testing, commissioning and approving the machinery and equipments during installation and assembling in the company.
22. Provide guidance to Contractor, in case of erection of fencing and barricades during execution of the work.
23. Enjoy accessibility of the records of all pours showing dates, quantities, locations, weather, and temperature conditions, a tabulation of the code numbers of all test cylinders cast and the result of all slump tests.
24. Issue written approval in case of proposal from Contractor for use of any kind of additives.
25. On routine basis measurement and inspection of the lines and grades for the better and accurate result.
26. Check and approve all lines, levels, benches and gradients
27. If required, direct removal of survey stations

PART B - Power of the Engineer-In-Charge to Order Suspension of Work:

The Engineer-in-Charge may, as he deems fit, by giving directions in writing and without invalidating the Contract, order the Contractor to suspend the Work or any part hereof for such time and for such reasons, as he may consider necessary. The Contractor shall not, after such directions to suspend the Work or any part thereof has been given, proceed with the Work or part thereof until he receives a written order from the Engineer-in-Charge to do so. In the event of such suspension, the Employer may, under the provision of the Contract, extend the time for Completion of the Work or part thereof by such period as it may consider reasonable, provided the suspension is not due to violation of regulations by Contractor. The decision of the Employer in the matter shall be final and binding on the Contractor.

The Work or any part thereof shall not be suspended by the Contractor in any circumstance without prior knowledge and approval of the Engineer-in-Charge excepting accident(s) involving loss of life or serious bodily injury. If the Contractor proposes to suspend the Work or any part thereof, he should report to the Engineer-in-Charge furnishing the reasons necessitating such suspension(s) of Work in detail, and should obtain his prior written order before such suspension(s).

If it appears to the Engineer-in-Charge that any Work has been executed with unsound, imperfect or unskillful workmanship or with material or articles of unsound or of a quality inferior to the

requirement of the Contract, the Contractor shall on order in writing from the Engineer-in-Charge, rectify or remove and reconstruct the Work forthwith so specified in whole or in part as the case may be, remove the material or articles at his own cost notwithstanding that the same may have been passed, certified and paid for. In the event of his failing to do so within a period as specified by the Engineer-in-Charge in his aforesaid order then the Engineer-in-Charge may rectify, remove, reconstruct and/or re-execute the Work or remove and replace with other material or articles as the case may be at the risk and cost of the Contractor.

Inspection of work:

1. The Engineer-in-charge/Mines Manager or his representative which includes HCL's Surveyor and his staff, will have full power and authority to inspect the work at any time wherever work is in progress either on the site or at the Successful Bidder's premises/ workshop wherever situated, premises/ workshops of any person, firm or corporation where work in connection with the Contract may be in hand or where material are being or are to be supplied and the Successful Bidder shall afford or procure for the Engineer-in-charge or his representative every facility and assistance to carry out such inspection. The Successful Bidder shall at all time during the usual working hours and at all other times at which reasonable notice of the intention of the Engineer-in-charge or his representative to visit the works shall have been given to the Successful Bidder, either himself be present to receive orders and instructions or have a responsible officer duly accredited in written be present for the purpose.
2. No material shall be dispatched from the Successful Bidder's stores before obtaining the approval in writing of the Engineer-in-charge. The Successful Bidder is to provide at all times during the progress of work and the maintenance period proper means of access with ladder, gangways, etc. and the necessary attendance to move and adopt as directed for inspection or measurement of the work by the Engineer-in-charge.
3. The Successful Bidder shall make available to the Engineer-in-charge or his representative which includes HCL's Surveyor and his staff, free of cost all necessary instrument and assistance in checking or setting out of works and in checking of any works made by the Successful Bidder for the purpose of setting out and taking measurement of work.

SCHEDULE - II
CONDITIONS FOR EMPLOYMENT OF LABOUR

1. The Contractor shall carry out its operations in strict compliance of its obligations under the provisions of Contract Labour (Regulation and Abolition) Act, 1970 and various notifications issued from time to time under the act.
2. The Contractor shall perform all its operations preferably mechanically and shall engage a minimum number of workers.
3. The workers engaged by the Contractor shall be on its roll. The Contractor shall ensure that all labour engaged by the Contractor or by any approved Sub-Contractor, whose assistance the Contractor has taken with prior written approval of HCL, shall be properly trained and qualified craft persons. The Contractor shall pay all their wages, other dues and benefits and shall abide by the Applicable Laws relating to employment of labour like Payment of Wages Act, Minimum Wages Act, Workmen's Compensation Act, Contract Labour (Abolition and Regulation) Act, and Workmen's Health Insurance etc.
4. When a Sub-Contractor whose assistance the Contractor has sought with the prior written approval of HCL is employed, the provision of this Contract relating to the Contractor's workers, shall apply to the worker of the Sub-Contractor mutatis mutandis.
5. The Contractor shall maintain all records required under the Applicable Laws relating to employment of workers in general and to Mine workers. HCL shall have the right to inspect all such records and the Contractor shall have the obligation to rectify all omissions and commissions relating to these records.
6. The Contractor shall, at its cost provide all facilities including medical facilities, canteen, training centre, recreation facilities etc. as may be required by the Applicable Laws or otherwise.
7. For employment of skilled/semi skilled/unskilled labour the Contractor will give preference to local people.
8. When so required by HCL, the contractor shall furnish certificate of qualifications and experience of all workers employed by the Contractor and its Sub-Contractors, whose assistance it has sought with the prior written approval of HCL, and HCL, if so required by law, retain these certificates in its custody.

Wages to the Labour:

Party will abide by laws with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Contract Labour (Regulation & Abolition) Act, 1970 etc. and also provisions of any other law as may be applicable from time to time. Wages of any kind i.e. Salary, Over Time, Bonus, and Advance or on any other account whatever shall be paid, through bank account only. Cash payment will not be allowed in any circumstance whatever the reason there may be.

SCHEDULE - III

CONDITION FOR ENVIRONMENT, HEALTH & SAFETY MANAGEMENT

1. Environment, Health and Safety Management

During the entire Contract Period, the Contractor shall observe and abide by the general guidelines and specific guidelines on environment, health and safety applicable to mining works in accordance with Applicable Laws and Good Industry Practices.

2. Environment

2.1 During the entire Contract Period, the Contractor's men and equipment shall conform to the provisions of all directions and orders issued by HCL in respect of environment protection.

2.2 The Contractor shall abide by and perform all Works in accordance with all applicable environmental laws, regulations and permits in force.

2.3 If after the execution of this Contract, any change in the Work or additional work is required due to new environmental laws and regulations not previously applicable to the Work, the Contractor and HCL shall agree upon the changes required and Additional Cost, if any. An addendum to the Contract will be executed incorporating the required changes and additional price, if any.

3. Safety

3.1 The Contractor shall, at all times, exercise all reasonable precautions for the safety of its personnel and employees/workers in the performance of its obligations under the Contract and shall comply with all lawful instructions of HCL and/or DGMS or other authority relating to safety in general and in particular to the safety of the Mine and its operations and safety of all persons engaged in the Mine and shall abide by all applicable provisions of the safety laws drawn up by the DGMS, GOJ or GOI or municipalities and other authorities in India and shall provide all facilities and gadgets required for the purpose. Any compensation to be paid to the workers/employees or others on any account including failure to observe safety laws shall be the responsibility of the Contractor. In case of non-compliance by the successful bidder, the same may be provided by HCL at the successful bidder's cost.

3.2 The contractor shall be responsible for implementation of safety rules as per good industry practices and applicable laws and directions of DGMS.

3.3 Special precautions should be taken while deploying workers in the mine. Before employing any labour to the mine proper vocational training should be imparted and all rules and regulations in that regard should be strictly followed and shall ensure that:

3.3.1 No person/vehicle shall be deployed at any place other than authorized place.

3.3.2 All workers should obey lawful instructions of mine management.

3.3.3 All drivers shall obey systematic traffic rules prepared by management.

3.4 Before deployment of the workers, they must be trained and briefed about safety aspects in a mine. However during course of execution of the work, if any accident occurs whether major or minor, the matter shall have to be immediately informed to mine management so that Notices of accidents in accordance of the statutes (Reg. 9 of MMR 1961) be given and other necessary steps may be taken in accordance of the Mines Act 1952 and other relevant laws.

4. **Supervision of the work by the Successful Bidder and the Successful Bidder's agent and his supervising staff at the work site:**

- a) Regarding statutory supervision, the Successful Bidder and HCL management shall frame out a policy to comply with the provisions of MMR1961. However, for execution, supervision and control of the Contract, Successful Bidder shall deploy statutory qualified supervisors and officials experienced in the field of Metal Mining in all the three shifts of operation.
- b) The Successful Bidder shall name and depute a qualified person having sufficient experience in carrying out work of similar nature, which the instructions for work are given.
- c) The Successful Bidder shall keep at all time on the work site while the work is in progress, a properly qualified and competent Project Manager, duly authorized and empowered to act for him and to receive on his behalf all such notices and communications as the company and/or the Engineer-in-charge may wish to issue from time to time. From the moment the Project Manager so appointed takes charge of the work, such notices and communications shall operate as if the Successful Bidder himself had received them and all act done by Project Manager shall be "*quit facit per alium perse*", which means "he who does through another does by himself". The act of Project Manager is the act of the Successful Bidder, as binding as if done by the Successful Bidder himself, notwithstanding absence of formal authority or definite instructions from the Successful Bidder to the said Project Manager or any purported restrictions or powers or limitations of authority imposed by the Successful Bidder. It shall be open to the company to enforce replacement of the Project Manager and/or any other employees of the Successful Bidder in the event that the Engineer-in-charge/ Mine Manager deems the Project Manager or any other employee to be incompetent or otherwise unacceptable at any time. The Project Manager shall arrange for receipt of material, supplies and equipment as per terms and conditions of the Contract.
- d) The Successful Bidder is expected to employ only Indian Nationals. In case foreign expert(s) is/are required to be engaged, it should be specifically mentioned in the offer, but no foreign exchange will be payable by the company, wherever practicable, skilled/semi-skilled (if available) and unskilled personals are to be recruited locally for underground and surface work.

5. **Fire Prevention**

The Contractor shall take all reasonable precautions to prevent break out of fire of any nature in the place or in the vicinity of the Mining Facilities. The Contractor shall be responsible for all damages due to fire directly or indirectly attributable to its activities or of its workers/employees. The Contractor shall have to provide a suitable, reliable and adequate fire fighting system by way of water pipeline with fire fighting hydrant points at various strategic locations in the Mining Facilities. In addition to this, fire extinguishers of different types such as CO₂ type, foam type, dry chemical powder type and soda-acid type, suitable for industrial use shall be provided at different required locations. Fire hydrants and fire fighting facilities shall also be provided at vulnerable points like workshops, fuelling facilities, mine offices etc. within the Work Site. The Contractor

shall prepare a plan for this purpose, obtain the approval of HCL and shall implement the plan, after such modifications/ additions as HCL may prescribe. The fire fighting plan should comply with all Applicable Laws and the Contractor shall obtain necessary approvals from the statutory authorities.

6. Sanitary and Medical Requirements

The Contractor shall promptly and fully comply with the Applicable Laws and provide sanitary and medical requirements, or as may be prescribed by HCL or by Engineer-in-Charge for proper work, safety and health of the workers/employees and of the local communities. In case of such non-compliance of the Contractor, the same may be provided by the Engineer-in-charge at the Contractor's cost.

7. Cleanliness

All portions of the work shall be maintained and kept neat, clean and proper sanitary conditions shall be maintained at all time.

8. First Aid

The Contractor shall keep first aid facilities and provisions as required under Applicable Laws at the work site.

9. Protection of Work

The Contractor and its workmen shall protect the work, excavations, equipment, existing installation and material belonging to the Contractor and HCL from damage until the issuance of Completion Certificate to the satisfaction of the Engineer-in-Charge. Should any damage occur, due to negligence of the Contractor he shall repair it at his own cost, to the satisfaction of the Engineer-in-Charge.

10. Drinking Water

The Contractor shall make necessary arrangements for sufficient supply of cool and wholesome drinking water as per the provisions of Applicable Law.

11. Conservancy

The Contractor shall make necessary arrangements of urinals and latrines at the Work Site in accordance with the Mines Act and rules thereto.

12. Work Hours

The Contractor shall comply with the requirements of the work hours and wages as prescribed by the Mines Act and rules thereto. Shift timings of Chapri Mine need to be followed. The persons of Successful Bidder shall abide by the rules of 'Time Office' of the Chapri Mine registering 'in' and 'out' attendances as per the statute.

SCHEDULE - IV

SUPPLIES FROM HCL

HCL shall provide following material, equipment, article etc. free of any charge unless otherwise mentioned to the Successful Bidder to perform the work awarded under this contract.

1. Explosives and detonators:

Explosives and detonators: Explosive and detonators required for blasting will be made available by HCL on chargeable basis which will be cost price at actuals plus five (5) per cent. Transportation of explosives and detonators from magazine to Project Site will be responsibility of the Contractor. Recovery towards cost of explosives and detonators will be made from the RA bills. The Contractor will submit annual requirement of the explosives and detonators to Engineer in-Charge at the beginning of year. First such requirement will be given at the time of execution of this Contract Agreement.

Current price of different explosives is:

Emulsion/Slurry Rs 80.31 per kg as on 29.03.2018

Electric delay detonator Rs 16.52 per number as on 29.03.2018

2. Explosive Magazines:

HCL will provide the explosive required to execute the job from current magazine to the Successful Bidder as per Statute. However the transportation of explosive from explosive magazine to site will be responsibility of the Successful Bidder only.

The Successful Bidder is required to develop the infrastructure for transportation of men and material including man riding facility (DGMS Approved) for the persons to go below ground through the Decline/ 2nd outlet shaft.

3. Diesel:

Bidder shall arrange diesel/fuel at their own cost. The earlier location of diesel dispensing pump at Rakha mine area close to Chapri block can be used by the successful bidder. However the bidders are advised to see the site for themselves. All statutory compliance shall be the responsibility of the successful bidder for storage, handling & transportation.

4. Electric Power: HCL shall provide power connection to the Successful Bidder for usage on surface at Main receiving station at 11 KV as well as underground on the following manner-

- a) The Successful Bidder will construct a main sub-station at surface. Subsequent distribution of power for underground and other sub-stations will be from main sub-station as per scope defined in technical specification.
- b) Power for any surface installation, office, buildings, workshop for any use shall be provided to the incoming circuit breaker of the Successful Bidder.

The Successful Bidder will also provide suitable electric meters, fuses, switches etc. which should be in the custody and control of HCL. The recovery rate for power supply shall be as per prevailing rate of Ghatsila ICC of HCL at actuals. HCL shall not however guarantee for the supply of power and no compensation for any failure or shortage of supply of power will be entertained and this also does not relieve the Contractor of his responsibility for timely completion of this work.

5. **Infrastructure:** HCL will be sharing its existing infrastructure with the Successful Bidder on a “as-is basis” at no cost to HCL. In case of any modifications, upgrades etc that need to be carried out by HCL, HCL will charge the entire amount with additional administrative expenses of 10% to the Successful Bidder.
6. Regarding site office etc., HCL may provide, on ‘as is where is’ basis, the required facilities for the Successful Bidder, if available. Office buildings, if available, at site will be provided free of charges. The Successful Bidder has to develop rest of its infrastructure at its own cost.
7. **Housing:** HCL will not be able to provide any housing facilities to the successful bidder. Temporary accommodations to be created by the contractor.

SCHEDULE - V

Schedule of items and Rates

As given in Appendix IX

SCHEDULE - VI ESCALATION

1. Price adjustment for all the items (excluding supply items) related with execution of the Project:

Awarded rate shall remain firm during the entire contract period except variation in rate of the following items in manner given in formula below:

i) **Labour Escalation** = Awarded Rate in Rs. per Unit $\frac{(L_2-L_1)}{L_1} \times 0.15$

Where:

L_1 = Minimum wages of Unskilled labour in non-coal mines (below ground) for schedule employment as per Central Govt. as on the Base date.

L_2 = The last published Minimum wages of Unskilled labour in non-coal mines (below ground) for schedule employment as per Central Govt. on the quarter under review.

ii) **Escalation on All India Wholesale Price Index**= Awarded Rate in Rs per Unit $\frac{(M_2-M_1)}{M_1} \times 0.35$

Where:

M_1 =All India Wholesale Price Index as published by the RBI Bulletin (New Series) (Base 2011-12 = 100) of all commodities as on the month of Tender submission

M_2 =All India Wholesale Price Index as published by the RBI Bulletin (New Series) (Base 2011-12 = 100) of all commodities as on the quarter under review.

Revised rate for the quarter under review = Awarded rate + changes due to Labour escalation (i) + changes due to change in All India Wholesale Price Index of all commodities (ii).

2. Price adjustment for supply items (co efficient 0.5):

$$\text{Price Adjustment} = \text{Awarded Rate in Rs per Unit} \times \frac{(S_2-S_1)}{S_1} \times 0.5$$

Where:

S_1 = Index number for Manufacture of Machinery and Equipment in RBI Bulletin (New Series) (Base 2011-12 = 100) as on the month of Tender submission

S_2 =Index number for Manufacture of Machinery and Equipment in RBI Bulletin (New Series) (Base 2011-12 = 100) as on the quarter under review.

Revised rate for the quarter under review = Awarded rate + changes due Index number for Manufacture of Machinery and Equipment in RBI Bulletin.

NOTE:

- i. The compensation for escalation shall be worked out on quarterly basis on the first day of every month.
- ii. Documentary evidence regarding increase in All India Wholesale Price Index of all commodities will also have to be submitted by the successful contractor for claiming escalation.

- iii. If the contract is to be extended beyond the stipulated period for completion of the work due to fault on part of the contractor, escalation on prices/wages will not be allowed. In such case, the rate with escalation as applicable prior to commencement of the extended period shall be paid to the contractor during the extended period of the contract. However, if the delay in the completion of work by the contractor is due to HCL's fault, escalation on prices/wages will be allowed during the extended period.

SCHEDULE – VII
PERFORMA FOR BANK GUARANTEE TOWARDS SECURITY DEPOSIT
(ON NON-JUDICIAL STAMP-PAPER OF APPROPRIATE VALUE)

To,

Hindustan Copper Limited,
‘Tamra Bhawan’
1, Ashutosh Chowdhury Avenue,
Kolkata – 700 019
Dear Sir,

M/s----- upon being awarded the work of **engineering, procurement, construction, mine development, ore production and execution of all the facilities in relation to the Project as defined in technical specification for DEVELOPMENT OF UNDERGROUND MINE AT CHAPRI AND PRODUCTION OF ORE FROM STOPES, INDIAN COPPER COMPLEX, JHARKHAND** at Chapri Copper Mine under tender/LOI/Work Order No. ----- approached us with the request to furnish Hindustan Copper Limited at Corporate Office, Kolkata a Bank Guarantee for Rs. -----only (Rupees ----- only) towards security deposit. At their request and in consideration of the promises we ----- have agreed to give guarantee as hereinafter mentioned.

1. We ----- hereby agree and undertake that if in your opinion any default is made by the said M/s ----- in performing any of the terms and/or conditions of the agreement or if in your opinion he commits any breach of agreement or there is any demand by you against the said M/s. ----- then on notice to us by you we shall on demand without demur and without reference the said M/s. ----- immediately pay to your, in any manner in which you may direct, the said amount of Rs.----- only (Rupees ----- only) or such portion thereof as may be demanded by you not exceeding the said sum and as you may from time to time require. Our liability to pay is not dependent or conditional on your proceeding against the said M/s ----- and we shall be liable to pay the aforesaid amount as and when demanded by you merely on a claim being raised by you and even before any legal proceedings are taken against the said M/s -----.
2. You will have full liberty without reference to us and without affecting this guarantee. Postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said M/s. ----- and to enforce or to forbear from endorsing any power or rights or by reason of time being given to the said M/s. ----- which under law relating to sureties would but for the provision have the effect of releasing us.
3. Your right to recover the said sum of Rs. ----- only (Rupees ----- from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. ----- and/or that any dispute or disputes are pending before any officer, tribunal or court.
4. Our guarantee herein contained shall not be determined or affected by the liquidation or winding up of dissolution or change or constitution or in solvency of the said M/s. -----

----- but shall in all respects and for all purposes be binding and operative until payment of all money due to you in respect of such liability or liabilities.

5. Our liability under this guarantee is restricted to Rs. -----only (Rupees ----- only). Our guarantee shall be valid up to ----- and we are liable to pay the guaranteed amount or any part thereof under the Bank Guarantee only and only if you serve upon us a claim or demand or a suit/action to enforce a claim under guarantee is filed against us on or before -----.
6. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do under the power of attorney dated ----- granted to him by the Bank.

Yours faithfully,

----- Bank

(Signature of a person duly authorized to sign on behalf of the Bank).

SCHEDULE - VIII

MANDATE FORM FOR ELECTRONIC PAYMENT THROUGH INTERNET & RBI

To

Hindustan Copper Limited,

.....

.....

Dear Sir,

Sub: Authorization for release of payment due from HCL,-----through
Electronic fund transfer (RBI-EFT)/ Internet /RTGS.

Refer Work Order No..... dated.....

(Please fill in the information in CAPITAL LETTERS. Please TICK wherever it is applicable)

1. Name of the Party :

2. Address of the Party :.....

.....

City:.....Pin Code.....

E-mail Id:.....

Permanent Account Number:.....

3. Particulars of Bank:

Bank Name		Branch Name	
Branch Place		Branch City	
Pin Code		Branch Code	
MICR No			
(9 Digits code number appearing on the MICR Band of the Cheque supplied by the Bank. Please attach Xerox copy of a Cheque of your bank for ensuring accuracy of the Bank name, Branch name and Code number)			
Account Type	Savings	Current	Cash Credit
Account Number (as appearing in the Cheque Book)			
RTGS/IFSC Code			

4. Date from which the mandate should be effective:

I hereby declare that the particulars given above are correct and complete. If any transaction is delayed or not effected for reasons of incomplete or incorrect information, I shall not hold Hindustan Copper Limited responsible. I also undertake to advise any change in the particulars of my account to facilitate updation of records for purpose of credit of amount through RBI EFT/Internet/RTGS.

Place:

Date:

Signature of the Party/Authorized Signatory

Certified that the particulars furnished above are correct as per our records.

Bank's Stamp:

Date:

(Signature of the Authorized Official from the Banks)

N.B.: RTGS / NEFT charges, if any, shall be borne by the party.

SCHEDULE – IX

PRICE SCHEDULE

(To be filled in E tendering portal only)

Name of the Plant/ Unit : : Hindustan Copper Limited.

Name of the Package :: Development of Underground Mine of 1.5 MTPA at

Chapri-Sideshwar

Name of the Bidders

Rate in Rs. are inclusive of all taxes & duties, freight & insurances, EXCLUDING GST.

PART-I : MINE DEVELOPMENT

Table:
1.1

PRICE SCHEDULE FOR DESIGN & ENGINEERING					
Sl	Description of Schedule Item	Quantity	Unit	Rate in Rs.	Total Amount in Rs.
(A)					
1	Design for shafts widening & deepening: <u>Preparation of Drawings for:</u>				
1.1	General arrangement	1			
1.2	Shaft lining with necessary design calculations	1			
1.3	Structural items required for sinking of shafts (like-sinking head frame, scaffold, shuttering etc.)	1			
1.4	Other auxiliary systems (like ventilation, pumping, concreting)	1			
2	Design for shaft collar: Assembly and detailed design for shaft collars	1			
3	Design for Insets: Assembly and detailed design for both sided insets with suitable bypass	1			
4	Design for Water garlands: Assembly and detailed design for water garlands	1			
5	Design of ore bin at surface	1			
6	Design for Shafts Furnishing:				

6.1	Detailed design for shaft furnishing including platform, buntions, guide rail. ladder ways, pipe fittings, cable, keps etc.	1			
6.2	Detailed design for shaft top fittings including shaft cover, fencing; gates,	1			
7	Head gears:				
7.1	Detailed design for permanent head gear structure, headgear sheaves, deflection pulley, axle assembly including all other safety features and required foundations	1			
8	Winding system				
8.1	Detailed design for cage winding system	1			
8.2	Detailed design of cage and suspension gear	1			
8.3	Detailed design of winder houses	1			
8.4	Detailed design of winder foundations	1			
8.5	Design for winders, attachments, electrical installations, cage etc.	1			
9	Design of fan house including evasee and bankman cabin	1			
10	Design for ventilation system including specifications of mechanical ventilators.	1			
11	Design of Electrical Works.	LS			
12	Design for water handling/pumping for 2,126 m ³ of water per day	LS			
13	Design of decline layout and portal	LS			
14	Design of Civil Works.	LS			
	Total Design & Engg (A)				
Total price (in Words).....					

Table:
1.2

PRICE SCHEDULE FOR DECLINE DEVELOPMENT & UNDERGROUND DEVELOPMENT					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in	Total Amoun

				Rs.	t in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
1	Dewatering of existing old working of Chapri Block				
1.1	Dewatering: Complete dewatering of the accumulated mine water at the first level of chapri block. The materials required for dewatering like pumps, pipe and pipe fittings, pump mounting platform etc. will be arranged by the contractor which will be taken back by the contractor on completion of dewatering.	cum	7000		
	SUB TOTAL-1 : (Dewatering)				
2	Decline & Underground Development				
2.1	Development of decline from existing Adit No 1. Excavation for Construction of RCC Portal of 6 m length upto the mouth of decline of 5.5 m width x 4.5 m height of arch shape (height of side 4.0m & center 4.5 m) gradient <u>1 in 7 upwards</u> with 300 mm deep, 300mm wide RCC (M 25 nominal) drain, 4" GI flanged pipe compressed air & 2" GI water line from surface as per approved drawing including supply of pipes, pipe fittings flanges, valve. Pipes of 25 mm will be supplies with sockets.	m	6		
2.2	Excavation of declines of 5.5 m width x 4.5 m height of arch shape (height of side 4.0m & center 4.5 m) at 1 in 7 gradient upwards for initial 15m and then 1 in 7 gradient down wards for remaining length, with 300 mm deep, 300mm wide RCC (M 25 nominal) drain along the side of decline with excavation of loading bay of 15m length at interval of 100m , including supply and erection of 4" GI flanged pipe for compressed air & water line (2" GI) with reducer and valve, LED light fittings at every 6 m interval or standards as set by DGMS, and manholes as per MMR 1961 including drilling, blasting, scaling of loose rock , rock bolting, ventilation arrangement as per ventilation standards mentioned in MMR 1961, muck removal and disposal at surface within a distance of 1Km radius from portal or as instructed by EIC. Rock boting with cement or resin grouted rock bolts of 1.8m long, 1.5 m X 1,5 m staggered spacing with 20mm diameter torsteel with 150x150x6 mm bearing plate and 150 mm threaded tightened with nut as per approved drawing including supply of pipe fittings flanges, valve. Pipes of 25 mm will be supplies with sockets. Provision of rock bolt testing of 10% of bolt. Dewatering	m	1540		

	of face during the development of decline shall be the responsibility of the contractor				
2.3	Providing, transmitting, placing of nominal RCC of 300 mm thickness of M25 grade nominal (in conformity with IS: 456) at decline and miscellaneous excavations including providing, fixing, and removal of steel shuttering plates, staging, centering, cutting, bending, binding, fixing, welding including carriage of steel reinforcement, vibrating of concrete, inclusive of all labour, material, reinforcement steel, incidental charges etc. complete as per the drawing and direction of Engineer-in-charge	cum	100		
2.4	165mm diameter Bore hole for pumping line from 2L to S/F, 2 nos. 4L to S/F 2 no & 6L to 4L 2 nos.	m	600		
2.5	Excavation for drives, crosscuts, etc at various levels (Horizontal Development) including, dewatering of face, drilling, blasting, muck removal and disposal at surface (waste dump yard for waste rock and at 500 T surface ore Bin for ore) within a distance of 1000m radius from portal, ventilation, scaling down of loose rocks, RCC (M 25 nominal) drain of 300 mm x 300 mm (width x depth) for full length of drive, including supply and erection of 4" GI flanged pipe compressed air water line (2" GI) with flange, reducer and valve, light fittings, manholes as per MMR 1961 and cement grouted rock bolts/rock capsules of 1.8m long tor steel bolts, 1.5 m x 1.5 m staggered spacing of 20mm diameter with 150x150x6 mm bearing plate and 150 mm threaded tightened with nut in rows as per approved drawing including supply of pipe fittings flanges, valve. Pipes of 25 mm will be supplies with sockets.				

a)	4.5m x 4.0 m (Decline Cross cut)	m	1660		
b)	4.5m x 4.0 m (Development in ore lodes)	m	9500		
c)	Cross cut of size 4.0m X 3.5m to reach ore-pass in F/W from H/W drive, below cut and fill stopes. Approximately 330m in ore and 220m in waste	m	330		
		m	220		
d)	Cross Cut of size 4.0m X 3.5m of 15 m, below R & P raise for LPDT loading by scrapper for 32 No. of raises. In waste rock.	m	480		
e)	4.5m x 4.0 m (Cross cut - Hang wall to foot wall)	m	550		
f)	4.5m x 4.0 m (foot wall drive connecting to ore passes)	m	1320		
g)	4.5m x 4.0 m (Ventilation Cross cut at 6L)	m	320		
h)	Ramp (4.5m x 4.0 m) at 1 in 7 gradient from main level to the sill drive to start mining in cut and fill stopes for taking equipments like drill Jumbo, LHD & LPDT at initial stage , involving drilling , blasting mucking to surface , rock bolting, ventilation etc.	m	400		
i)	Development of central waste pass of 2.4 m x2.4 m between 2 nd to 4 th level with a finger raise at 3 rd Level. A chute is to be constructed at 4 th Level below the waste pass to load in 1.5 MT side tipping tubs and hoisting to surface. The waste pass will be situated 50m from the 2 nd outlet shaft.	m	75		
j)	Development of central waste pass of 2.4 m x2.4 m between 4 th to 6 th level with a finger raise at 5 th Level. A chute is to be constructed at 6 th Level below the waste pass to load in 1.5 MT side tipping tubs and hoisting to surface. The waste pass will be situated 50m from the 2 nd outlet shaft.	m	75		
k)	Excavation of sump at 2nd level (500 cum) and 4th level (1000 cum), 6th L (1000 Cum) including drilling, blasting, muck removal and disposal at surface within a distance of 1000m radius from portal,	m3	2500		
2.6	Raises at various levels: Incline raises from level to level including drilling, blasting, muck removal and disposal at surface within a distance of 1000m radius from portal, ventilation, scaling down of loose rocks, water line (2" HDPE) with flange, reducer and valve and cement grouted/ rock capsules, rock bolts of 1.5m long, 1.5m x 15m staggered spacing of 20 mm torsteel with 150 x150 x 6 mm bearing plate and 150 mm threaded tightened with nut as per approved drawing.				
a)	Ore pass (2.4m X 2.4m) by drop raising for cut and fill stopes at 70 degree in waste rock	m	1650		

	(without rock bolting).				
b)	Box hole raise of size 2.4 m X 1.8m from roof of the LPDT cross cut in R&P stope to hole through in the R & P raise . 15m length for 32 R & P stopes. In waste rock (without rock bolting).	m	480		
c)	Service raise of size 2.4 X1.8m level to level for cut and fill stopes, in F/W or H/W contact in ore.	m	3000		
d)	Raise of size 2.4m X 1.8m for Room and Pillar stopes and ventilation purpose average 65 meter length following the H/W contact of the ore body 32 numbers in ore.	m	2100		
e)	Ventilation air intake raise of 4.5 m dia by drop raising (Vertical) level to level from surface to 6th level (-) 44mRL. This includes preparation of site at surface, for DTH drilling, blasting. Mucking to be done from individual level and hoisting the ore/waste rock to surface through the decline. The job also includes collar concreting upto 10 m below surface and raising a wall around the raise at surface with 300 mm width and 1 m height with PCC and covering the opening with chain link fence.	m	250		
f)	Cross cut of size 4.0m X 3.5m end from Ventilation raise to 8 th lode at 6 th level	m	250		
g)	Ventilation return raise of 4.5m dia by drop raising from surface at to 2L (100mRL). This includes preparation of site for DTH drilling, blasting, mucking and hoisting the waste rock to surface and disposal within 1 Km radius. Location to be finalised by Engg in Charge. The job includes collar concreting from surface to a depth of 10 m along with a fan house and instalation of an exhaust fan with all electricals	m	60		
h)	Approach drive of size 4.0m X 3.5m from 2 nd level 5 th lode to north ventilation raise. In waste rock.	m	75		
i)	Sill Raise (2.4m X 1.8m) driven from main level to the sill drive in H/W contact in ore at the time of stoping in cut & fill stope.	m	220		
	SUB TOTAL-2 : (Decline & Underground Development)				
3	Underground Definition Drilling				
3.1	Underground diamond drilling, logging , sampling & analysis (Cu%) of AX Size (1 3/8") coring of maximum length of 250 meter in any direction	m	8000		

	SUB TOTAL-3 : (Underground Definition Drilling)				
4	Stripping, Deepening and Equipping of Eastern Shaft (2nd Outlet)				
4.1	Striping/Widening of the existing shaft from existing dimension of approximately 1.5m x 3m to 6.1 m unfinished diameter (from surface to full depth of the shaft) through loose weathered soil/rock ,including temporary support ,drilling and blasting , muck removal and muck disposal to a maximum distance of 1 km from top of the shaft. Scaling of loose and support with Rock bolts of 1.5m long, 1.5m x 15m staggered spacing of 20 mm torsteel with 150 x150 x 6 mm bearing plate and 150 mm threaded tightened with nut in rows as per approved drawing. This shall also include drivage of Fan drift below collar for exhaust air.	m	52		
4.2	RCC lining of M25 grade concrete for the collar of eastern shaft (Surface to 25m depth)	m3	70		
4.3	Lining with PCC 30 cm of thickness with M25 grade concrete on unfinished shaft of 6.1m dia from 25m depth from surface to 52m depth from surface to get a finished diameter of 5.5 m.	m3	75		
4.4	Deepening/sinking of Eastern shaft (6.1m unfinished Dia) from existing 52 m depth (+124 mRL) to below 6L (-54 mRL) including drilling, blasting, mucking, loose dressing, Support with Rock bolts of 1.5m long, 1.5m x 15m staggered spacing of 20 mm torsteel with 150 x150 x 6 mm bearing plate and 150 mm threaded tightened with nut in rows as per approved drawing and disposal of the waste rock within 1.0 km from the shaft top. Provision of emergency power (in case of power failure) is to be arranged by the contractor during shaft sinking. Arrangements for ventilation locking has to be made at the shaft mouth to prevent short circuiting of air	m	178		
4.5	PCC lining of 30 cm thickness with M25 concrete on excavated 6.1m dia shaft to get a finish dia of 5.5m.	m3	600		

4.6	Excavation of Shaft Insets: 5 insets and brow at 2 nd to 6 th level of size 10m length X 6.5m wide X 4.5m height for 4 th level and 6 th level and 6m length X 6.5m wide X 4.5m height at 2 nd level, 3 rd level and 5 th level in the shaft from edge of shaft with concreted drain of 300 mm x 300 mm (width x depth) including drilling, blasting, muck removal and disposal to a maximum distance of 1km at surface from shaft top, , pumping of water to any extent, ventilation, scaling of loose rock as per the approved drawing. Support with Rock bolts of 1.5m long, 1.5m x 15m staggered spacing of 20 mm torsteel with 150 x150 x 6 mm bearing plate and 150 mm threaded tightened with nut in rows as per approved drawing.	m	100		
4.7	R.C.C. at brow and plat: Providing, transmitting by pipe or any other means, placing of M 25 grade R.C.C. (in conformity with IS: 456) in brow and plats at different insets	Cum	100		
4.8	Construction of water garland : construction of water garland in the 2 nd outlet shaft above all level insets and connecting with 100 mm dia HDPE pipe	No	4		
4.9	Cross cut of 4.0 X 3.5m from 2 nd outlet shaft insets to the different levels at 2 nd ,3 rd ,4 th ,5 th ,& 6 th level up to 8 th lode .	m	1150		
	SUB TOTAL-4 : (Stripping and Equipping of Eastern Shaft -2nd Outlet)				
5	Stowing				
5.1	165 mm dia bore holes from surface to 2 nd level and other levels as required, and connection from the bore hole to extend HDPE pipe to the stope under filling	m	200		
	SUB TOTAL-5 : (Stowing)				
	TOTAL-DECLINE DEVELOPMENT & UNDERGROUND DEVELOPMENT (1+2+3+4+5)				
Total price (in Words).....					

**Table:
1.3**

PRICE SCHEDULE FOR SUPPLY OF EQUIPMENT					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in	Total Amoun

				Rs.	t in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
1	WINDER				
1.1	Supply of suitable double drum winder of reputed make and motor at eastern shaft Chapri with complete instrumentation and control for men (10 persons) and material hoisting (capable of 3 tonne) hoisting at a time for an depth of 250 meters along with signalling & communication system Sourced from reputed manufacturers, who have supplied minimum 20 winders of same or higher capacity and electrical/ electronic/ instrument/ automation/ control from ABB/ Siemens/ Schneider/Allen Bradley/ Winder control (South Africa)/ make only, with complete, Instrumentation and control for services with complete, Instrumentation and control for ore hoisting. Successful bidder shall provide the certification confirming the supply of 20 winders and seek HCL's approval before placing the order for the equipment. Before giving approval, HCL to confirm credential, at its own discretion and may visit the project sites where this equipment is working. The winder should satisfy all the conditions for manwinding as per DGMS guideline.	No.	1		
1.2	Headgear of strong construction suitable for operation of both material and man winders as per approved design including bell cap, ladders, platforms, arrestors and over wind safety catches, and any other requirements for man winding and all other requirements with two coats of epoxy	No.	1		
1.3	Supply of suitable cage as per approved design for winding of 10 person and hoisting of Rock through Tipping tubs of 1.5 Tons (1 extra as per MMR 1961)	No.	3		
1.4	Supply of Suspension gears for winding rope attachment to the 2 cages as per design	No.	2		
1.5	Supply of head-gears pulleys complete sets for cages (1 extra as per MMR 1961)	Set	3		
1.6	Supply of winding rope for Cage and counterweight (around 18-20 mm dia) as per approved design.	M	700		
1.7	Supply of structural steel for various section and size for shaft equipping such as bunton, platform, keps, fencing etc.	t	50		
1.8	Supply of buffer spring as per DGMS guidelines at the shaft bottom for the 2 cages.	sets	2		

1.9	60 lbs / 30kg rail for guide rail in shaft	t	35		
1.10.	30 lbs/ 15 kg for track rails	t	15		
1.11	Supply of Pipes for Compressed air and water				
1.11.1	2 numbers of 12 inch high pressure compressure pipelines from surface to 6th level with tapping at 2nd level to 6th level	m	500		
1.11.2	2 numbers of 6 inch water line from 4th level to surface and 2 numbers from 2nd level to surface.	m	300		
1.11.3	2 numbers of 4 inch pipelines for drilling water from surface water tank to 6th level with tapping at 2nd level to 6th level.	m	600		
	Sub Total-(1) Winders				
2	Material Handling Equipments				
2.1	Void	Void	Void		
2.2	10t x14m span SG EOT Crane in Winder House Duty Class – M5 as per IS: 3177 Speed: Hoist – 5 m/min. CT – 10 m/min. LT – 20 m/min	no.	1		
2.3	7.5t Electric Hoist at compressor room	no.	1		
2.4	2t manual travelling hoist in Head gear location	no.	1		
	Sub-total-2 (MH)				
3	Water Sysytem				
A	For dewatering of mining (flow: 2126m3/hr for 15 hr working)				
3.1	Pumps (Dewatering from level-6 to level-4,)	Nos.	4		
3.2	Rubber Expansion Joint	Nos.	4		
3.3	Pipe (DN100),	m	400		
3.4	Motorised Gate Valves (DN100)	Nos.	4		
3.5	NRV (DN100)	Nos.	4		
3.6	Manual Gate (DN100)	Nos.	4		
3.7	Foot valve with strainers	Nos.	4		
B	Dewatering from level-4 to hill top (surface level: ~+215m),				
3.8	Pumps (Dewatering from level-4 to ground floor)	Nos.	4		
3.9	Rubber Expansion joints	Nos.	4		
3.10	Pipe (DN100)	m	400		
3.11	Pipe (DN100)	m	1000		
3.12	Motorised Gate Valves (DN100)	Nos.	4		
3.13	NRV (DN100)	Nos.	4		
3.14	Manual Gate (DN100)	Nos.	4		
3.15	Foot valve with strainers	Nos.	4		
C	Connection of water pipe from Top hill tank to RCC mixing tank at ground floor				
3.16	Pipe (DN200)	m	500		
3.17	Manual Gate (DN200)	Nos.	2		
D	Miscellaneous				
3.18	CS Pipe (DN150)	m	1500		

3.19	Manual Gate (DN200)	Nos.	15		
3.20	Air Release Valves (DN50)	Nos.	10		
E	Drinking Water facilities (For 400 person)				
3.21	Filling of drinking water tank of capacity 4KL	Nos.	7		
3.22	GI Pipe (DN50)	m	1500		
3.23	GI Pipe (DN100)	m	300		
3.24	Manual Gate (DN50)	Nos.	15		
3.25	Manual Gate (DN100)	Nos.	2		
3.26	SS Water Cooler	No.	1		
F	Additional dewatering from 2nd level (+55m) to Top Hill				
3.27	Pumps (Dewatering from level-2 to Hill Top)	Nos.	3		
3.28	Rubber Expansion Joint	Nos.	3		
3.29	Pipe (DN100)	m	300		
3.30	Motorised Gate Valves (DN100)	Nos.	3		
3.31	NRV (DN100)	Nos.	3		
3.32	Manual Gate (DN100)	Nos.	3		
3.33	Foot valve with strainers	Nos.	3		
	Sub-total-3 (Water System)				
4	250 m³ live capacity Ore bin to be made at the slope of the hill. The ore bin to have suitable lining, Grizzly of 0.30m X 0.30 opening, over ore bin. Suitable Rock breaker to break the o/s rock at the grizzly				
4.1	Ore Bin Lining by Rail including construction of ramp	LS	1		
4.2	Grizzly	t	75		
4.3	Rock Breaker	LS	1		
	Sub-total-4				
5	Tailing Handling				
5.1	Supply of HDPE 6" pipe for 2 nos of bore holes of 165 mm dia drilled from surface to underground at 2L. From 2L to the stopes at various levels by 6" HDPE pipes to carry the mill tailings with 60:40 ratio approx. (with 60% tail and 40% water).	m	600		
	Sub-total-5 (Tailing Handling)				
6	Compressor				
6.1	Air cooled Screw air compressor of 1500cfm capacity & 7 kg/cm ² discharge pressure.	Nos.	5		
6.2	Air Receiver for 6000cfm capacity	No.	2		
6.3	Piping for air line within compressor house battery limits	Lot	1		
	Sub-total-6 (Compressor)				
7	Electrical Facilities				
7.1	MRS-Power Distribution Equipment	LS	1		
	Power Distribution Parts				
1	33kV Outdoor Lightning Arrestor	Nos.	3		
2	33kV outdoor Isolator	Set	2		

3	33kV outdoor Current Transformer	Nos.	3		
4	33kV outdoor Voltage Transformer	Nos.	3		
5	33kV outdoor Vacuum Circuit Breaker	Set	2		
6	33kV ACSR DOG conductor	kM	0.5		
7	33kV Clamp and Connectors	Lot	1		
8	Structure and angle and channels	Ton	4		
9	33kV control relay panel with Relays, metering devices and indication lamp, Hooter , Buzzer etc	Set	1		
10	33/3.3kV, 8MVA, ONAN, OLTC Power Transformer EQUIPPED WITH NITROGEN INJECTION SYSTEM FOR FIRE PROTECTION	No	1		
11	3.3kV, 50A, Neutral Grounding Resistor WITH NGR MONITORING RELAY	NO.	1		
12	3.3kV VCB Switchboard				
12.1	3.3kV , 1250A, VCB Incomer with Line PT	Nos.	3		
12.2	3.3kV , 1250A, VCB Buscoupler (WITHCASTLE LOCK ARRANGEMENTFOR INTERLOCK)	Nos.	2		
12.3	3.3kV , 1250A, VCB Outgoing with CBCT and separate EOR relay	Nos.	15		
12.4	3.3kV Bus PT	Nos.	2		
13	33/0.415kV, 200kVA, Oil Filled ONAN transformer	Nos.	1		
14	13Mtr 34.6kg/Mtr RSJ pole (Douple pole arrangement with all accessories, Like, AB Switch, DO fuse, Insulator, Clamp and connectors)	Set	1		
15	AC distribution board with following details	Set	1		
	Incomer – 300A MCCB, with castle lock arrangement	Nos.	2		
	Buscoupler – 300A MCCB with castle lock arrangement	Nos.	1		
	Outgoing feeder- 100A, MCCB with CBCT and separate EOR relay	Nos.	6		
	Outgoing feeders – 63 A, MCCB with CBCT and separate EOR relay	Nos.	6		
	Outgoing feeders – 32 A, MCCB with CBCT and separate EOR relay	Nos.	6		
16	Main Lighting distribution board with 110V centre tap 30kVA, 415/110V lighting trafo with following details	Set	1		
	Incomer – 100A MCCB, with castle lock arrangement	Nos.	2		
	Buscoupler – 100A MCCB, with castle lock arrangement	Nos.	1		
	Outgoing feeders – 32 A, MCCB CBCT and separate EOR relay	Nos.	6		
17	DC distribution board with following details	Set	1		
	Incomer – 100A MCCB	Nos.	2		

	Buscoupler – 100A MCCB	Nos.	1		
	Outgoing feeders – 32 A, MCCB	Nos.	10		
18	30V, 100AH battery with Charger	Set	1		
19	33kV (E) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI ROUND DOUBLE WIRE Armoured cable.	m	1000		
20	3.3kV (UE) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI ROUND WIRE double armoured cable.	m	1000		
21	1.1kV grade, 3.5Cx300 sq. mm Stranded copper conductor, XLPE insulated, double Armoured cable.	m	1000		
22	1.1kV grade, 3.5Cx150 sq. mm Stranded copper conductor, XLPE insulated, double Armoured cable.	m	1000		
23	1.1kV LT control cable 10 Core x 2.5sq.mm, Copper	m	1000		
24	Earthing material (As required)				
	Outdoor Switchyard	Lot	1		
	HT Substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
	Pole earthing of 3mtr. Pipe arrangement	Lot	1		
25	Lightning protection material (As required)				
	Outdoor Switchyard	Lot	1		
	HT Substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
26	Illumination material (Light fitting, Junction Boxes, Distribution boxes, Wires and cables etc) (As required)				
	Outdoor Switchyard	Lot	1		
	HT Substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
27	Miscellaneous Safety items ,Rubber mat, Danger board (33kV, 3.3kV & 415V), Sand Fire bucket, Hand gloves, Shock treatment chart etc	Lot	1		
28	GI conduit Pipe 150 Dia (As required)	Mtr	100		
29	Erection accessories, like POLYMER disc insulator, clamp and connectors etc.	Lot	1		
30	All Structural items for Gantry, equipment structure, Lighting cum lightning protection tower. (As required)	Lot	1		
31	VOID				
32	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for surface)	Nos	2		

33	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for underground level-4 & 6)	Nos	4		
34	3.3 kV, 1250 A VCB switchboard (suitable for fault level of 25 kA) with 1 incomer & three outgoing ((for underground level-4 & 6)	Nos	2		
35	3.3 kV / 0.433 kV Dry type, 1250 kVA Distribution transformers. (for surface)	Nos	2		
36	3.3 kV / 0.433 kV Dry type, 500 kVA Distribution transformers. (for underground level - 4 & 6)	Nos	6		
37	Floor mounted, 415 V, 400 Amps Main Lighting distribution board with two incomers of 400 Amps & 4 numbers Outgoing of 100 Amps.	Nos	2		
38	Additional outgoing of 100 Amps in MLDB	Nos	2		
39	415V / 120V, Dry type, 20 kVA, Mid point earthed Lighting transformer with taps upto +/- 10 % at both sides in steps of 2.5%.	Nos	8		
40	Wall/Structure mounted MCB distribution board for lighting with one number 20 Amps TPN MCB & 12 number 6 Amps SPN MCBs	Nos	25		
41	415 V, 200 Amps Isolator for Lighting transformers	Nos	8		
42	415 V, 1250 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with three incomers & two bus-coupler, each of 1250 Amps. (Each feeder shall have CBCT operated earth leakage relay) for underground substations at Level-4 & Level-6 (Mechanically and electrically interlocked)	Set	2		
43	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs inclusive of CBCT operated earth leakage relay. (Exact feeders to be provided as per approved SLD of each PCC, Feeder addition deletion as per rate below)				
	a) Outgoing feeders of PCC – 800 Amps ACB	Nos.	1		
	b) Outgoing feeders of PCC – 630 Amps ACB	Nos.	1		
	c) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	6		
	d) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	12		
	e) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	1		
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	1		

44	415 V, 2500 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with two incomers & one bus-coupler, each of 2500 Amps. (Each feeder shall have CBCT operated earth leakage relay) for LT substation at surface area. . (Mechanically and electrically interlocked)	Set	1		
45	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs incl. CBCT operated earth leakage relay.				
	a) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	3		
	b) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	4		
	c) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	2		
	d) Outgoing feeders of PCC – 200 Amps MCCB	Nos.	2		
	e) Outgoing feeders of PCC – 160 Amps MCCB	Nos.	2		
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	4		
46	Independent Floor mounted / transportable Starter panel having mining type door interlock for following required in underground area.				
	a) Star-Delta Starter panel for 160 kW jumbo drill with MCCB, Overload relay & 630 Amps contactor (gate & box arrangement)	Nos.	4		
	b) Star-Delta Starter panel for 132 kW pump motor with MCCB, Overload relay & 400 Amps contactor	Nos.	2		
	c) Star-Delta Starter panel for 90 kW pump motor with MCCB, Overload relay & 250 Amps contactor	Nos.	1		
	d) Star-Delta Starter panel for 55 kW pump motor with MCCB, Overload relay & 170 Amps contactor	Nos.	3		
	e) Star-Delta Starter panel for 80 kW Electric LHD with MCCB, Overload relay & 250 Amps contactor (gate end box arrangement)	Nos.	6		
	f) DOL Starter panel for Auxiliary Fan motor of 7.5 kW with MCCB, Overload relay & 25 Amps contactor with ELR	Nos.	20		
47	Mining type LED tube light fitting complete with 2 x 10W lamp, suitable for 90-130V AC. Fitting should include metallic stand for rotary holder & clear plastic cover and wiremess grill 4-way 16 Amps PVC terminal block and double compression glands.	Nos.	2500		

48	3.3kV(UE), aluminium conductor, aerial bunched cable of 150 sq mm + 120 sq mm including required numbers of suspension clamps/connectors.	Mtrs	1000		
49	1.1 kV, aluminium conductor, aerial bunched cable of 185 sq mm + 150 sq mm including required numbers of suspension clamps/connectors	Mtrs	500		
50	1.1 kV grade, HR PVC power cable of copper conductors, XLPE insulated and provided with a common covering of PVC inner sheath, and PVC outer sheathed of type ST2 PVC compound, double armored conforming to IS:1554 (Part-I) – 1988, as amended up to date.				
	a) 3.5 x 240 sq.mm	Mtr	500		
	b) 3.5 x 185 sq.mm	Mtr	500		
	c) 3.5 x 150 sq.mm	Mtr	500		
	d) 3.5 x 120 sq.mm	Mtr	500		
	e) 3.5 x 95 sq.mm	Mtr	500		
	f) 3.5 x 70 sq.mm	Mtr	500		
	g) 3.5 x 50 sq.mm	Mtr	500		
	h) 3.5 x 35 sq.mm	Mtr	500		
	i) 4 x 25 sq.mm	Mtr	500		
	j) 4 x 16 sq.mm	Mtr	500		
	k) 4 x 10 sq.mm	Mtr	500		
	l) 4 x 6 sq mm	Mtr	500		
	m) 4 x 2.5 sq mm (Copper conductor)	Mtr	500		
51	1.1 kV grade, HR PVC, circular stranded (rm) annealed multi strand copper conductor, PVC insulated and provided with a common covering of PVC inner sheath, and overall PVC outer sheathed of type ST2 PVC compound and multi-core, armored to IS : 1554 (Part-I) – 1988, Type YRY/YFY				
	a) 10 x 1.5 sq.mm	Mtr	1000		
	b) 7 x 1.5 sq.mm	Mtr	100		
	c) 5 x 1.5 sq.mm	Mtr	500		
	d) 3 x 1.5 sq.mm	Mtr	1000		
52	LED Luminaries with lamp(s) suitable for 40W LED, 220 V, Suspended /surface mounted for Battery room in substations similar to Bajaj type BI PC 40W LED	Nos.	4		
53	LED Luminaries with lamp(s) suitable for 36W LED 220 V , Recess type for Control Room similar to Bajaj type BZRS QL 36W GZ WH	Nos.	4		
54	LED Street Light Luminaries with lamp(s) suitable for 120W LED 220 V,	Nos.	10		
55	Lighting Junction boxes	Nos.	2600		
56	56 inch sweep, ceiling fans complete with control gear, fan hook, down rods electronic regulators conforming to this specification.	No	10		

57	9 M Long Pole for street light with JB (300 X 300 X100 mm) confirming to specification.	No	10		
58	Prefabricated, GI Ladder type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes				
	a) 600mm wide	Mtr.	500		
	b) 450mm wide	Mtr.	500		
	c) 300mm wide	Mtr.	1000		
59	Prefabricated, 6mm thick, GI Perforated type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes				
	a) 600mm wide	Mtr.	100		
	b) 300mm wide	Mtr.	100		
	c) 100mm wide	Mtr.	100		
	d) 50mm wide	Mtr.	100		
60	Wooden / Metallic clamps required for supporting of cable in shaft / wall	Lot	1		
61	Chemical earthing	Lot	1		
62	Steel structures consisting of MS Angle, MS Channel, MS plate of various sizes required for fabrication of brackets/supporting structures for, installation of cable trays, local control panels, light fittings, control panels etc.	Tonne	10		
63	Medium duty, GI pipes of following sizes				
	100mm	Mtr.	10		
	50mm	Mtr.	10		
	40mm	Mtr.	10		
64	1 inch MS Black conduits for lighting of PMCC, MCC rooms & other Civil buildings/rooms	Mtr	200		
65	2.5 sq. mm multistrand PVC insulated cu. Wire colour RBG for illumination of Electrical buildings (Cable laid in Conduit either in surface or in concealed manner as directive of site in –charge)	Mtr	500		
66	Pedestal fans	Nos.	6		
67	16 Amp plug & socket with MCB control with metallic enclosure Make: Indo Asian – For window type AC in office rooms/miscellaneous rooms	Nos.	10		
68	Switch boards with metallic enclosure with acrylic cover on the top having 10 no. piano switch of 5A rating, 2 no. 15/5 A socket (3pin cum 2pin) & suitable for mounting 2 no. electronic fan regulator. For lighting of Control rooms, office rooms, work shop.	Nos	8		
69	Multi strand single core copper cable (green colour) of 10 sq.mm for earthing of electronic equipment	Mtr	100		
70	Copper strip of size 25 mm x 3 mm for electronic earthing	Mtr	10		

71	Bakelite insulator as supports with female threads for supports for copper strip	Nos.	10		
72	Earthing pits with chemical earthing conforming to relevant is	Nos.	10		
73	GI earthing flats of following sizes				
	a) 75x10mm	Mtr.	200		
	b) 50x6mm	Mtr.	200		
	c) 25x3mm	Mtr.	500		
74	GI stranded wire for earthing of equipment of following sizes				
	a) 16 sq.mm	Mtr.	100		
	b) 6 sq.mm	Mtr.	200		
75	Underground cable installation including excavation of soil, provision of sand, bricks, RCC protective slab cover, back filling of soil, removal of debris.	Cub.M.	5		
76	Miscellaneous erection & installation materials, all consumable materials required during, testing & commissioning like insulating tapes, terminals, ferrules, lugs, cable tags, connectors, GI cable markers, cable dressing materials, wires, brazing and soldering materials, fluxes, welding electrodes, gases, paints, oil, kerosene, solvent, clamps, anchor fasteners, inserts, nuts, bolts, washers, sands, bricks, hard ware such as bends, threads, elbows, reducers, caps, saddles, spacers, wooden grips, screws Inter panel wiring/termination (if any) etc required to complete the installation work. For erection of Panels & electrical equipment if cranes & hydra are required same shall be in the scope of tenderer	Lot	1		
	Sub-Total-7 (Electrical facilities)				
8	Supply of Structural Steel.				
8.1	Steel Structures	Tonne	175		
8.2	0.5mm BMT permanent color coated metal sheets	sqm	1000		
	Sub-Total-8 (Structural)				
9	Road Weigh Bridge				
9.1	Supply of all equipments (mechanical,electrical and instrumentation etc.)	Nos	2		
	Sub-Total-9 (Road Weigh-Bridge)				
10	Fire Extinguisher				
10.1	Portable fire extinguishers each for 4.5 kg Co2 type and 5 kg DCP type is to be considered for electrical/oil/general fire. Fire Extinguishers	Nos	5		
	Sub-Total-10 (Fire Extinguisher)				

11	Mechanical Ventilator including motor and electricals at surface.				
11.1	Axial Flow having duty of 180 Cum per second, estimated static pressure of 0.84 KPa with 200 KW motor with all electrical from reputed manufacturer	Nos	2		
	Sub-Total-11 (Mechanical-Ventilator)				
	TOTAL SUPPLIES (1+2+3+4+5+6+7+8+9+10+11)				
Total price (in Words).....					

Note:

- 1) The supply will include three (3) copies of operation and maintenance manuals, spare parts catalogue.

Table:
1.4

PRICE SCHEDULE FOR ERECTION OF EQUIPMENT					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in Rs.	Total Amount in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
1	WINDER				
1.1	Erection of suitable double drum winder and motor with automatic contravances at eastern shaft Chapri with complete instrumentation and control for men (10 persons) and material hoisting (capable of 3 tonne) hoisting at a time for a depth of 250 meters along with signaling & communication system Sourced from reputed manufacturers, who have supplied minimum 20 winders of same or higher capacity and electrical/ electronic/ instrument/ automation/ control from ABB/ Siemens/ Schneider/Allen Bradley/ Winder control (South Africa)/ make only, with complete, Instrumentation and control for services with complete, Instrumentation and control for ore hoisting. Successful bidder shall provide the certification confirming the supply of 20 winders and seek HCL's approval before placing the order for the equipment. Before giving approval, HCL to confirm credential, at its own discretion and may visit the project sites where this equipment is working.	No.	1		

1.2	Head Gear: Headgear of strong construction suitable for operation of both material and man winders as per approved design including bell cap, ladders, platforms, arrestors and over wind safety catches, and any other requirements for man winding and all other requirements with two coats of epoxy	No.	1		
1.3	Installation of suitable cage for winding of 10 person and hoisting of Rock through Tipping tubs of 1.5 Tons	No.	2		
1.4	Erection of Suspension gears for winding rope attachment to the cages as per design	No.	2		
1.5	Erection of head-gears pulleys complete sets for cage (1 to be kept extra)	Set	2		
1.6	Erection of winding rope for Cages (around 18-20 mm dia)	M	700		
1.7	Shaft equipping & fittings				
1.7.1	Construction of Ladder way in the shaft by making sollars at every 10ms interval with strong iron ladders and fixed at less than 80 degree inclination from horizontal and overlapping by minimum 1 m. Fencing of the ladder way from surface to 6 level with expanded metal fencing.	t	10		
1.7.2	Fixing of Bunton in the shaft every 6 m interval with steel girders imbedded in the rock on both sides of the shaft for fixing the guide rails for the 2 cages from the top of the head gear upto and below 6 level.	t	20		
1.7.3	Installation of keps, fencing, platform and any other structure required in shaft as per approved drawing (Keps to be at surface level, 4th level and 6th level landing. Chain keps to be provided at 2nd level, 3rd level and 5th level.)	t	20		
1.8	Fixing of buffer spring as per DGMS guidelines at the shaft bottom for the 2 cages.	sets	2		
1.9	Fixing of 2 pairs of guide rails 60 lbs rails from top of the head gear upto and below 6 level for movement of cages.	t	35		
1.10.	Laying of 30 lbs track rails from waste pass chute at 4L to 4L shaft plat (for loading of mine car into cage), waste pass chute at 6L to 6L shaft plat (for loading of mine car into cage) and other places in UG, along with diamond crossing and also at surface for handling mine tubs. Provision of rail at both the cages for loading of mine cars. The track rails are to be fixed on wooden slippers at 1m intervals with proper ballasting and track crossing at junctions	t	15		
1.11	Laying of pipeline for Compressed air and water				

1.11.1	2 numbers of 12 inch high pressure compressure pipelines from surface to 6th level with tapping at 2nd level to 6th level	m	500		
1.11.2	2 numbers of 6 inch water line from 4th level to surface and 2 numbers from 2nd level to surface.	m	300		
1.11.3	Fixing of 4 inch 2 numbers pipelines for drilling water from surface water tank to 6th level with tapping at 2nd level to 6th level.	m	600		
	Sub Total-(1) Winder				
2	Material Handling Equipments				
2.1	Void	sets	Void		
2.2	10t x14m span SG EOT Crane in Winder House Duty Class – M5 as per IS: 3177 Speed: Hoist – 5 m/min. CT – 10 m/min. LT – 20 m/min	no.	1		
2.3	7.5t Electric Hoist at compressor room	no.	1		
2.4	2t manual travelling hoist in Head gear location	no.	1		
	Sub-total-2 (Material Handling Equipments)				
3	Water Sysytem				
A	For dewatering of mining (flow: 2126m3/hr for 15 hr working)				
3.1	Pumps (Dewatering from level-6 to level-4,)	Nos.	4		
3.2	Rubber Expansion Joint	Nos.	4		
3.3	Pipe (DN100),	m	400		
3.4	Motorised Gate Valves (DN100)	Nos.	4		
3.5	NRV (DN100)	Nos.	4		
3.6	Manual Gate (DN100)	Nos.	4		
3.7	Foot valve with strainers	Nos.	4		
B	Dewatering from level-4 to hill top (surface level: ~+215m),				
3.8	Pumps (Dewatering from level-4 to ground floor)	Nos.	4		
3.9	Rubber Expansion joints	Nos.	4		
3.10	Pipe (DN100)	m	400		
3.11	Pipe (DN100)	m	1000		
3.12	Motorised Gate Valves (DN100)	Nos.	4		
3.13	NRV (DN100)	Nos.	4		
3.14	Manual Gate (DN100)	Nos.	4		
3.15	Foot valve with strainers	Nos.	4		
C	Connection of water pipe from Top hill tank to RCC mixing tank at ground floor				
3.16	Pipe (DN200)	m	500		
3.17	Manual Gate (DN200)	Nos.	2		
D	Miscellaneous				
3.18	CS Pipe (DN150)	m	1500		
3.19	Manual Gate (DN200)	Nos.	15		
3.20	Air Release Valves (DN50)	Nos.	10		

E	Drinking Water facilities (For 400 person)				
3.21	Drinking water tank of capacity 4KL	Nos.	7		
3.22	GI Pipe (DN50)	m	1500		
3.23	GI Pipe (DN100)	m	300		
3.24	Manual Gate (DN50)	Nos.	15		
3.25	Manual Gate (DN100)	Nos.	2		
3.26	SS Water Cooler	No.	1		
F	Additional dewatering from 2nd level (+55m) to Top Hill				
3.27	Pumps (Dewatering from level-2 to Hill Top)	Nos.	3		
3.28	Rubber Expansion Joint	Nos.	3		
3.29	Pipe (DN100)	m	300		
3.30	Motorised Gate Valves (DN100)	Nos.	3		
3.31	NRV (DN100)	Nos.	3		
3.32	Manual Gate (DN100)	Nos.	3		
3.33	Foot valve with strainers	Nos.	3		
	Sub-total-3 (Water System)				
4	250 m3 live capacity Ore bin to be made at the slope of the hill. The ore bin to have suitable lining, Grizzly of 0.30m X 0.30 opening, over ore bin. Suitable Rock breaker to break the o/s rock at the grizzly . This shall include construction a ramp (road) of 1 in 7 gradient from ground level to ore bin top so that LPDT at go to the top of ore bin and unload the ore over grizzley.				
4.1	Ore Bin Lining	LS	1		
4.2	Grizzly (0.3m X 0.3m)	t	75		
4.3	Rock Breaker	LS	1		
4.4	Earth work for construction of ore bin.	m3	3000		
	Sub-total-4				
5	Tailing Handling				
5.1	Installation of HDPE 6" pipe through 2 nos of bore holes of 165 mm dia drilled from surface to underground at 2L then laying 6" HDPE pipes in UG at various levels by to carry the mill tailings with 60:40 ratio approx. (with 60% tail and 40% water).	m	600		
	Sub-total-5 (Tailing Handling)				
6	Compressor				
6.1	Air cooled Screw air compressor of 1500cfm capacity & 7 kg/cm2 discharge pressure.	Nos	5		
6.2	Air Receiver for 6000cfm capacity	No.	2		
6.3	Piping for air line within compressor house battery limits	Lot	1		
	Sub-total-6 (Compressor)				
7	Electrical Facilities				
7.1	MRS-Power Distribution Equipment				
1	33kV Outdoor Lightning Arrestor	Nos.	3		

2	33kV outdoor Isolator	Set	2		
3	33kV outdoor Current Transformer	Nos.	3		
4	33kV outdoor Voltage Transformer	Nos.	3		
5	33kV outdoor Vacuum Circuit Breaker	Set	2		
6	33kV ACSR DOG conductor	kM	0.5		
7	33kV Clamp and Connectors	Lot	1		
8	Structure and angle and channels	Lot	1		
9	33kV control relay panel with Relays, metering devices and indication lamp, Hooter , Buzzer etc	Set	1		
10	33/3.3kV, 8MVA, ONAN, OLTC Power Transformer EQUIPPED WITH NITROGEN INJECTION SYSTEM FOR FIRE PROTECTION	No	1		
11	3.3kV, 50A, Neutral Grounding Resistor WITH NGR MONITORING RELAY	no.	1		
12	3.3kV VCB Switchboard				
12.1	3.3kV , 1250A, VCB Incomer with Line PT	Nos.	3		
12.2	3.3kV , 1250A, VCB Buscoupler (WITHCASTLE LOCK ARRANGEMENTFOR INTERLOCK)	Nos.	2		
12.3	3.3kV , 1250A, VCB Outgoing with CBCT and separate EOR relay	Nos.	15		
12.4	3.3kV Bus PT	Nos.	2		
13	33/0.415kV, 200kVA, Dry type Oil filled ONAN transformer	Nos.	1		
14	13Mtr 34.6kg/Mtr RSJ pole (Douple pole arrangement with all accessories, Like, AB Switch, DO fuse, Insulator, Clamp and connectors)	Set	1		
15	AC distribution board	Set	1		
	Incomer – 300A MCCB with castle lock for interlock	Nos.	2		
	Buscoupler – 300A MCCB with castle lock for interlock	Nos.	1		
	Outgoing feeder- 100A, MCCB with CBCT and separate EOR relay	Nos.	6		
	Outgoing feeders – 63 A, MCCB with CBCT and separate EOR relay	Nos.	6		
	Outgoing feeders – 32 A, MCCB with CBCT and separate EOR relay	Nos.	6		
16	Main Lighting distribution board with 110V centre tap 30kVA, 415/110V lighting trafo.	Set	1		
	Incomer – 100A MCCB with castle lock for interlock	Nos.	2		
	Buscoupler – 100A MCCB with castle lock for interlock	Nos.	1		
	Outgoing feeders – 32 A, MCCB CBCT and separate EOR relay	Nos.	6		
17	DC distribution board	Set	1		

	Incomer – 100A MCCB	Nos.	2		
	Buscoupler – 100A MCCB	Nos.	1		
	Outgoing feeders – 32 A, MCCB	Nos.	10		
18	30V, 100AH battery with Charger	Set	1		
19	33kV (E) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI ROUND DOUBLE WIRE Armoured cable.	Mtr.	1000		
20	3.3kV (UE) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI steel strip double armoured cable.	Mtr.	1000		
21	1.1kV grade, 3.5Cx300 sq. mm Stranded copper conductor, XLPE insulated, double Armoured cable.	Mtr.	1000		
22	1.1kV grade, 3.5Cx150 sq. mm Stranded copper conductor, XLPE insulated, double Armoured cable.	Mtr.	1000		
23	1.1kV LT control cable 10 Core x 2.5sq.mm, Copper	Mtr.	1000		
24	Earthing material (As required)	Set	1		
	Outdoor switchyard	Lot	1		
	HT substation	Lot	1		
	LT substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
	Pole earthing of 3Mtr pipe arrangement	Lot	1		
25	Lightning protection material (As required)				
	Outdoor switchyard	Lot	1		
	HT substation	Lot	1		
	LT substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
26	Illumination material (Light fitting, Junction Boxes, Distribution boxes, Wires and cables etc) (As required)				
	Outdoor switchyard	Lot	1		
	HT substation	Lot	1		
	LT substation	Lot	1		
	Compresses air station building	Lot	1		
	Canteen	Lot	1		
	Office	Lot	1		
27	Miscellaneous Safety items ,Rubber mat, Danger board (33kV, 3.3kV & 415V), Sand Fire bucket, Hand gloves, Shock treatment chart etc	Lot	1		
28	GI conduit Pipe 150 Dia (As required)	Mtr	100		
29	Erection accessories, like POLYMER disc insulator, clamp and connectors etc.	Lot	1		
30	All Structural items for Gantry, equipment structure, Lighting cum lightning protection	Lot	1		

	tower. (As required)				
31	Approval of Statuary clearances (DGMS / Electrical) from concerned departments	Lot	1		
32	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for surface)	Nos	2		
33	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for underground level-4 & 6)	Nos	4		
34	3.3 kV, 630 A VCB switchboard (suitable for fault level of 25 kA) with 1 incomer & three outgoing ((for underground level-4 & 6)	Nos	2		
35	3.3 kV / 0.433 kV Dry type, 1250 kVA Distribution transformers. (for surface)	Nos	2		
36	3.3 kV / 0.433 kV Dry type, 500 kVA Distribution transformers. (for underground level - 4 & 6)	Nos	6		
37	Floor mounted, 415 V, 400 Amps Main Lighting distribution board with two incomers of 400 Amps & 4 numbers Outgoing of 100 Amps.	Nos	2		
38	Additional outgoing of 100 Amps in MLDB	Nos	2		
39	415V / 120V, Dry type, 20 kVA, Mid Point Earthed Lighting transformer with taps upto +/- 10 % at both sides in steps of 2.5%.	Nos	8		
40	Wall/Structure mounted MCB distribution board for lighting with one number 20 Amps TPN MCB & 12 number 6 Amps SPN MCBs	Nos	25		
41	415 V, 200 Amps Isolator for Lighting transformers	Nos	8		
42	415 V, 1250 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with three incomers & two bus-coupler, each of 1250 Amps. (Each feeder shall have CBCT operated earth leakage relay) for underground substations at Level-4 & Level-6. Electrically and Mechanically interlocked.	Set	2		
43	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs inclusive of CBCT operated earth leakage relay. (Exact feeders to be provided as per approved SLD of each PCC, Feeder addition deletion as per rate below)				
	a) Outgoing feeders of PCC – 800 Amps ACB	Nos.	1		
	b) Outgoing feeders of PCC – 630 Amps ACB	Nos.	1		
	c) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	6		
	d) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	12		

	e) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	1		
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	1		
44	415 V, 2500 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with two incomers & one bus-coupler, each of 2500 Amps. (Each feeder shall have CBCT operated earth leakage relay) for LT substation at surface area. Electrically and Mechanically interlocked.	Set	1		
45	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs incl. CBCT operated earth leakage relay.				
	a) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	3		
	b) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	4		
	c) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	2		
	d) Outgoing feeders of PCC – 200 Amps MCCB	Nos.	2		
	e) Outgoing feeders of PCC – 160 Amps MCCB	Nos.	2		
46	Independent Floor mounted / transportable Starter panel having mining type door interlock for following required in underground area.				
	a) Star-Delta Starter panel for 160 kW jumbo drill with MCCB, Overload relay & 630 Amps contactor (gate & box arrangement)	Nos.	4		
	b) Star-Delta Starter panel for 132 kW pump motor with MCCB, Overload relay & 400 Amps contactor	Nos.	2		
	c) Star-Delta Starter panel for 90 kW pump motor with MCCB, Overload relay & 250 Amps contactor	Nos.	1		
	d) Star-Delta Starter panel for 55 kW pump motor with MCCB, Overload relay & 170 Amps contactor	Nos.	3		
	e) Star-Delta Starter panel for 80 kW Electric LHD with MCCB, Overload relay & 250 Amps contactor (gate & box arrangement)	Nos.	6		
	f) DOL Starter panel for Auxiliary Fan motor of 7.5 kW with MCCB, Overload relay & 25 Amps contactor with ELR	Nos.	20		
47	Mining type LED tube light fitting complete with 2 x 10W lamp, suitable for 90-130V AC. Fitting should include metallic stand for rotary holder & clear plastic cover and wiremesh grill 4-way 16 Amps PVC terminal block and double compression glands	Nos.	2500		

48	3.3kV(UE), aluminium conductor, aerial bunched cable of 150 sq mm + 120 sq mm including required numbers of suspension clamps/connectors.	Mtrs	1000		
49	1.1 kV, aluminium conductor, aerial bunched cable of 185 sq mm + 150 sq mm including required numbers of suspension clamps/connectors	Mtrs	500		
50	1.1 kV grade, HR PVC power cable of copper conductors, XLPE insulated and provided with a common covering of PVC inner sheath, and PVC outer sheathed of type ST2 PVC compound, double armored conforming to IS:1554 (Part-I) – 1988, as amended up to date.				
	a) 3.5 x 240 sq.mm	Mtr	500		
	b) 3.5 x 185 sq.mm	Mtr	500		
	c) 3.5 x 150 sq.mm	Mtr	500		
	d) 3.5 x 120 sq.mm	Mtr	500		
	e) 3.5 x 95 sq.mm	Mtr	500		
	f) 3.5 x 70 sq.mm	Mtr	500		
	g) 3.5 x 50 sq.mm	Mtr	500		
	h) 3.5 x 35 sq.mm	Mtr	500		
	i) 4 x 25 sq.mm	Mtr	500		
	j) 4 x 16 sq.mm	Mtr	500		
	k) 4 x 10 sq.mm	Mtr	500		
	l) 4 x 6 sq mm	Mtr	500		
	m) 4 x 2.5 sq mm (Copper conductor)	Mtr	500		
51	1.1 kV grade, HR PVC, circular stranded (rm) annealed multi strand copper conductor, PVC insulated and provided with a common covering of PVC inner sheath, and overall PVC outer sheathed of type ST2 PVC compound and multi-core, armored to IS : 1554 (Part-I) – 1988, Type YRY/YFY				
	a) 10 x 1.5 sq.mm	Mtr	1000		
	b) 7 x 1.5 sq.mm	Mtr	100		
	c) 5 x 1.5 sq.mm	Mtr	500		
	d) 3 x 1.5 sq.mm	Mtr	1000		
52	LED Luminaries with lamp(s) suitable for 40W LED, 220 V, Suspended /surface mounted for Battery room in substations similar to Bajaj type BI PC 40W LED	Nos.	4		
53	LED Luminaries with lamp(s) suitable for 36W LED 220 V , Recess type for Control Room similar to Bajaj type BZRS QL 36W GZ WH	Nos.	4		
54	LED Street Light Luminaries with lamp(s) suitable for 120W LED 220 V	Nos.	10		
55	Lighting Junction boxes	Nos.	2600		
56	56 inch sweep, ceiling fans complete with control gear, fan hook, down rods electronic regulators conforming to this specification.	No	10		

57	9 M Long Pole for street light with JB (300 X 300 X100 mm) confirming to specification.	No	10		
58	Prefabricated, GI Ladder type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes				
	a) 600mm wide	Mtr.	500		
	b) 450mm wide	Mtr.	500		
	c) 300mm wide	Mtr.	1000		
59	Prefabricated, 6mm thick, GI Perforated type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes				
	a) 600mm wide	Mtr.	100		
	b) 300mm wide	Mtr.	100		
	c) 100mm wide	Mtr.	100		
	d) 50mm wide	Mtr.	100		
60	Wooden / Metallic clamps required for supporting of cable in shaft / wall	Lot	1		
61	1 inch MS Black conduits for lighting of PMCC, MCC rooms & other Civil buildings/rooms	Mtr	200		
62	2.5 sq. mm multistrand PVC insulated cu. Wire colour RBG for illumination of Electrical buildings (Cable laid in Conduit either in surface or in concealed manner as directive of site in –charge)	Mtr	500		
63	Pedestal fans	Nos.	6		
64	16 Amp plug & socket with MCB control with metallic enclosure Make: Indo Asian – For window type AC in office rooms/miscellaneous rooms	Nos.	10		
65	Switch boards with metallic enclosure with acrylic cover on the top having 10 no. piano switch of 5A rating, 2 no. 15/5 A socket (3pin cum 2pin) & suitable for mounting 2 no. electronic fan regulator. For lighting of Control rooms, office rooms, work shop.	Nos	8		
66	Multi strand single core copper cable (green colour) of 10 sq.mm for earthing of electronic equipment	Mtr	100		
67	Copper strip of size 25 mm x 3 mm for electronic earthing	Mtr	10		
68	Bakelite insulator as supports with female threads for supports for copper strip	Nos.	10		
69	Earthing pits with chemical earthing conforming to relevant IS	Nos.	10		
70	GI earthing flats of following sizes				
	a) 75x10mm	Mtr.	200		
	b) 50x6mm	Mtr.	200		
	c) 25x3mm	Mtr.	500		
71	GI stranded wire for earthing of equipment of following sizes				

	a) 16 sq.mm	Mtr.	100		
	b) 6 sq.mm	Mtr.	200		
	Sub Total -7-(Electrical)				
8	Structural Steel.				
8.1	Steel Structures	Tonne	175		
8.2	0.5mm BMT permanent color coated metal sheets	sqm	1000		
	Sub-Total-8 (Structural)				
9	Road Weigh Bridge				
9.1	Supply of all equipments (mechanical,electrical and instrumentation etc.)	Nos	2		
	Sub-Total-9 (Road Weigh-Bridge)				
10	Fire Extinguisher				
10.1	Portable fire extinguishers each for 4.5 kg Co2 type and 5 kg DCP type is to be considered for electrical/oil/general fire. Fire Extinguishers	Nos	5		
	Sub-Total-10 (Fire Extinguisher)				
11	Mechanical Ventilator including motor and electricals at surface.				
11.1	Axial Flow having duty of 180 Cum per second, estimated static pressure of 0.84 KPa with 200 KW motor with all electrical from reputed manufacturer	Nos	2		
	Sub-Total-11 (Mechanical-Ventilator)				
	TOTAL-Erection (1+2+3+4+5+6+7+8+9+10+11)				
Total price (in Words).....					

Table:
1.5

PRICE SCHEDULE FOR CIVIL WORKS					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in Rs.	Total Amount in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
A	Civil Works				
I	Section Earth Work(EW)				
EW-1	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains , including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. (Working space beyond foundation shall be considered				

	for payment as indicated in CPWD specifications for all earth work items)				
	In all kinds of soil	cum	1900		
EW-2	For excavation for depth exceeding 1.5 m up to 3m .				
	In all kinds of soil	cum	500		
EW-3	For excavation for depth exceeding 3m up to 4.5m .				
	In all kinds of soil	cum	150		
EW-4	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge.				
	In ordinary rock	cum	600		
EW-5	For excavation exceeding 1.5 m in depth and up to 3m				
	In ordinary rock	cum	200		
EW-6	For excavation for depth exceeding 3m up to 4.5m .				
	In ordinary rock	cum	100		
EW-7	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge.				
	In hard rock requiring blasting	cum	600		
EW-8	For excavation in foundations exceeding 1.5 m up to 3m depth				
	In hard rock requiring blasting	cum	200		
EW-9	For excavation for depth exceeding 3m up to 4.5m .				
	In hard rock requiring blasting	cum	100		
EW-10	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 3.0 m.(Payment for filling will be made for the qty of authorised excavation)	cum	1500		

EW-11	For back filling of foundations beyond 3m up to a depth of 4.5m	cum	200		
EW-12	Transportation, carriage and disposal of surplus excavated earth, soft/ decomposed rock up to a distance of 3KM , including loading, unloading, stacking, levelling, dressing etc. by mechanical or manual means with all bye-works complete as per specification and instruction of the engineer	cum	1200		
EW-13	Earth work in excavation for cutting at locations of buildings to required level including disposal of earth to low lying areas including leveling compaction up to 1 KM distance	cum	62000		
II	Section –(CC)PLAIN & Reinforced Concrete				
	Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant Engineer-in-charge Note : Excess/less cement used than specified in this item is payable/ recoverable separately. All works up to plinth level				
CC-1	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum	cum	420		
CC-2	M-15 grade plain cement concrete screed over roofs etc. (cement content considered @ 240 kg. /cum)	cum	95		
CC-3	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying , excluding the cost of centering, shuttering finishing and reinforcement, including cost of admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer-in-charge per approved design mix, including pumping of concrete to site of laying but excluding the cost of entering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of	cum	740		

	concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/recoverable separately)				
CC-4	All works above plinth level up to floor V level	cum	370		
CC-5	For providing richer mixes at all floor levels.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum	cum	1400		
CC-6	Add for using extra/deduct for less cement in the items of design mix over and above the specified cement content therein.(Applicable for all items of concrete)	quintal	1500		
CC-7	Steel reinforcement for R.C.C. work including cost of steel, transportation to site, storage, straightening, cutting, bending, placing in position and binding all complete up to plinth level.	MT	302		
CC-8	Centering and shuttering including strutting, propping etc. and removal of form for all heights :				
a)	Foundations, footings, bases of columns, etc. for mass concrete	Sqm	700		
b)	Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc	Sqm	3000		
c)	Suspended floors, roofs, landings, balconies and access platform	Sqm	1960		
d)	Lintels, beams, plinth beams, girders, bressumers and cantilevers	Sqm	950		
e)	Columns, Pillars, Piers, Abutments, Posts and Struts	Sqm	450		
f)	Stairs, (excluding landings) except spiral-staircases	Sqm	60		
g)	Small lintels not exceeding 1.5 m clear span, moulding as in cornices, window sills, string courses, bands, copings, bedplates, anchor blocks and the like	Sqm	10		
h)	Weather shade, Chajjas, corbels etc., including edges	Sqm	5		
i)	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc., including cost of de-shuttering and de centering at all levels, over a height of 3.5 m, for every additional height of 1 metre or part thereof Suspended floors, roofs,	Sqm	2,500.00		

	landing, beams and balconies (Plan area to be measured)				
III	Section –BRICK MASONRY (MN)				
MN-1	Brick work with non modular fly ash bricks conforming to IS:12894,class designation 10 average compressive strength in foundation up to plinth in :Cement mortar 1:6 (1 cement : 6 coarse sand)	cum	50		
MN-2	Brick work with non modular fly ash bricks conforming to IS:12894,class designation 10 average compressive strength in super structure above plinth level up to floor V level in :Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	425		
MN-3	. Half brick masonry with non modular fly ash bricks of class designation10, conforming to IS :12894, in super structure above plinth and upto floor V level Cement mortar 1 : 4 (1	sqm	170		
IV	Section –MISCELLANEOUS (MS)				
MS-1	Providing and fixing mild steel inserts made from plates , angles, pipes, round holding down bolts with nuts and washer plates complete.	kg	3500		
MS-2	Supplying and providing good quality granite boulders of 250 mm thick below floors using boulders of 200mm size including all bye works as per specifications and instructions of engineer in charge	cum	250		
MS-3	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	sqm	170		
MS-4	Providing and laying water proofing treatment on roofs of slabs over screed concrete laid in slope1:100(screed concrete will be paid unders eparate item) by applying cement slurry mixed with water proofing cement compound of reputed make like consisting of applying	sqm	1200		
	a)after surface preparation, first layer of slurry of cement mixed with water proofing cement compound as per manufacturer specification				

	b)Laying second layer of Fibre glass cloth when the first layer is still green. Overlaps of joints of fibre cloth should not be less than 10 cm.				
	c)third layer of 1.5 mm thickness consisting of slurry of cement mixed with water proofing cement compound as per manufacture specification. This will be allowed to air cure for 4 hours followed by water curing for 48hours.				
	d)fourth and final layer is 25mm thick protective screed to be laid in panels by providing chicken wire mesh .For the purpose of measurement the entire horizontal surface area will be measured. The product performance shall carry guarantee for 10 years against any leakage				
MS-5	Providing and mixing integral crystalline admixture for waterproofing treatment to RCC structures like water tanks,. at the time of transporting of concrete into the drum of the ready-mix truck, using integral crystalline admixture @0.80% (minimum) to the weight of cement content per cubic meter of concrete) or higher as recommended by the manufacturer's specification in reinforced cement concrete at site of work.	kg	1400		
MS-6	Providing and fixing in position 25mm thick pre-moulded joint filler in expansion joints	sqm	30		
	Sub Total-Civil Works (A)				
B	ARCHITECTURAL WORKS				
FL	SECTION - FLOORING				
FL-1	Cement concrete flooring 1:2:4 (1cement: 2 coarse sand :4graded stone aggregate) finished with a floating coat including cement slurry but excluding the cost of nosing of steps etc. complete				
	40 mm thick with 20 mm nominal size stone aggregate.	SQM	1065		
FL-2	Cement plaster skirting upto 30cm height, with cement mortar 1:3 (1 cement : 3 coarse sand)finished with a floating coat of neat cement.				
	18 mm thick	SQM	43		

FL-3	Providing and laying Ceramic glazed floor tiles 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick Cement Mortar 1:4 (1 Cement : 4 Coarse sand), jointing with grey cement slurry @ 3.3 kg/ Sqm including pointing the joints with white cement and matching pigment etc., complete.	SQM	3		
FL-4	Providing and fixing 1st quality ceramic glazed floor tiles conforming to IS: 15622 (thickness to be specified by the manufacturer) of approved make in all colours except burgundy, bottle green, black of any size as approved by Engineer-in-charge, in skirting, risers of steps and dados over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete.	SQM	14		
FL-5	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) :				
	25 mm thick	SQM	240		
FL-6	Kota stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	SQM	16		
FL-7	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% & conforming to IS : 15622 of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1cement :4 coarse sand), jointing with grey cement slurry @ 3.3 Kg/Sqm including grouting the joints with white cement & matching pigments etc., complete.				
	Size of tile 600x600 mm	SQM	30		

FL-8	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% & conforming to IS : 15622 of approved make, in all colours and shades, in skirting, risers of steps, over 12mm thick bed of cement mortar 1:3 (1cement :3 coarse sand), jointing with grey cement slurry @ 3.3 Kg/Sqm including grouting the joints with white cement & matching pigments etc., complete.				
	Size of tile 600x600 mm	SQM	7		
FL-9	Providing and laying polished granite stone flooring in required design in patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and joint with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the engineer-In-charge				
	Polished granite stone slab Jet black, Cherry Red, Elite brown, Cat eye or equivalent	SQM	18		
FN	SECTION - FINISHING				
FN-1	12 mm cement plaster of mix:				
	1:6 (1 cement : 6 fine sand)	SQM	1595		
FN-2	20 mm cement plaster of mix:				
	1:6 (1 cement : 6 fine sand)	SQM	1763		
FN-3	6 mm cement plaster of mix:				
	1:3 (1 cement : 3 fine sand)	SQM	1200		
FN-4	Finishing walls with Premium Acrylic Smooth exterior paint with silicone additives of required shade :				
	New work (Two or more coat applied @ 1.43 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm).	SQM	1849		
FN-5	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/ litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.				
	two coats	SQM	2670		
FN-6	Painting with synthetic enamel paint, having VOC (Volatile Organic Compound) content less than 150 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade				

	and colour.				
	two coats	SQM	68		
FN-7	Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content.				
	With ready mixed pink or grey primer on wood work (hard and soft wood) having VOC content less than 50 grams/ litre.	SQM	55		
	With ready mixed red oxide zinc chromatic on steel /iron works having VOC content less than 250 grams/litre.	SQM	13		
	With water thinnable cement primer on wall surface having VOC content less than 50 grams/litre.	SQM	2670		
FN-8	Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete.	SQM	2670		
FN-9	Painting with acid proof paint of approved brand and manufacture of required colour to give an even shade:				
FN-10	French spirit polishing :				
	Two or more coats on new works including a coat of wood filler.	SQM	55		
DW	SECTION - DOOR, WINDOW & JOINERY WORK				
DW-1	Providing and fixing pressed steel door frames conforming to IS: 4351 manufactured from commercial mild steel sheet of 1.60 mm thickness including hinges, jamb, lock jamb, bead and if required angle threshold of mild steel angle of section 50x25mm, or base ties of 1.60 mm, pressed mild steel welded or rigidly fixed together by mechanical means, including M.S. pressed butt hinges 2.5mm thick with mortar guards, lock strike-plate and shock absorbers as specified and applying a coat of approved steel primer after pre-treatment of the surface as directed by Engineer-in-charge:				
	Profile B				
	Fixing with adjustable lugs with split end tail to each jamb	RM	50		

DW-2	Providing and Fixing factory made PVC door frame made of PVC extruded sections of size 75 mm x 53 mm, having wall thickness 2.0 mm (± 0.2 mm). Both verticals sides of the frame reinforced with PVC profile of cross section size 28 mm x 30 mm x 2 mm thickness (± 0.2 mm) and 75 mm x 200 mm long, including reinforcing both ends of the top frame with PVC profile. PVC Door Frame and PVC reinforcement profile to be mitred cut, jointed and fusion welded together, including providing and fixing 3 nos of 125 mm long stainless steel hinges to frame, fixing the frame with jamb with required nos & sizes of anchor dash fastener, all complete as per manufacturer's specification and direction of engineer- in-charge.	RM	5		
DW-3	Providing and fixing 37 mm thick factory made PVC Door shutter, styles and rails made of PVC hollow extruded printed and laminated section having overall dimension 115 mm x 37 mm with wall thickness 2 mm (± 0.2 mm) with inbuilt beading on one side, the styles and rails mitred cut and joint at corners by inserting 2 nos PVC profile reinforcement of size 75 mm x 200 mm long with cross section size of 28 mm x 30 mm having wall thickness 2 mm (± 0.2 mm). Styles, rails and reinforcements to be fusion welded together. Only hinge side vertical style to be reinforced with PVC profile reinforcement in full length. Printed and laminated PVC lock rail of size 110 mm x 37 mm having wall thickness 2 mm (± 0.2 mm) to be welded horizontally with the vertical styles after inserting PVC profile reinforcement as in styles and rails, providing with PVC snap fit beading, panels of 100 x 20 mm printed & laminated and inserting 2 nos 6 mm dia bright steel rod horizontally with both side threaded and tightened with check nuts and washers complete, all as per manufacturer's specification and direction of engineer-in-charge.	SQM	2		
DW-4	Providing and fixing ISI marked flush door shutters conforming to IS: 2202 (Part-I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters.				
	35 mm thick including ISI marked stainless steel butt hinges with necessary screws.	SQM	24		

DW-5	Providing and fixing IS: 12817 marked stainless steel butt hinges with stainless steel screws etc. complete:				
	100x58x1.9 mm	EACH	45		
DW-6	Providing and fixing decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S, including cost of adhesive of approved quality				
	1.5 mm thick	SQM	24		
DW-7	Providing and fixing aluminium sliding door bolts, ISI marked anodized (anodic coating not less than grade AC10 as per IS:1868) transparent or dyed to required colour or shade, with nuts and screws etc. complete.				
	300x16 mm	EACH	12		
DW-8	Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC10 as per IS:1868) transparent or dyed to required colour or shade with necessary screws etc. complete.				
	150x10 mm	EACH	15		
DW-9	Providing and fixing aluminium handles, ISI marked, anodised (anodic coating not less than grade AC10 as per IS:1868) transparent or dyed to required colour or shade with necessary screws etc. complete.				
	125 mm	EACH	28		
DW-10	Providing and fixing aluminium hanging floor door stopper, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour and shade with necessary screws etc., complete				
	single rubber stopper	EACH	13		
DW-11	Providing and fixing chromium plated brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles of approved quality with necessary screws etc. Complete	EACH	11		
DW-12	Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm) with double speed adjustment with necessary accessories and screws etc. complete	EACH	15		

DW-13	Providing and fixing carbon steel galvanized (minimum coating 5 micron) dash fastener of 10 mm dia double threaded 6.8 grade (yield strength 480 N/sq.mm), counter sunk head, comprising of 10 mm dia polyamide PA 6 grade sleeve, including drilling of holes in frame, concrete/masonry, etc. as per direction of Engineer-in-charge.				
	(a) 10x140 mm	EACH	66		
DW-14	Providing and fixing anodised aluminium grill (anodised transparent or dyed to required shade according to IS: 1868 with minimum anodic coating of grade AC 15) of approved design/pattern, with approved standard section and fixed to the existing window frame with C.P. brass/ stainless steel screws @ 200mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved anodised aluminium standard section around the opening, all complete as per requirement and direction of Engineer-in-charge. (Only weight of grill to be measured for payment).	KG	257		
DW-15	Providing and fixing factory made uPVC white colour casement/ casement cum fixed glazed windows comprising of uPVC multi-chambered frame, sash and mullion (where ever required) extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to uPVC profile), uPVC extruded glazing beads of appropriate dimension, EPDM gasket, stainless steel (SS 304 grade) friction hinges, zinc alloy (white powder coated) casement handles, G.I fasteners 100 x 8 mm size for fixing frame to finished wall, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut & fusion welded at all corners, mullion (If required) shall be also fusion welded including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. (Single / double glass panes and silicon sealant shall be paid separately).				

	Note: For uPVC frame, sash and mullion extruded profiles minus 5% tolerance in dimension i.e. in depth & width of profile shall be acceptable				
	Casement window single panel with S.S. friction hinges (300 x 19 x 1.9 mm), made of (small series) frame 47 x 50 mm & sash 47 x 68 mm both having wall thickness of 1.9 ± 0.2 mm and single glass pane glazing bead of appropriate dimension. (Area of window upto 0.75 sqm.)	SQM	3		
	Casement window double panels with S.S. friction hinges (350 x 19 x 1.9 mm) made of (big series) frame 67 x 60 mm & sash/ mullion 67 x 80 mm both having wall thickness of 2.3 ± 0.2 mm and single glazing bead/ double glazing bead of appropriate dimension. (Area of window above 1.50 sqm).	SQM	132.75		
DW-16	<p>Providing and fixing factory made uPVC white colour sliding glazed window upto 1.50 m in height dimension comprising of uPVC multi-chambered frame with in-built roller track and sash extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to uPVC profile), appropriate dimension of uPVC extruded glazing beads and uPVC extruded interlocks, EPDM gasket, wool pile, zinc alloy (white powder coated) touch locks with hook, zinc alloy body with single nylon rollers (weight bearing capacity to be 40 kg), G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. (Single/ double glass panes, wire mesh and silicon sealant shall be paid separately)</p> <p>Note: For uPVC frame and sash extruded profiles minus 5% tolerance in dimension i.e. in depth & width of profile shall be acceptable</p>				

	Two track two panels sliding window made of (big series) frame 67 x 50 mm & sash 46 x 62 mm both having wall thickness of 2.3 ± 0.2 mm and single glazing bead I double glazing bead of appropriate dimension. (Area of window above 1.75 sqm upto 2.50 sqm).	SQM	49.5		
DW-17	Filling the gap in between Door/ Window/ ventilator frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.				
	Upto 5mm depth and 5 mm width	RM	152		
DW-18	Providing and fixing glazing in door, window, ventilator shutters and partitions etc. complete as per the architectural drawings and the directions of Engineer-in-charge				
	With float glass panes of 5.50 mm thickness	SQM	183		
	With float glass panes of 8 mm thickness	SQM	6		
DW-19	Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C. P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) :				
	(a) For fixed portion				
	i. Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15)	KG	26		
	(b) For shutters of doors, windows & ventilators including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber / neoprene gasket required (Fittings shall be paid for separately)				
	i. Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC	KG	32		

	15)				
RC	SECTION- ROOFING & CEILING				
RC-1	<p>Providing and fixing false ceiling at all heights with integral densified calcium silicate reinforced with fibre and natural filler false ceiling tiles of Size 595x595 mm of approved texture, design and patterns having NRC (Noise Reduction coefficient) of 0.50 (minimum) as per IS 8225:1987, Light reflectance of 85% (minimum). Non combustible as per BS:476 (part-4), fire performance as per BS:476 (part 6 &7), humidity resistance of 100%, thermal conductivity < 0.043 W/m K as per ASTM 518:1991, in true horizontal level suspended on inter- locking metal powder coated T-Grid of hot dipped galvanised iron section of 0.40 mm thick on Silhouette profile, rotary stiched double webbed white with 6 mm reveal profile (white/black), comprising of main-T runners of size 15x42 mm of length 3000 mm, cross - T of size 15x42 mm of length 1200 mm and secondary intermediate cross-T of size 15x42 mm of length 600mm to form grid module of size 600 x 600 mm, suspended from ceiling using galvanised mild steel items (galvanizing @ 80 grams per sqm) i.e. 50 mm long, 8 mm outer diameter M-6 dash fasteners, 6 mm dia fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x2 mm. Galvanised iron perimeter wall angle of size 22x19x0.40 mm of length 3000 mm to be fixed on periphery wall/ partition with the help of plastic rawl plugs at 450 mm center to center and 40mm long dry wall S.S screws. The work shall be carried out as per specifications, drawing and as per directions of the Engineer-in-Charge.</p>				
	With 15 mm thick integral densified micro edge light weight calcium silicate false ceiling tiles	SQM	48		
RC-2	<p>Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.(i) Single socketed pipes.</p>				
	110 mm diameter	RM	152		

RC-3	Providing and fixing on wall face unplasticised - PVC moulded fittings/ accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.				
	a. Coupler				
	110 mm	EACH	53		
	c. Single tee with Door				
	110x110x110 mm	EACH	3		
	d. Single tee without Door				
	110x110x110 mm	EACH	3		
	e. Bend 87.5°				
	110 mm bend	EACH	35		
	f. Shoe (Plain)				
	110 mm shoe	EACH	16		
RC-4	Providing and fixing unplasticised -PVC pipe clips of approved design to unplasticised - PVC rain water pipes by means of 50x50x50mm hard wood plugs, screwed with M.S. screws of required length, including cutting brick work and fixing in cement mortar 1:4 (1 cement : 4 coarse sand) and making good the wall etc. complete.				
	110 mm	EACH	53		
RC-5	Providing and fixing to the inlet mouth of rain water pipe cast iron grating 15 cm diameter and weighing not less than 440 grams.	EACH	17		
SP	SANITARY & PLUMBING				
SP-1	Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	EACH	1		
SP-2	Providing and fixing 600x120x5mm glass shelf with edges round off, supported on anodised aluminium angle frame with C.P. brass brackets and guard rail complete fixed with 40 mm long screws, rawl plugs etc., complete.	EACH	1		
SP-3	Providing and fixing toilet paper holder:				
	Vitreous china	EACH	1		
SP-4	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931				
	15 mm nominal bore	EACH	1		

SP-5	a) Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete including cutting and making good the walls and floors wherever required :				
	White Vitreous china Orissa pattern W.C. pan of size 580x440mm with integral type foot rests.	EACH	1		
	b) Providing and fixing uplasticised PVC connection pipe with brass unions :				
	45 cm length				
	15 mm nominal bore	EACH	1		
	c) Providing and fixing PTMT angle stop cock 15 mm nominal bore, weighing not less than 85 gms	EACH	1		
SP-6	a) Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require :				
	White Vitreous China flat back Wash basin size 550x400 mm with single 15 mm C.P. brass pillar taps.	EACH	1		
	b) Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete				
	Flexible pipe				
	32 mm dia	EACH	1		
	c) Providing and fixing PTMT Waste Coupling for wash basin and sink, of approved quality and colour.				
	Waste coupling 31 mm dia of 79 mm length and 62mm breadth weighing not less than 45gms.	EACH	1		
	d) Providing and fixing uplasticised PVC connection pipe with brass unions :				
	45 cm length				
	15 mm nominal bore	EACH	1		
	e) Providing and fixing PTMT angle stop cock 15 mm nominal bore, weighing not less than 85 gms	EACH	1		
SP-7	e) Providing and fixing PTMT angle stop cock 15 mm nominal bore, weighing not less than 85 gms	EACH	27		
SP-8	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:8931				
	15 mm nominal bore.	EACH	1		

SP-9	Providing and fixing PTMT liquid soap container 109mm wide, 125mm high and 112mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms.	EACH	1		
SP-10	Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fitting arrangement of approved quality and colour.				
	600mm long towel rail with total length of 645mm, width 78mm and effective height of 88mm, weighing not less than 190gms	EACH	1		
SP-11	Providing and fixing 15 mm nominal bore C.P. brass fittings of approved make and conforming to IS:8931 including C.P. brass extension if required:				
	a)Health foscet (hand jet) with flexible connection pipe (for WC)	SET	1		
SP-12	Providing and fixing CP brass Robe hook fixed with CP brass screws with all bye-works complete as per specifications and direction of the Engineer.	EACH	2		
SP-13	Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete.				
	Flexible pipe				
	32 mm dia	EACH	5		
	40 mm dia	EACH	5		
SP-14	Providing and fixing uplasticised PVC connection pipe with brass unions :				
	45 cm length				
	15 mm nominal bore	EACH	5		
SP-15	Providing and fixing soil, waste and vent pipes:				
	100 mm dia.				
	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905	RM	4		
	75 mm diameter				
	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905	RM	5		
SP-16	Providing and fixing bend of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete.				
	100 mm dia.				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	1		
	75 mm dia				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	2		
SP-17	Providing and fixing plain bend of required degree.				

	100 mm dia.				
	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905	EACH	1		
	75 mm dia				
	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905	EACH	1		
SP-18	Providing and fixing double unequal plain junction of required degree:				
	100x100x75x75 mm				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	10		
SP-19	Providing and fixing single unequal plain junction of required degree:				
	100x100x75 mm				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	1		
SP-20	Providing and fixing single unequal plain invert branch of required degree:				
	100x100x75 mm				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	10		
SP-21	Providing and fixing Hubless centrifugally cast iron offsets epoxy coated inside & outside as per IS:15905				
	65 mm offsets				
	With 100 mm dia pipe	EACH	2		
	With 75 mm dia pipe	EACH	2		
SP-22	Providing and fixing terminal guard:				
	100 mm				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	1		
SP-23	Providing and fixing shielded coupling for Hubless centrifugally cast iron pipe.				
	100 mm dia				
	SS 304 grade coupling with EPDM rubber gasket	EACH	1		
	75 mm dia				
	SS 304 grade coupling with EPDM rubber gasket	EACH	1		
SP-24	Providing and fixing M.S. stays and clamps for sand cast iron / centrifugally cast (spun) iron pipes of diameter:				
	100 mm	EACH	2		
	75 mm	EACH	2		
SP-25	Providing and fixing trap of self cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors:				
	100 mm inlet and 100 mm outlet				

	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	1		
	100 mm inlet and 75 mm outlet				
	Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905	EACH	1		
SP-26	Cutting chases in brick masonry walls for following diameter sand cast iron/centrifugally cast (spun) iron pipes and making good the same with cement concrete 1:3:6 (1 cement: 3 coarse sand :6 graded stone aggregate 12.5 mm nominal size), including necessary plaster and pointing in cement mortar 1:4 (1 cement: 4 coarse sand):				
	100 mm dia.	RM	1		
	75 mm dia.	RM	2		
SP-27	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge.				
	Internal work - Exposed on wall				
	20 mm nominal outer dia Pipes	RM	4		
	25 mm nominal outer dia Pipes	RM	8		
SP-28	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This Includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge.				
	Concealed work, including cutting chases and making good the walls etc.				
	15 mm nominal outer dia Pipes	RM	3		
	20 mm nominal outer dia Pipes	RM	5		
SP-29	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :				
	32 mm nominal bore.	EACH	10		
	40 mm nominal bore	EACH	1		
	50 mm nominal bore	EACH	5		
SP-30	Providing and placing on terrace (at all floor levels) polyethylene water storage tank, ISI : 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without				

	fittings and the base support for tank				
	Circular tank	PER LITRE	500		
SP-31	Providing and fixing C.P. Brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gms.				
	15 mm nominal bore	EACH	5		
SP-32	Providing and fixing PTMT pillar cock of approved quality and colour.				
	15 mm nominal bore, 125 mm long foam flow, weighing not less than 120 gms.	EACH	1		
SP-33	Providing and fixing PTMT grating of approved quality and colour.				
	Circular type				
	100 mm nominal dia	EACH	5		
	100 mm nominal dia with 25 mm waste hole	EACH	5		
	Sub Total-Architectural Works (B)				
TOTAL- CIVIL & ARCHITECTURAL WORKS (A+B)					
Total price (in Words).....					

**Signature and
Seal**

In Rs.

A.	TOTAL Mine Development Cost (PART-I = Table-1.1+Table-1.2+Table-1.3+Table-1.4+Table-1.5)	
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**PART-II : PRODUCTION &
TRANSPORTATION**

Table: 2.1

PRICE SCHEDULE FOR PRODUCTION FROM STOPEs					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in Rs.	Total Amount in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
1	STOPING				
1.1	Production of ore from Post pillar stopes, Horizontal Cut & Fill stopes after developing the sill Drive including drilling, blasting, mucking the blasted ore using LHD and dumping into ore pass in the stope , Loading to LPDT and transportation and discharge to surface ore bin.Loose dressing & supporting of roof/back and pillars as per the approved support plan. Cable bolting to be done at 3.5m X 3.5m grid pattern for various length varying from 7m to 20m as per direction of engineer in charge. The size of the rock bolt is 1.8m long, 20 mm dia Tor steel fixed in a staggered manner at 1.5m X 1.5m spacing. Extension of steel rings in ore pass/ service raises. Equipping of service raise cum manway with ladder with hand posts., ventilation, illumination in man ways, stoping areas and at specified locations. Stope void filling including transportation of classified mill tailings from Mosabani plant and dispose off into a surface bunker. From the bunker by mixing the tailing with water and passing through boreholes and pipes to the stope voids complete in all respect as directed by the Engineer-in-Charge or his authorized representative. It also includes pipe fitting, drainage system, extension of pipe line, installation of auxiliary ventilation fans, extension of ducting for ventilation, compressed air and water pipe line as and wherever required. Erection of any additional support as and when required				
	Year 1	Ton	0		
	Year2	Ton	0		
	year 3	Ton	171000		
	Year 4	Ton	234500		
	Year 5	Ton	219500		

1.2	Production of ore from Room & Pillar stopes after developing the raise , including drilling, blasting, scrapping the blasted ore to the box hole raise of the stope and loading into the LPDT and transportation and discharge to surface ore bin. Loose dressing & supporting of roof/back with rock bolts. The size of the rock bolt is 1.8m long, 20 mm dia Tor steel fixed in a staggered manner at 1.5m X 1.5m spacing. Stope void filling including construction of a wall with decantation pipe at the mouth of the stope openings. Transportation of classified mill tailings from Mosabani plant and dispose off into a surface bunker. From the bunker by mixing the tailing with water and passing through boreholes and pipes to the stope voids complete in all respect as directed by the Engineer-in-Charge or his authorized representative. It also includes pipe fitting, drainage system, extension of pipe line, installation of auxiliary ventilation fans, extension of ducting for ventilation, compressed air and water pipe line as and wherever required. Erection of any additional support as and when required				
	Year 1	Ton	0		
	Year 2	Ton	0		
	year 3	Ton	0		
	Year 4	Ton	15000		
	Year 5	Ton	30000		
	Sub-Total (Stoping)				
Total price (in Words).....					

Table: 2.2

PRICE SCHEDULE FOR TRANSPORTATION OF TAILING					
Item No.	Description of Schedule Item	Unit	Qty.	Rate in Rs.	Total Amount in Rs.
(a)	(b)	(c)	(d)	(e)	(f)
	Transportation				
1	Ore Transportation from Surface Ore bin to Mosabani stockpile located at a distance of 18km. The return trip will bring the tailing from Mosabani plant to the mine site tailing disposal bunker/site.				
1.1	Year 1	t/km	0		
1.2	Year2	t/km	0		
1.3	year 3	t/km	157500		
1.4	Year 4	t/km	315000		
1.5	Year 5	t/km	315000		
	Sub-Total (Transportation)				
Total price (in Words).....					

Signature and Seal

Note:

- 1) The bidder to Quote the unit rate in whole numbers (i.e without any decimal).
- 2) The quantities indicated are estimated quantities. Final payment will be made based on actual quantities to be executed & certified by the Purchaser.
- 3) Bidder is requested to quote against each item.

In Rs.

B. TOTAL Production & Transportation Costs (PART-II = Table-2.1+Table-2.2)	
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Table No. 3

TOTAL PACKAGE COST

	Description	Amount in Rs excl. GST
PART-I:	Mine Development Costs (Sl. No. A)	
PART-II:	Production & Transportation Costs (Sl. No. B)	
Total Price (Part-I+Part-II)		
Total price (in Words).....		

Note:

- 1) Price Evaluation will be based on total price of Part-I & Part-II as mentioned in Table No. 3.
- 2) In case of Discrepancies on item descriptions & quantities between price format & BOQ/TS, then descriptions & quantities in BOQ/TS will prevail.
- 3) Bidder is requested to quote against each item.
- 4) Supplies & services are inclusive of all taxes & duties, freight & insurances excluding GST.
- 5) Where there is discrepancy between amounts in figures and words, the lower of the two will govern.
- 6) Where there is discrepancy between the total amount of an item quoted by the bidder and amount derived from the multiplication of the unit price and the quantity, the lower of the two will govern.
- 7) Where there is discrepancy in total summation as quoted by the bidder and as derived from calculation, the lower of the two will govern.
- 8) If any discrepancy is found in furnishing any Remarks/Footnotes/Comments between Un-priced bids and Priced bids, Remarks/Footnotes/Comments furnished in Un-priced bids will prevail.

PRICE SCHEDULE FOR OPEN ITEMS (Annexure 01)				
(HCL shall be indicating the price during pre bid meeting during price at which bidder has to supply				
Item No.	Description of Schedule Item	Unit	Qty.	Price by HCL
(a)	(b)	(c)	(d)	(f)
	Price Offer For Open Items			price by HCL which shall be binding to all bidders
1	Steel of any size/section including procurement, fabrication, transportation and erection			
1.1	For supports at drives/cross cuts and any other excavation.	t		
1.2	For other purposes.	t		
2	Void	Void		
3	Installation of Rock Bolt with 20mm dia, tor steel in underground including drilling, grouting with cement / rock capsules with bearing plate of 6 mm thickness, 150 mm x 150 mm, 6” threaded nut should be capable of taking 8t load on pull test.			
3.1	1.5 m length	No.		
3.2	1.8 m length	No.		
3.3	2.4 m length	No.		
4	165mm dia DTH hole (of length min. 60m)	m		
5	115mm dia DTH hole (of length min 30m)	m		
6	Procurement and installation of interwoven wire-mesh/ chain link of 50 mm x 3 mm wire thickness in shotcrete or rock bolts excluding cost of shotcrete and rock bolts.	Sq. m		
7	Fibre reinforced Shotcrete 100 mm thickness (underground) including all material	Sq. m		
8	Fibre reinforced Shotcrete 50 mm thickness (underground) including all material	Sq. m		
9	Cable bolting in underground including drilling of 57mm dia upper holes at various angles of 20 mm thickness wire rope of varying length from 8m to 15m including supply of cable, breather and charging tubes, resin or cement, chemical, drilling of hole and insertion of cable bolt and fixing.	Per m		
10	RCC M 25 (including cost of reinforcement steel)	cum		
11	PCC M 20	cum		
12	Miscellaneous excavations	cum		
13	Procurement & Installation of pipes in the 2 nd outlet shaft and extension at each inset/ level with reducer ,valveand water trap drive as per the approved drawing including cost of fastners and packing .			
13.1	MS flanged pipes 300mm with corrosion free paint . 300m	m		
13.2	MS flanged pipes 100mm with corrosion proof paint .400m	m		
13.3	GI flanged pipes 100 mm , 800m	m		
13.4	GI flanged pipes 75 mm 800m	m		
13.5	MS Pipe 200mm tube thickness 5.9 mm plain end	m		
13.6	MS Pipe 150mm tube thickness 5.4 mm plain end	m		
13.7	GI Pipe 100 mm C class plain end	m		
13.8	GI Pipe 50mm C class with socket,	m		
13.9	HDPE Pipe 63 mm	m		
	Sub Total-Open Items			
Bidder to take a note of supply of above items as per HCL notified rates which shall be given during prebid meeting to be held before bid submission.				

VOL - II

INTENT OF SPECIFICATION

Hindustan Copper Limited (HCL), a public sector undertaking under the administrative control of the Ministry of Mines, Government of India, was incorporated on November 09, 1967. It is the only vertically integrated copper producing company in India with presence in mining, beneficiation, smelting, refining and downstream saleable product

HCL has decided to develop an 1.5 Mtpa underground mine at Chapri at Indian Copper Complex (ICC), Singhbhum district Jharkhand. The major facilities to be developed / installed are decline development upto 6th level, underground development upto 6th level, widening & deepening of existing eastern shaft alongwith commissioning of men & material winding system , electrical substation at surface and underground substations, UG pumping station at 2 L, 4L & 6 L and Compressor house at surface etc

Successful bidder will be appointed for five years and his scope shall also include production from stopes in addition to underground development.

The tentative quantity of ore (Minimum Cu - 0.85%) generation is given below:

Year	Ore from Development (tonnes)	Ore from Stopping (tonnes)	Total (tonnes)
Year 1	5200	0	5200
Year 2	136740	0	136740
Year 3	178672	171000	349672
Year 4	148152	249500	397652
Year 5	94556	249500	344056
Total	563320	670000	1233320

The ore produced during development & from stopes shall be transported to existing Mosabani Concentrator plant located at a distance of 18 km for further beneficiation. The coarser slimes shall be taken back to Chapri for backfilling in voids generated in stopes. Waste rock produced from decline development and other underground development shall be dumped to specified dumping yard at surface initially. When the stopping operation commences the waste rock produced from development shall be dumped to underground voids to the extent possible.

Brief Description of Chapri Project

Chapri copper deposit which falls under the Rakha mining lease of HCL, is located 15.0 km away from Ghatsila Railway station on Howrah – Mumbai main line and about 11 km from Moubhandar Smelter and township of HCL. The mine is well connected by blacktopped road with Kolkata – Ranchi NH No. – 33 (distance from Kolkata about 230 km).

The strike length of Chapri Block is around 1400 m, which starts from Rakha mine from 1600mSE and extends up to 2942mSE. A part of Chapri block has already been mined through Rakha mine. Presently the Rakha mine is flooded upto 1980mSE. The present operation of Chapri will be from 2050mSE to 2934.5mSE. A solid barrier pillar of 70 m is left between flooded Rakha mine (1980mSE) and the proposed Chapri mine development (2050mSE). The strike length of the Chapri block that is considered in this tender is for 884.5m. Chapri block contains the highest content of copper, per metre of strike length, of any of the Singhbhum deposits, including Mosaboni. The copper mineralization is, however, located in several lode structures (Parallel lodes) rather than the major single lode of the Mosaboni Mine.

This part of 884.5m of Chapri block is a virgin block and an underground mine will be developed for a depth of about 400m from surface in final phase. Initially in Phase – I, the mine will be developed and operated upto 6L (i.e. around 200m depth from surface)) through decline from an existing Adit No. 1 at 136.89mRL. Above 2L to surface, the ground of about 40 m will be left as crown. Level intervals have been considered as 35m.

The proposed mine will incorporate latest internationally – accepted mining practices, consistent with Indian condition, and the engineering and geological constraints inherent in the Singhbhum deposits. An optimum level of mechanization can be applied to the working of wide ore zones.

There exist Sideshwar block adjacent to Chapri Block. Sideshwar block falls under Kendadih Lease. It was planned to develop both the blocks together to open a mine namely Chapri-Sideshwar mine, however it has been decided that in the first phase of mine development only the Chapri Block shall be developed and mined. The present tender is for development and operation of Chapri block between a coordinate 2050 mSE to 2934.5 mSE under phase I up to 6 L only.

Chapri copper mine (“Mine”) have about 49.87 Mt @ 1.05 % Cu ore resources as per JORC as on September, 2010. The ore reserve between 2050 mSE to 2934.5 mSE for the part being developed is around 7.38 Mt @ 1.00% Cu. Further depth exploration work is under progress.

The intent of this bidding document is to enable the bidder to submit a detailed comprehensive offer matching the requirements specified in this document for this package.

This technical specification calls for item wise execution of the job as elaborated in Commercial Document enclosed with the NIT and Scope of work as covered in chapter 03 of this Technical Specification (TS).

This item wise technical specification shall be read in conjunction with Volume – I, i.e. commercial specification for development of underground mine at Chapri and production of ore from stopes. The provisions given in these documents shall be complimentary to one another. However, in case of any conflict between the provisions of these documents with respect to technical matter, the provisions in the technical specification will prevail.

The project schedule or contract schedule shall be 60 months excluding 4 (four) months mobilization period from the date of issue of LoI (Letter of Intent).

02**SPECIAL INSTRUCTIONS TO THE BIDDER**

- 02.01 The Bidder may furnish their offer as sole Bidder / consortium basis. Eligibility criteria of the consortium for bidding shall be as per details provided in Volume - I.
- 02.02 Bidder shall carry out work considering latest & state of art mining technology and ensure that major process equipment sizes, model are proven on industrial scale.
- 02.03 Bidder shall collect Site & meteorological information details before submission of offer.
- 02.04 **TEST WORK**
- 02.04.01 Bidders are advised to conduct test works as felt necessary by them before submission of their offer and get satisfied themselves with all possible variances pertaining to soil & geotechnical tests.
- 02.04.02 Bidder to note that no implication on price & schedule, if any, on account of any test results shall be entertained.
- 02.05 The Bidder shall visit and inspect the site and shall satisfy himself of the site conditions and shall collect information which may be required for preparation of offer.
- The Successful Bidder shall bear full responsibility to the nature and conditions under which the work is to be executed, including effect of climate, rainfall etc. No claim for any extra payment shall be entertained due to any special site conditions
- 02.06 Information to be furnished along with offer in addition to those mentioned in relevant chapter but not limited to the following;
- Technical part in the tender document shall be in the order of sequence of chapters of TS (technical part) starting from point no. 04 onwards. The offer shall be complete with technical details, drawings, sketches, design parameters, Performance Guarantee etc. which are necessary for providing clarity of the offered system/ items.
 - Responsibility matrix of consortium members.
 - Foreign personnel supervision Man-months in India for engineering (if any), manufacturer's supervision, supervision at site for erection, testing, commissioning and performance guarantee tests.
 - Bidder shall sign all the pages of this technical specification and shall submit signed filled copy of all data sheet.
 - Bidder to note that deviations will not be accepted in general however, during Pre-bid meeting the bidder can provide specific deviations and exclusion from TS if any (in editable soft copy also) with valid & justified reasons for not adhering to TS for consideration of HCL.
- 02.07 The offer shall be submitted in hard and in soft copy also.

- 02.08 Based on these documents, Bidder to assess and get satisfied about the nature and quantity of work involved and to quote his prices for the above job.
- 02.09 Bidder shall arrange the visit of HCL officials to the plants, for which Bidder claims eligibility, if required, during tendering stage.

03. SCOPE OF WORK, BATTERY LIMITS AND OBLIGATION OF PURCHASER

03.01 SCOPE OF WORK

The broad scope of work on item rate basis of Bidder shall be as per relevant clauses of this specification, commercial documents and respective chapters of the Technical Specification shall be referred to.

All the facilities required for development of underground mine including installation of equipment / plant and meeting underground development and ore production targets of both during development and during production from stopes as stipulated in the tender shall be deemed to be covered in the Technical specification, unless specifically excluded from the Bidder's scope. The scope of work within the consortium partners (if on consortium basis) shall be as per the responsibility matrix, to be attached with the offer.

For timely completion of the project, it has been decided that some of the existing facilities of HCL shall be utilised and are outside the scope of this package. Major such facilities includes mine office, administrative building etc.

The broad scope of work of the Bidder shall include but not limited to the following as elaborated in various clauses:

Broad Scope of Work of Bidder

03.01.01 Dewatering of existing waterlogged working of Chapri block

There exists small length of old working done by M/s MECL. Three Adits were developed, Adit No.1 at 136.89mRL, Adit No.2 at 148.59mRL and Adit No. 3 at 147mRL, along with horizontal developments of 810m at 124.68mRL. There are two short winzes connecting the Adit No.2 and Adit No. 1 with the horizontal development at 124.68mRL. A vertical shaft of 52 m depth at the southern end from 178mRL to 126mRL (Roof of the drive) with a size of 1.5mx 3.0 m was sunk in the Chapri block. Presently this part of the old excavation is water logged. The entire quantity of water present in old working of Chapri is to be dewatered first before taking up any mine development activity. The approximate estimated quantity of water is around 7000 m³; however, bidder's scope shall include dewatering of the entire quantity of water present irrespective of the indicative water quantity mentioned here.

03.01.02 Design & Engineering

Design & Engineering of various facilities including shaft sinking, furnishing, winding system, decline & mine development, water handling, electrical system etc. covering all items as per price schedule. Bidder to note that construction / execution works shall be carried after taking approval of design & construction drawings from HCL.

03.01.03 Decline drivage

A decline of 1 in 7 gradient having dimension 5.5m X 4.5m shall be driven from surface Adit No 1 (+136.89mRL) to below 6L (-50mRL). In the present contract mine development upto 6L (-44mRL) have been considered through decline. The decline construction shall include construction of RCC portal of 6m length at 1 in 7 upwards and then 15 m decline development at gradient 1 in 7 upwards and then driveage of decline at gradient 1 in 7 downwards .(This is done as precautionary measure to avoid water going down through the decline in case of heavy rain.). The driveage of decline shall be through mechanised trackless method using drill jumbos, LHD & LPDT. The decline has been proposed in the footwall of the extreme footwall lode.

03.01.04 Underground development

Underground development of various levels shall be done through decline. Reduced levels for various levels are as below:

Surface RL at Decline mouth	+136.89 mRL
2 nd Level	+100 mRL
3 rd Level	+55 mRL
4 th Level	+26 mRL
5 th Level	-9 mRL
6 th Level	-44 mRL

There are total 4 lodes namely 5 lode, 6 lode, 7 lode and 8 lode in the Chapri block. The No.5 lode being the footwall most lode. The cross cut from the decline will intersect all the lodes from 2nd L to 6th L. All the individual lodes will be developed at 2nd L, 3rd L and 4th L and only 6th Lode will be developed at 5th L and 6th L. Stope preparation has to be done in a manner to start production from 4th L starting from the hangwall most lode. For cut & fill stopes it will be double lift that is starting from 4th L and moving up to 2nd L. For Room &

Pillar stope it will be from level to level. Underground development shall include the following:

- (i) Development of cross-cut from decline to intersect each lode at each level
- (ii) Drive development in ore
- (iii) Foot wall drive development in waste rock
- (iv) Ramp from main level to Sill drive
- (v) Ore pass by drop raises
- (vi) Cross-cut in ore to Ore pass in footwall
- (vii) Drop raises for ventilation from surface
- (viii) Incline raises for stopes

The waste rock generated during decline development and other underground development shall be stacked at surface at specified dumping yard or as directed by EIC. However ore generated during underground development shall be dumped to the 500T ore bin constructed at surface.

03.01.05 Stripping / widening, Deepening and Equipping of Eastern Shaft (2nd Outlet) and provision of winding system, waste pass along with exhaust ventilation fan and Ladder Way.

Existing eastern shaft (Top RL +178 mRL) will be used for return air way, second out let and waste rock hoisting. The approximate dimension of the existing eastern shaft is 1.5m X 3m and existing depth is 52m (i.e. upto 126 mRL). To use the shaft as return airway, second outlet and for waste rock hoisting, following activities have been proposed to be done:

- The entire length of the shaft shall be stripped/widened to 6.1m unfinished dia. RCC lining of 300mm thickness shall be done in the shaft from surface to 25m depth. Below RCC lining, PCC lining of 300mm thickness shall be done for the remaining depth to get a 5.5m finished diameter shaft. Rock bolting with 1.8 m length, 20mm diameter tor steel grouted with cement capsules to be fixed where ever required depending upon the geological condition of the rock.
- Further deepening/sinking of (6.1m unfinished dia) the shaft shall be done from existing 52 m depth (+124 mRL) to below 6L (-54 mRL) with 10m over run space.
- PCC lining of 300mm thickness of the deepened portion of the shaft to get a finished dia of 5.5m.

- From the decline at 2nd, 3rd, 4th, 5th and 6th level horizon, entry will be made to reach upto 2nd outlet shaft by developing drives.
- Insets are to be developed at 2nd L, 3rd L, 5th L with a size of 6m length x 6.5 m width and 4.5m height. Insets at 4th L and 6th L will be 10m length x 6.5 m width and 4.5 m height.
- A fan drift shall be driven in the shaft.
- A mechanical ventilator of 180 m³/sec shall be installed in the eastern shaft mouth.
- Arrangements for ventilation locking has to be made at the shaft mouth to prevent short circuiting of air
- To use the Eastern Shaft as second outlet and waste rock hoisting it shall be equipped with guide rails, buntions, ladder way, keps etc.
- A Double Drum winder with two single deck cages, suspension gear, complete winding system shall be installed for men/material winding and waste rock hoisting in the eastern shaft. The roof of the cages should be conical
- Provision of mine car/tipping tub loading to the cage at 4th level and 6th level is to be made.
- A separate waste pass by drop raising, size 2.4m x 2.4m, to be developed between 2nd level to 4th level with a finger raise at 3rd L for dumping waste rock at a distance of minimum 50m from the shaft with a chute arrangement to draw the waste rock in to 1.5 MT side tipping mine cars and hoist to surface.
- A similar waste pass, 2.4m x 2.4m size between 4th Level to 6th level to be made by drop raise with a finger raise at 5th L with arrangements of chute at 6th level to draw the waste rock and hoist to surface from 6th Level. The location could be near the waste pass excavated between 2nd to 4th level.

The above arrangements will reduce the load on decline for hoisting waste rock.

03.01.06 Excavation of ventilation raises :

Boundary ventilation system is considered for the Chapri project at the present moment. There will be two intake air and two return air circuit. Decline is one intake air and 2nd outlet is one return circuit. One more intake and one return circuit is to be established. For this two numbers of ventilation raises (Unlined) have been proposed by drop raising with a size of 4.5 m diameter from surface

- (a) One raise from surface to 6th L, which will act as intake airway and located at 2934 mSE within the demarcated area of the mine boundary. The raise will be developed level to level up to 6th L. For coursing the air to the areas of activity necessary ventilation stoppings may have to be erected.
- (b) Another raise from surface to 2nd level at 2050 mSE within the mine boundary and will act as 2nd return air way with a ventilation fan installed at the mouth of the raise at surface in fan

a chamber. The return air will be coursed to 2nd L through level to level raises and cross cuts that would be developed at the north end at 2050 mSE.

- (c) The mouth of the Intake raise has to be collar concreted with RCC for a depth of 15m. To prevent accidental fall, a strong masonry wall is to be constructed for a height of 2.0 m and be covered with expanded fencing material . A fencing around the ventilation shaft is required to be made.
- (d) The mouth of the return air shaft at 2050mSE also needs a collar concrete with 300mm RCC for a length of 15m from surface down. A fan chamber to be made for fixing the 180 m³ fan with evasy and with all electricals.

03.01.07 Production of ore from stopes :

The method of stoping depends on the lode width for these type of deposits.

For lode width upto 3.0 m Room & Pillar method of mining is practiced.

For lode width 3.0 m to 6.0 m Horizontal Cut and Fill method is practiced.

For lode widths above 6.0 m Post & Pillar method of mining is practiced.

Room & Pillar stopes: Production of ore from Room & Pillar stopes starts by stripping the raise which is through to the upper level by widening to 7.5 m width on either side of the raise. A sill pillar of 5m above the lower level and a crown pillar of 3m below the upper level are left as support. Between the two Room & Pillar stope a pillar of 3m thickness is left all through between the upper to lower level. Rock bolting the roof in a staggered pattern of 1.2m x 1.2 using 20mm dia tor steel of 1.5 m long rock bolts and grouted with cement capsules or cement grouting using grouting gun. After widening the ore left in the footwall is drilled and blasted till the footwall contact is exposed. The job includes drilling, blasting, loose dressing mucking by scrapper and dumping of ore to box hole raises provided with chute for loading to LPDT and transport through decline and discharge to surface ore bin. It also includes pipe fitting, drainage system, extension of pipe line, installation of auxiliary ventilation fans, extension of ducting for ventilation, compressed air and water pipe line as and wherever required. Erection of any additional support as and when required. Once mining is over these voids to be filled with waste rock generated or by mill tailings after closing the openings of the stope at the bottom.

Horizontal Cut & Fill Stope: The stoping is started by driving a Ramp 1 in 7 up to reach the Sill level height of 5 m above the main lower level ore drive. The ramp is provided to speed up the sill development and will be used only for the 1st cut. Later prior to filling, the ramp is closed with retaining wall and decantation pipe. The Sill drive driven will hole through the two terminal raises of the stope block, and widened to full width of the ore body

and heightened to maximum 4.8 m. The hanging wall and the roof is supported by rock bolts at 1.5m x 1.5 m staggered pattern. Cable bolting is done depending upon the ground condition. The stope strike length is divided into two panels of maximum 100 m. Two terminal raises are there to provide entry and exit from the stope . Each panel has to have at least one entry from top and one from bottom level. When one panel is heightened to 4.8 m it is to get ready for tailing filling. For this decantation pipe lines are to be laid on the floor of the void panel with hessian cloth, extension of steel ore pass rings and commence filling. Filling is done up to a height 2.4m below the roof. When one panel is under filling the other panel is under drilling, blasting and mucking. Production of ore from Horizontal Cut & Fill stopes is done by making an excavation in the roof for a height of 4.8 m and then horizontal holes are drilled and blasted standing on the muck pile. Stopping includes drilling, blasting, mucking the blasted ore using LHD and dumping into ore pass in the stope, loading to LPDT and transportation and discharge to surface ore bin. Equipping of service raise cum man way with ladder way with hand posts., illumination in man ways, stopping areas and at specified locations. Stope void filling including transportation of tailings from Mosabani plant and dispose off into a surface bunker. From the bunker by mixing the tailing with water and passing through boreholes and pipes to the stope voids complete in all respect as directed by the Engineer-in-Charge or his authorized representative. It also includes pipe fitting, drainage system, extension of pipe line, installation of auxiliary ventilation fans, extension of ducting for ventilation, compressed air and water pipe line as and wherever required. Erection of any additional support as and when required.

Post and Pillar method of mining.

This method of cut & fill mining is practiced when the lode width is more than 6.0 m wide. and strike length more than 80m. A ramp is excavated to reach the Sill level 10m above the lower starting level. The ramp is provided to develop the sill level and up to 1st cut using drill jumbos, LHD, LPDT. However the ramp is not continued further and the mouth of the ramp will be sealed before filling starts. Later only the Electric LHD is expected to be in the stope. Basically it is identical to Horizontal Cut and fill method except for the formation of 4mx4m in-situ vertical pillars to give additional support to the roof by breaking the long spans excavated. The pillars are formed every 13m along strike and 9 m across. Support includes rock bolting of the hangwall, roof and the pillars. Cable bolting is done as an additional precaution in bad grounds. Here blast holes of 2.4m to 3m length, 32-41mm diameter are drilled upwards at an angle of 75⁰ to 80⁰ and blasted using ANFO with booster cartridge and electric delay detonators. Minimum one ore pass in each panel is required. Ore pass is excavated in waste rock generally by drop raising from level to level, away from the footwall contact of the ore body at 70⁰ - 75⁰ inclination. Approach from the panel level is

made by driving a cross cut and holing to the ore pass raise. Rest of the job are all of those mentioned in Horizontal Cut and fill mining method.

The tentative quantity of ore (Min Cu - 0.85% shall be considered as ore) generation is given below Year	Ore from Development (tonnes)	Ore from Stoping (tonnes)	Total (tonnes)
Year 1	5200	0	5200
Year 2	136740	0	136740
Year 3	178672	171000	349672
Year 4	148152	249500	397652
Year 5	94556	249500	344056
Total	563320	670000	1233320

03.01.08 Supply of different items / equipments, their erection & commissioning shall be carried out by bidder as per TS and price schedule.

03.01.09 Underground definition drilling

Underground definition drilling, logging, sampling & analysis (Cu%) of AX Size (1 3/8") coring of maximum length of 250 meter in any direction as described in price schedule. Channel sampling in back and footwall side at every cut at 3m interval at cut & fill stopes. In R&P stope face sampling at 3 meters apart from roof to floor.

03.01.10 250m³ (Live capacity) ore Bin, Grizzly with 0.30m X 0.30m Opening, Bin Lining & Rock Breaker

LPDT will dump the ore over the grizzly over the ore bin located on the hill slope so that drawing of the ore from chute of the bin will be at the decline level at 137mRL. The oversize retained at the surface grizzly will be crushed by rock breaker installed above Ore bin in the grizzly section. The grizzly undersize material will be collected by truck and dispatch to Mosabani concentrator at a distance of 18kms from Chapri after weighment in weigh bridge.

03.01.11 Ore transportation from ore bin at mines to Mosabani concentrator plant

The ore generated during development of ore drive, raises and stoping activities shall be hauled to surface through decline and dumped to surface ore bin using LPDT of adequate size. From ore bin the ore shall be transported to stock pile at Mosabani concentrator plant by truck which is around 18 Km away from the mine. The return trip should bring the classified mill tailing from Mosabani concentrator site to Chapri tailing pad.

03.01.12 Supply, erection and commissioning of following electrical facilities

(i) Surface substation

Incoming power shall be tapped from 33kV outgoing terminal of JSEB metering station. Further power shall be distributed to downstream load centers through 33/3.3kV, 1x5MVA ONAN transformer using 3.3kV VCB AIS switchboard and outdoor switchyard bay for 5MVA incomer comprising of Isolator, LA, CT, PT, VCB, Conductor, clamp and connector.

Spare space shall be kept for future provision of another 33kV outdoor bay for 5MVA transformer.

(ii) Underground Substation

Underground Electrical Sub-stations have been proposed at 4L and 6L of 3.3 KV having fifteen terminal points at each level with other auxiliary devices for safety and protection of circuit with metering arrangement and outgoing cables

03.01.13 Mine dewatering system

Construction of sumps at 2nd level 4th Level and 6th Level. Installation of suitable pumps along with the sumps to handle 2126 m³ of water per day.

03.01.14 Construction of various civil and industrial buildings viz. Substation, compressor house, winder house, fan house etc.

03.01.15 The successful bidder's Scope of Work shall also include all the obligations covered in various parts of "Instructions to contractors", "General Conditions", "Special Conditions" and will interalia include the following:

- a) Design, construction, fabrication, supply, transportation to site, receipt at site

including handling & storage of all mining, civil, structural, mechanical, electrical, pollution control, equipments, water supply, sewage disposal, drainage etc. including other items will be responsibility of the selected bidder. The Scope of Work shall also include bringing in and/ or procurement and/ or deployment of new equipment and/ or plant & machinery as well as replacement of existing equipment as required. Financing of the replacement equipment shall also be the responsibility of the successful bidder for items not covered in BOQ enclosed with TS.

- b) All equipments installed as part of BOQ and owned by HCL can be used during the contracted period by successful bidder, however, the same will be handed over to HCL in properly maintained condition by replacing the wear & tear component by new items ensuring it to have further residual life of minimum 60% as compared to new item

Installation, commissioning, maintenance and operation of all equipment and/ or plant & machinery in the mine shall be the responsibility of the bidder notwithstanding whether deployed by the bidder or by HCL. The successful bidder shall arrange supply of spare parts for equipment till its rated life or till hand over of the same to HCL management after the end of contractual period in working and properly maintained condition, whichever is later.03.02 All equipment, manpower and consumables required for executing the work shall be procured/arranged by the successful bidder at his own cost. The successful bidder shall arrange for drilling, blasting, mucking and hauling for Mine Development and Ore production both (initial procured equipment should not be older than 2017 make and its fleet capacity should match with the target, subsequent procurements to match with the enhanced target shall also be with the new equipment only). Maintenance and procurement of all other equipment essential for their operation, maintenance and procurement of drilling accessories, spare parts and all other consumables shall be responsibility of successful bidder only. Cap lamps along with charger, racks and safety wears will also be the responsibility of the successful bidder.

03.03 The successful bidder shall submit the list of manpower separately for Ore Production and Mine Development including other activities before start of the work to the Engineer-in-Charge. The Engineer-in-Charge shall allow for the work upon his satisfaction to the sufficiency of the manpower.

03.04 Procurement of all machineries, transportation of the machineries at site, materials, tools and tackles etc. required for maintenance of equipment will be arranged by the successful

bidder at his own cost. Also any other or additional equipment, tools or facilities required for execution of the work under contract will have to be arranged by the successful bidder at his own cost.

- 03.05 Installation & Maintenance of Rock Breaker, grizzly and track for Ore production shall be the responsibility of the successful bidder.
- 03.06 Successful Bidder has to fulfill the entire statutory requirement and has to carry out the work as stipulated under various rules framed by DGMS and any special conditions imposed by DGMS for safety of the work persons and work place.
- 03.07 Work shop facility required at each main level will have to be created by the Successful Bidder and the extra excavation required for this purpose will have to be done by the contractor. The rates shall be included in the decline & mine development.
- 03.08 **Ventilation:** It shall be successful bidder's responsibility to keep his working area well ventilated to ensure an adequate supply of air to within 4.5 metres of the face or blind end as per statutory standards applicable and make his own arrangement for procurement and maintenance of equipments like ducts, auxiliary fans or suitable mechanical appliances, electric cables, starters, ACB/VCB, switches etc (complying to CERA-2010) for proper coursing of air.
- Successful Bidder shall arrange for regular inspection of all the areas to check proper ventilation at different workings as per statutory standards and submit the report to the Engineer-in-charge. Conducting periodical statutory ventilation survey in the area shall also be the responsibility of the successful bidder. The successful bidder shall maintain records of such survey and get countersigned by the Mines Manager.
- 03.09 The successful bidder at his own cost should arrange all the essential inputs required for operation/maintenance of Equipments except mention in free supply by HCL.
- 03.10 The successful bidder shall ensure safe working of Men & Machinery and the company shall in no way be held responsible for any damage/loss/accident etc. of any type and/or reason including blasting operations.
- 03.11 The successful bidder shall be liable to pay for any damage caused to the HCL's Equipment etc. due to negligence of his employees. HCL reserves the right to deduct amount of such

damages caused by the successful bidder or his employees to HCL's equipment from Security Deposit lying with HCL/ running bills at that time.

- 03.12 Working hours shall be on 3 shifts of 8 hours per day, 6 days a week shall be followed. Total working days per month shall be the days in a month except Sunday and paid holidays. In case the successful bidder wants to work 7 days a week permission before hand has to be obtained in writing from the Engineer-In-Charge and Mine Manager. As per Mines Act and Mines Rule all obligatory leave procedures must be followed for all persons employed.
- 03.11 The successful bidder should comply with all the statutory provisions as per MMR 1961 during the period of work and maintain records under the said regulation.
- 03.12 The successful bidder shall not be entitled to any additional cost on account of shifting of equipment from one place to another place.
- 03.13 The successful bidder should employ only skilled, qualified, experienced and authorized manpower for operation and maintenance of Equipment. In case of newly appointed manpower, they should undergo Vocational Training, and other requirements as per mining regulations and as per statute for working in mines.
- 03.14 The successful bidder should conduct & provide details regarding expected Occupational & Safety Hazards. Protective measures for Occupational Safety & Health hazards so that such exposure can be kept within permissible exposure level so as to protect health of workers with special reference to Occupational Health. Plan of exposure specific health status evaluation of workers; pre placement and periodical health status of workers; plan of evaluation of health of workers by pre designed format, chest x ray, Audiometry, Spirometry Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations and plan of monthly and yearly report of the health status of workers with special reference to Occupational Health and Safety. The standard set will be as prescribed by the latest Conference(s) on Safety in Mines.
- 03.15 Power Supply, Illumination & communication: The successful bidder will have to arrange power for carrying out its operation. Illumination and communication will also have to be arranged by the successful bidder of its own. Bidder can draw power from the substations installed under this package by bidder on chargeable basis.
- 03.16 The contractor shall make economic use of water and shall reuse the industrial water by re-

circulating it in a close conduit.

03.17 It should not allow any spillage of tailing out of the prescribed area of storage/ usage.
In case of such eventuality he has to forthwith address the same and clear the area. The Contractor has to indemnify HCL against any damage/ loss/ claim of compensation from the local villagers/ authorities.

03.18 The Contractor shall not violate the Indian Explosives Act and rules framed there under. Any penalties levied on HCL due to misuse/non permitted use will be recovered from the contractor with a minimum of 10% penalty due to such negligence.

03.19 Operation and maintenance of equipment

The Contractor shall be responsible for operation, maintenance and repairs of all equipment, tools and tackles used by the Contractor whether belonging to HCL or the Contractor's own except where express responsibility is undertaken by HCL. The operators/drivers of the equipment, wherever required, shall be as per the statutory requirements.

03.20 Safety aspects to be observed by the successful bidder: Special precautions should be taken while deploying workers in the mine. Before employing any labour to the mine proper vocational training should be imparted and all rules and regulations in that regard should be strictly followed and shall ensure that:

- No person/vehicle shall be deployed at any place other than authorized place. All workers should obey lawful instructions of mine management. All vehicles should possess the fitness certificate and fitted with audio visual alarm and will be subjected to mandatory statutory tests/examination.
- All drivers shall obey systematic traffic rules prepared by management.

Before deployment of the workers, they must be trained and briefed about safety aspects in a mine. However during course of execution of the work, if any accident occurs whether major or minor, the matter shall have to be immediately informed to mine management so that Notices of accidents in accordance of the statutes (Reg. 9 of MMR 1961) be given and other necessary steps may be taken in accordance the Mines Act 1952 and other relevant laws.

The successful bidder shall see that his workmen are strictly following the provision of safety rules and are using the safety equipments provided by the successful bidder. In case the successful bidder fails to provide the safety equipments to workers, the same shall be

supplied by HCL and the cost thereof shall be recovered from the bills of successful bidder. Safe operating practices should be framed for all the jobs required in executing the work.

- 03.20 **Security:** Successful bidder will be allowed to engage Security & supervisory manpower, at their own terms having no liability on HCL as already mentioned in the scope of work.

The successful bidder has to arrange its own Security at the work site for guarding HCL's/Contractor's equipment, mined copper ore etc. The necessary cost and salary & wages for such Security Guards are to be borne by the Successful bidder and shall be covered in his quoted rate.

The Successful bidder shall be responsible for internal security within the mine site and shall adhere to HCL's security regulations as may be notified to the Successful bidder.

- 03.21 The successful bidder shall use its best endeavors to ensure that un-authorized persons do not enter the sites.

The Successful bidder shall take all precautions to prevent break out of fire of any nature in the place or in the vicinity of his operations. He shall be responsible for all damages due to fire directly or indirectly attributable to his own activities or those of his sub contractors. Fire hydrant must be installed in strategic locations which should be connected to the underground pumping line and also connected to the surface water tank.

The Successful bidder shall erect and maintain fencing and barricades required in connection with his operation to guard or protect sites of work and safety of public.

- 03.22 **Supply of Materials/Consumables:** The successful bidder shall at his own expense, provide all Stores, Spares materials & consumables, required for the work unless specifically mentioned otherwise and rate quoted by the contractor shall be for the finished work inclusive of all materials, consumables, spares etc. required for completion of the work as well as maintenance of equipment deployed for the work as specified in the contract.

Bidder to note that open items as per enclosed Annexure 01 have to be supplied by successful bidder at HCL notified rates.

- 03.23 **Statutory Personnel:** The services of Mines Manager, Safety Officer, Ventilation officer, Training Officer, Mine engineer (both Mechanical & Electrical), Geologist, Welfare Officer

etc. shall be provided by HCL. The Contractor shall deploy its own statutorily qualified staff that will be duly authorized by Mine Manager in respect of their area and nature of work. The contractor's statutory staff will be directly paid by HCL, amount of which shall be recoverable from the Contractor's running bills. However this manpower will have no legal right to the employment in HCL during the contract or after the expiry of the term of the agreement. The contractor's officers and staff will work in close coordination with HCL's officials and particularly in respect of safety; they have to work under the guidance of Mine Manager and his other statutory staff. The successful bidder is also required to deploy all other statutory personnel as required under the statute.

- a) 1st class Mining engineer
- b) 2nd class Mining engineer
- c) Mine Foreman
- d) Mining Mate
- e) Short firer/ blaster
- f) Winding engine driver (1st & 2nd Class)- as per requirement
- g) Mechanical Engineer & Foremen
- h) Electrical Engineer & Supervisors
- i) Geologist
- j) HR/ Welfare Officer
- k) Training Officer, Instructors and Trainers
- l) Adequate number of First Aid trained personnel
- m) Site Dispensary with Doctor, Nurse & Para Medical Staff
- n) Rescue trained persons
- o) Other competent persons as required by the Indian Laws

Site Project Manager and other personnel of the successful bidder: The successful bidder shall keep during the period of agreement a competent Project manager at the work sites and other necessary suitable and qualified personnel for smooth execution of work. The successful bidder shall employ only competent, skillful and orderly men to do the work. The Mines Manager/Mines Agent/In-charge/any executive nominated by HCL shall have right to ask the successful bidder to remove from work site any person of the successful bidder whose presence, in his opinion, is undesirable and the successful bidder will have to remove him within three hours of such orders. In extreme cases, HCL may ask successful bidder to permanently debar undesirable person from entering in the premises of HCL including all leases and working places.

03.24 Pollution Control Measures: The successful bidder has to take adequate pollution control measures to prevent pollution in and around the working area arising out of the different workings / operation of machineries.

03.25 Battery Limits

The table given below will be referred to major battery limits

Table 03.01

Sl. No.	Item	Description
A.	INCOMING	
1.	Ore Produced during UG development & Stoping	All ore produced in development and stoping operation will be hauled to surface ore bin and from there it will be transported to Mosabani feed stockyard by dumpers.
	Waste rock produced during development	All the waste rock produced after development will be hauled to surface and dumped to the specified dump yard within distance of 1km of decline portal
2.	Utilities:	
	Water	<p>Indicative details make-up water, drinking water and fire water are given below:</p> <ul style="list-style-type: none"> Industrial quality requirement will be met from water generated / pumped from the underground 2L, 4L & 6L pumping stations. Additional water, if required shall be arranged by bidder. Fire Hydrant water, if required shall also used from the water generated from underground development Drinking Water shall be arranged by bidder through tankers. Bidder shall arrange sufficient quantity of water to meet the drinking and other statutory requirements of entire mining complex.
		In tapping points of water (make up and drinking) magnetic type flow meter along with isolation & by-pass valve shall be provided by Bidder.

Sl. No.	Item	Description
3.	HT LT Power	<ul style="list-style-type: none"> • Tapping of HT power from HCL indicated source • L T power in bidder scope <p>Bidder has to refer electrical part of TS of power distribution scheme for detail scope of TS</p>
4.	Compressed air	Bidder can use the compressors covered in this BOQ for meeting up their industrial compressed air requirement. Bidder shall only consider only operation & maintenance cost pertaining to compressors.
5.	Explosives & detonators	Bidder shall receive the same at existing magazine and transportation from magazine to Chapri shall be under the scope of bidder. Bidder shall comply to required statutes for storage & transportation of explosives
6.	Slimes	Bidder has to transport the deslimed tailings generated at Mosabani to meet the back filling requirements of the voids generated during stoping.
7.	Roads	Bidder shall develop roads to meet their transportation requirements of ore and returning back of slimes. The cost of such road construction will be included in the development cost

03.03 OBLIGATIONS OF PURCHASER

03.03.01 Purchaser shall supply raw materials and above services/utilities at the battery limits as mentioned above in accordance to clauses mentioned in Vol-1 i.e. commercial document for this tender

04 TECHNICAL SPECIFICATION

04.01 General

This Technical specification shall be read in conjunction with other relevant tender documents.

The mining & technical parameters of mines & equipments are based on available data and may be treated as a guideline. Bidder may required conduct test works to select and indicate their best parameter which shall be energy efficient, environmental friendly and will ensure trouble free operation. Sizing and capacity of facilities indicated in the respective section may be considered as minimum.

The preferred make for different supply items have been given in respective chapters. Bidder to note that wherever, preferred make is not mention, bidder shall follow HCL approved make or shall take HCL prior approval before ordering & supply.

Bidder shall refer respective TS chapters for detailed specification

04.02 Equipment Specification :

The selection of equipments for development and production will be based on the development and stoping need.

Development:

The Decline is expected to give an average monthly progress of 70 m, working three shifts a day, working with Electro hydraulic drill jumbo, LHD & LPDT. The drives and cross cut with three faces should give an average of 250m per month. The equipments for these needs to be trackless diesel equipments.

The drop raising has been assumed with 115mm diameter hole. The manual raising for has been assumed as 30m per month using jack hammer mounted on pusher legs and scrapping the blasted ore to the chute by Electric 50-60 HP scrapers .

Stoping:

For Sill development by Electro Hydraulic Drill Jumbo, Electric LHD is considered. For stoping Electric LHD. For Production holes a two boom wagon drill mounted on tire, capable of drilling 32-41 mm diameter upper holes. Jack hammer on pusher leg for other purposes. Cable bolt to be drilled with drifter machine capable of drilling 51 to 64mm

diameter holes from 6m to 25m length at angle varying from 45⁰ to 130⁰ in the roof of post pillar stopes.

Track laying : The mine tubs that are to be used are 1.5 MT capacity side tipping mine cars with 0.60m wheel base. The cages should be designed to hoist these mine tubs with waste rock from 4th and 6th Level. The track rails will be 15 kg/m with 0.6m track gauge.

Scraper for Room and Pillar stopes/ manual raise – 50-60 hp double drum electric hoist.

Rated capacity of the process equipments shall be so selected that the design capacity of each of the process equipment shall be minimum 15% more over and above the rated capacity.

Standardization of size & capacity of different critical equipment have to be done to maintain common inventory and for ease in day to day operations.

Besides equipment, complete electrics, automation, instruments & control, consumables like lubricants, and heat insulation materials, valves & fittings, installation accessories, interconnections, stairs, connecting platforms, railings, monorails etc. shall also be included in scope for smooth operation of the equipment individually & integrally with associated systems and equipment.

The success bidder has to give the details of equipments like LHD, LPDT, Drill Jumbo etc. to the Engineer in charge of HCL for obtaining approval from DGMS.

04.01 MINING

04.01.01 conceptual scheme for development of the mine

The lease boundary of Rakha Mining lease comprising of Chapri Block is up to 2942 mSE. (The coordinate is taken from the Main Incline Shaft of Rakha Mine which is '00' coordinate) Leaving 7.5 m as common boundary, mining in Chapri block will be done up to 2934.5mSE. The Chapri block starts from 1600mSE to 2942mSE, a strike length of 1342m. A part of the Chapri block from 1600mSE to 1980mSE, that is about 380 m in strike length has been mined from Rakha mine. Presently the Rakha Mine along with this part of Chapri block is flooded upto 1980mSE coordinate. A barrier pillar of 70 m is being left from flooded Rakha Mine from coordinate 1980mSE to 2050mSE. The present contract

for development of Chapri will be from 2050mSE to 2934.5mSE that is for a strike length of 884.5 m leaving 7.5 m as barrier from 2942 mSE.

By doing this the Chapri will be totally delinked from flooded Rakha mine and opening of the Chapri will not be dependent on the Rakha mine dewatering. In phase-I the mine shall be developed by Decline only. The Production shaft will come up in Phase-II only after dewatering the Rakha flooded mine, since the proposed location of the vertical shaft is situated in flooded Chapri area mined from Rakha mine. The decline will allow early exploitation of the deposit leading to early production. As a 2nd outlet a vertical shaft will be excavated of 5.5 m diameter equipped with an Electric Double Drum winder with man & material hoisting provisions, from the existing ventilation shaft of 1.5mx 3.0m which is 52m depth from surface known as Eastern ventilation shaft at 2700mSE.

Chapri block has about 90 % of the ore reserve between 4m to 25 m wide ore body with around 0.85-1% Cu, dipping at 25 to 35 degree, and suitable for Cut & Fill mining as practiced in other mines of ICC group of mines. The minable tonnage available within the 884.5 m strike length between 2L to 4L for all the lodes is around 5.67 Mt @ 0.98% Cu and that between 4L to 6L for the 6th lode being developed is around 1.71 Mt @ 1.06% Cu. Total 7.38Mt at 1.00% Cu.

Trackless mining is proposed with LPDT hauling the ore to surface through the decline. This block has also about 10 % of tonnage from narrow ore bodies less than 3m, to be mined by labor intensive Room & Pillar method of stoping using electric scrapper to bring the blasted muck out from the stope. Modification has been made in collecting the broken ore from the stope in to LPDT (Instead of filling into track mounted mine car). Total 32 nos of raises have been planned to be developed as Room & Pillar stopes. These raises will also help in ventilating the development headings at the time of level developments. All the lodes are having certain stretches of areas where the lode width is less than 3.0m and room & pillar method of mining is to be adopted.

The entry to the mine will be through a decline which will be developed from Adit No.1 (136.89 mRL), earlier excavated by MECL while doing exploratory mining. The decline shall be located in the footwall of all lodes and will be around 30 m from the footwall contact from the nearest 5th lode. The decline will act as main entry and exit to the mine in addition to main air intake route for the mine. The 2nd outlet shaft can be used for waste rock hoisting and also other materials to reduce load on the decline, besides being a return airway in south.

The decline will be arched shaped of size 5.5m width x 4.5m height, developed at 1 in 7 gradient. The sides of the decline shall be of 4.0 m height and center will be of 4.5m height. It is proposed to develop the decline with upward gradient (1 in 7) for initial 6m for the Portal length & then 15 m of the decline length and then downward gradient (1 in 7) for the remaining length. This is done as a precautionary measure to guard against any water going down the decline during heavy rains.

The present project is for the first phase of mine development and operation of Chapri mine. In this phase mine development and operation shall be limited upto 6th level using decline. The surface has a valley between two hillocks forming a seasonal nallah. A crown pillar with minimum thickness of 40 meter will be left from the lowest point at surface to the roof of underground at 2nd Level. Mining will be from 6th level to the 2nd level horizon at 100mRL.

There are 4 parallel lodes starting from hanging wall side as lode No 8, 7, 6, and 5 with waste parting of varied thickness between the lodes. Stopping will progress from hangwall lode to footwall lode. However if the parting is sufficient from safety point of view, other lode mining can be taken up simultaneously after obtaining stopping permission from DGMS. In Phase-I, mine development by cross cut to intersect all the 4 lodes will be taken up from decline from 2nd level to 6th level. For stopping purpose all the lodes from 2nd level to 4th level will be explored for stoppe preparation. At 5th level and 6th level only Lode No. 6 will be developed and made ready for stopping. .

Stopping will start from 4th level and progress to 2nd level (double lift) in case of cut and fill stopping method, and leave a crown pillar of 5 m to protect the 2nd level. Mining will be level to level (single lift) for room and pillar stopping method.

The 2nd outlet of this mine will be through the old existing Eastern Shaft at 178mRL, which is approx 1.5m x 3m cross section and has been sunk upto 52m depth (126mRL), and holed to an old drive developed by M/s MECL at 124mRL. This will also serve as one of the main return air way. The existing shaft upto 52 m depth will be stripped and widened to 6.1m diameter shaft. Collar concreting with 300 mm RCC will be done from surface to 25m depth. From 25m depth upto 126 mRL, the shaft end will be lined with 300mm PCC to get all through 5.5 m finished diameter shaft. From 126mRL, deepening by shaft sinking will be done with 6.1 m diameter upto (-) 54mRL, (i.e. 10 m below 6th level at (-) 44mRL). From 126mRL to (-) 54 mRL the shaft will be lined with 300 mm PCC to obtain a finished diameter of 5.5m.

It has been proposed to use the Eastern shaft for waste rock hoisting and as a second outlet. Hence the eastern shaft shall be equipped with an electric Double Drum winder (with two cages) with complete winding system installed for men/material/waste rock winding. For waste rock hoisting provision of loading of 1.5 ton side tipping tubs/ mine car shall be made in the cage. Waste rock loading arrangement shall be made on 4th level and 6th level. The shaft will have a ladder way compartment completely fenced from the cage compartment. Ladder way sollars will be fixed every 6m apart with perforated platform. Strong construction iron ladders to be fixed between the sollars at a inclination not more than 80° from horizontal with the ladder being extended 1m above each solar and at surface. Buntions for guide rails with 30kg/m rail will be fixed on two sides of the shaft, holding the cage on one side with guide shoes. This will allow less air resistance and allow more space in the shaft for lowering materials. Shaft insets will be developed at each level from 2nd L to 6th L and connected to the decline

For waste rock hoisting a drop raise of 2.4 m x 2.4 m is to be developed between 2nd to 4th level with a finger raise at 3rd Level. A chute is to be constructed at 4th Level below the waste pass to load in 1.5 MT side tipping tubs and hoisting to surface. The waste pass will be situated 50m from the 2nd outlet shaft.

A similar ore transfer to be made between 4th Level to 6th L with a finger raise at 5th Level. The location of the waste transfer can be near the waste transfer from 2nd to 4th Level

A ladder way will be established from surface to 6th level. The compressed air lines, pumping pipe lines and other facilities will be taken through this shaft. Buntions and rigid guides shall be installed.

At present the approach road to the eastern shaft is not adequate. The activity of eastern shaft deepening, widening and equipping, construction of winder house etc. shall be commenced after the construction of approach road upto the shaft. Hence it is envisaged that shaft widening and deepening activity shall be commenced in beginning of the 2nd year. Hence 165mm bore hole from surface have been proposed for lay the pumping pipeline, so that till the completion of shaft sinking activity the pumping operation shall continue. Provision of emergency power (in case of power failure during sinking operation) is to be arranged by the contractor.

After initial development and stope preparation, stoping will be taken up both in Cut & Fill stopes and Room & Pillar stopes from 3rd year. The mine will be developed as a trackless mine and stope layouts are planned accordingly for withdrawal of ore.

Cross cut of 4.5m X 4.0m from Decline shall be developed at each levels (2nd L, 3rd L, 4th L, 5th L and 6th L) to intersect all the lodes. This will be followed by development of the drives in different lodes at 2L,3L & 4L. Lode No.6 will be developed at 5th and 6th level only. Stopping operation will start from the hangwall lode. In case the parting between the lodes are sufficient from safety point of view, stoping could start from in-between the lodes.

For mine development diesel LHD and LPDT shall be deployed. For mucking in cut & Fill stopes electric LHD have been proposed. For drilling operation in development faces Jumbo drill shall be deployed. Ore transportation from stopes to Surface ore bin shall be through LPDT.

8th lode is the extreme most hangwall lode, at an approximate distance of 400m from the decline cross cut. Hence for ventilation purpose an intake raise at 2935mSE of 4.5 meter diameter by drop raising has been proposed from surface, within the deforested area up to 6th level. Cross cut will be developed in each levels from 2nd to 6th intersecting all the lodes at 2935mSE coordinate. The drop raises will hole through in to these cross cut. Fresh air will be coursed to the furthest point. These cross cuts developed in each level intersecting all the lodes will be connected to the 2nd outlet shaft and also the decline at each levels. This will serve the purpose of two entries required in each level.

04.01.02 METHOD OF MINING

The plan has been conceptualized based on available surface drill hole data, and the RRA report. Four numbers of prominent parallel lodes are there in Chapri Block. Lodes are separated by partings of waste rock of different thickness. Actual parting will be known after developing the lode and delineating the contacts. The ore body for around 90% of the tonnage is wide more than 3m, has been considered for Cut and fill stoping method with lode varying from 3m to 25 m. Only 10% of the tonnage is narrow width of 2 to 3 mts suitable for Room & Pillar method of stoping. Hence mechanised trackless mining have been proposed to develop the Chapri block.

Decline development will be done with electro-hydraulic jumbo, diesel LHD & LPDT. The expected average advance per month is 70m, with three shift workings. Ore development in exploring the lode is done following the hang wall contact of the ore body. During development the tramming of ore/waste rock shall be trackless using LPDT (around 30T) through decline. Trackless system of mining will enable the development of mine at faster rate and expected monthly progress of 250m per set consisting of one drill jumbo, one LHD and one LPDT with 3 nos of faces per set of equipments. To mechanize Sill development in cut and fill stopes with drill jumbo etc., a ramp from the lower level of the stope, to sill level has been considered at the time of stoping. The Sill level is opened at a height, keeping a 5m solid pillar from the lower level in case of Horizontal cut & fill stope, and 10m solid pillar in case of Post Pillar method. Ramp development will be at a gradient of 1 in 7 upward. The Ramp developed will be paid as per BOQ. Sill development has been considered as a part of stoping and no separate rates are admissible for Sill development. During production from stopes, tramming of ore will be trackless by LPDT from cut & fill stopes as well as from Room & Pillar stopes by slightly modifying the ore loading system in Room & Pillar stopes. The ore will be collected in LPDT and hauled to surface through the decline and will be emptied in surface ore bin. The ore bin will have a Rock breaker and grizzly of 30cms x30cms opening keeping the crusher at Mosaboni in view.

Two basic methods of stoping have been proposed for production of ore in Chapri Block.

1. Cut and Fill and 2. Room and Pillar .

In Cut and fill, two methods based on width of the ore body are practiced, namely

(i) Horizontal Cut & Fill method for ore body width 3m to 6m.

(ii) Post Pillar method of cut & fill for ore body width 6m and above, and

(2) Room & Pillar method for ore body width between 1.5m to 3m with post filling with waste rock or mill tailing.

(i) Horizontal Cut & Fill method is practiced for lode widths 3m to 6m ,where the ore body is fully exposed from hangwall to foot wall . The length of the stopes are generally 80 to 100 m. The stope is divided into two panels . Two end raises are required in a stope . A sill drive is proposed to be developed 5 m above the lower level through a ramp. The sill drive is to be through to the end raises. The size of the sill drive is 3mx3m and later widened to full width of the ore body. A notch is made in the roof in the centre of the

panel and standing on the muck pile horizontal holes are drilled on either side of length 2.4m to 3.0m using jack hammer with pusher legs, making a final height of 4.8m from the floor. Rock bolting with 1.5 m long 20mm dia Tor-steel rock bolts are fixed in the roof at 1.5mx 1.5m staggered pattern is fixed using cement capsules etc. 10 % of the bolts installed should undergo pull test which should not fail at 6MT load. The rock bolting to be done before the blasted muck is removed. Cable bolting is not required in HCF stopes. After a panel is heightened to 4.8m and is empty, preparation of stowing is done. Classified mill tailing is brought to the panel void through bore hole and HDPE pipe lines. Decantation pipe lines are spread at the floor wrapped with hessian cloths and channeled out to lower level through the ore pass rings. The tailing comes from surface tailing and water mixing bunker at 60 tails and 40 water ratio through bore holes and pipes and monitored through telephone lines and persons located at strategic locations. While one panel is under filling, drilling, blasting and mucking goes on from the other panel. Electric LHD is used for tramming the ore to the ore pass. For long run ore passes are made in the footwall away from the footwall contact of the ore body by drop raise level to level excavated at 75-80° inclination. From the panel level cross cut is made from footwall to hole through into the ore pass for dumping the broken ore. The production from these type of stope is about 400 MT per day. To avoid secondary blasting the bottom of the ore pass is kept open, where a LHD could collect and load the LPDT to haul it to surface and broken by the rock breaker installed in surface ore bin. Ventilation of the stope, illumination, air and water pipe lines and general housekeeping will be the responsibility of the successful bidder.

(ii) Post Pillar method is adopted where lode width is above 6m. In Post Pillar method in-situ pillars of 4m x4m are formed every 13m along strike and 9m across strike, to give support to the exposed roof. Here upper drilling is done using double boom stope wagon to drill upper holes of 32-41mm diameter holes at 80 to 85°. explosive used is ANFO with cartridge booster and electric delay detonators. Cable bolting is done in the hang wall and back of the roof, using 20-25mm dia pre-stressed cable, length varying from 10m to 25 m with 57mm dia holes in a grid pattern of 3.5m x 3.5 m. Rest of the operation are all similar to Horizontal Cut & Fill stoping method.

The cut and fill mining will be for double lift operations from 4th level to 2nd level, and 6th level to 4th level. Room and pillar mining will be single lift from level to level. The stope length in cut & fill method is divided into two panels, one panel shall remain under filling and preparation and other panel shall remain under production. Two entries in each panel are made, one from upper level and the other from lower level provided with ladder way.

Ore pass shall be excavated in each panel of C&F stope in footwall in waste rock at about 65 degrees by drop raising. Ore passes in the initial stage of mining is done by making a raise from the ore drive and extending by fixing steel rings in segments. These are not used once they touch the hang wall. The ore pass made in waste rock at footwall is approached from each panel after filling by driving and holing into the ore pass.

Drawing of the ore from the ore pass is from bottom level of the stope. A cross cut is driven below each panel from the ore drive below the Sill pillar leading upto the ore pass. A connection drive is made in waste rock between the two ore passes for convenience of LPDT movement and ventilation. The LPDT moves to the ore pass and a LHD will load the LPDT.

The ore pass will be open pass so that even if boulders are generated in the stope secondary blasting is not involved to avoid fumes which disrupt production from the stope.

Two raises in the footwall contact of the ore body will be made for each Cut & Fill stopes and are driven from lower level to next upper level at the two extremities of the stopes. Two raises will be developed from the lower level hang wall upto the sill drive and later extended by welding and fixing steel ore pass rings in segments to form 1.2 m diameter ore pass in the initial stage of stoping and then use for services. These steel ring ore passes are not continued to be used as ore pass since at 65-70° inclination it gets into the hanging wall, thereby creates loose formation. These steel ring ore passes later follow the dip of the ore body and are used for services, ladder way and fixing pipes for decantation while filling with mill tailings.

Filling will be done in a panel once the height of the back reaches 4.8m. For decantation, perforated pipe lines with hessian cloth are laid in the entire panel for faster drying after filling is completed. The height of the gap left from back of the stope to the fill level is 2.4 m for allowing stope wagon to drill upper holes of 32- 41mm diameter, 3m depth hole at 75- 80° angle. The classified mill tailing is piped from surface bunker through bore holes and HDPE pipes at 60% tailing and 40% water in the form of slurry. A wall is made of bamboo mat and hessian cloth to separate the panel under filling from the production panel.

2. Room & Pillar stope.

Room and Pillar mining is done in narrow flat ore body using track mounted equipments for lode width from 1.5m to 3.0m. But since 90% of the production will be coming from

wide cut and fill stopes with high productivity, the trackless method of mining is selected. These narrow ore bodies appear within the wide blocks of Cut and fill stopes. Hence an improvised method is adopted to develop the raise and stope mucking for the R&P stopes using trackless LPDT.

- Before a raise is started , it is necessary to develop a cross cut by the side of the proposed raise for a length of 15 m to accommodate a LPDT.
- From the end of the crosscut a box-hole raise at 70° is to be excavated to intersect the ore body with a size 2.4m x1.8m. This box hole raise will be used to load the LPDT while developing the raise and while stoping using 50-60HP electric scrapper installed in the level. The loaded LPDT would then haul the ore to surface.
- The R & P stopes are all single lift from one level to the next upper level. Drilling water and compressed air lines are extended from top level as well as bottom level to the stope.
- The raise for Room & Pillar stope is excavated manually with a size of 2.4 width and 1.8 m height from lower level and hole through in upper level following the hangwall contact of the ore body.
- Mining is done by stripping both the sides of the raise to a width of 15 m along the rise-dip direction for a height of 1.8 m, leaving a Sill pillar of 5 m and at the lower level and 3.0 m crown pillar at the top level to protect the levels. After widening to 15 m width along strike, the ore in the floor is stripped till the foot wall contact is exposed.
- Between two consecutive Room & Pillar stopes a rib pillar of 3m is left all through in rise dip direction.
- The support of the roof is by rock bolts of 1.5 m depth with 20mm diameter tor-steel with thread and nut at one end. The bolt is fully grouted with cement capsules or cement, sand with water mix at 1:1: ½ ratio. 10% of installed bolts is required to be tested for pull and hold minimum 6MT load. The dimensions of the stopes for both room and pillar and cut and fill has been made as per past practice in Mosaboni group of mines.

The production envisaged from Room and Pillar stope is 172 MT per day. From horizontal Cut and fill stope to moderate width Post Pillar stop is 400MT per day. For ore body width above 10m in Post Pillar/ wide ore body stopes its 1000 MT per day using 5.4m³ LHD .

- As there will be several Cut & fill stopes and also Room and pillar stope in a level , one set of LHD & LPDT can serve several ore passes by turn including the R& P stope

A Tentative Production and development schedule for the project period shall be as below:

Year	Development (m)	Production from stopes (T)
1 st Year	710	0
2 nd Year	4739	0
3 rd Year	5006	171000
4 th Year	4386	249500
5 th Year	3718	249500

04.01.03 MINE VENTILATION:

The mine will have boundary ventilation system having two return shaft/raise. One of the return airway shall be through the existing Eastern Shaft which will be widened and deepened and lined upto 6th Level, with a finished diameter of 5.5 m. This shaft will also serve as a 2nd outlet shaft. The other return shaft will be a drop raise of 4.5 m (Unlined) from surface at North at 2050 mSE to 2nd Level. From 2nd level to 6th level a series of raises at 2050 mSE will be developed by conventional means as a return air way and connected to the return shaft.

Main mechanical ventilator, one each will be installed at the mouth of the return air way in a properly build fan house. The capacity of each mechanical ventilator will be 180 meter cube per second

There will be two fresh air intake in to the mine.

- (a) One through the decline
- (b) And other by ventilation raise driven from surface to 6th L at 2942mSE in hangwall side. This raise will be connected in all the levels through horizontal development.

There shall be two return airways

- (a) 2nd outlet shaft from surface to 6th level.
- (b) The other return ventilation shaft will be close to Adit No.1, from surface to 2nd level. Raises will be excavated at 2050mSE coordinate from 6th L to 2nd L through different lodes and connected to the 2nd L return raise.

An axial flow fan will be installed by making a ducting from below the collar of the eastern shaft and the fan will be installed in a fan house with all electrical. A similar exhaust fan will be installed at surface at the mouth of the raise opening near Adit no 1.

Arrangements for ventilation locking have to be made at the shaft mouth to prevent short circuiting of air.

04.01.04

EQUIPMENTS USED IN MINING ACTIVITY

The equipments proposed to be used in underground mining activities are as below:

Activity	Equipment used		
	Drilling	Mucking	Transportation
Decline development, UG horizontal development including development of ramps and sill level	Twin boom Jumbo drill	Diesel LHD	LPDT
Vertical development including Raise, ore pass etc.	Jack hammer & air leg	Electric Scraper Diesel LHD	LPDT
Cut & Fill stopes	Twin boom wagon drills fitted with hydraulic jack hammer capable of drilling 41 mm dia, 3.0 m length hole.	Electric/Diesel LHD	LPDT
Room & Pillar stopes	Jack hammer & air leg	Electric Scraper	LPDT

04.01.05

TAILING FILLING:

A bunker is required to be made at surface with water jet connection. A bore hole drilled below the bunker and then connected by HDPE pipes will take the classified tailing to the stope for filling. The classified tailing from the tailing paddock will be brought by the return trip of dumper carrying ore to Mosaboni concentrator. A storage site will be required for storing the tailing. About 60% of the volume mined will be the tailing requirement. Room & Pillar stope voids also needs to be filled.

04.01.06

MINE DESIGN PARAMETERS

Design criteria for decline

- i. At the mouth of Decline construction of a RCC portal shall be done
- ii. The gradient of the Decline shall be 1 in 7.
- iii. Curves have a minimum centre line radius of 50 m.
- iv. Passing bays are to be provided every 100 m interval. These will also serve as loading bays during development.

- v. The decline should have a minimum 0.3 m thick graded road base with a drain to one side.
- vi. The decline should be sited in footwall of lode no. 5 and are designed to traverse dykes/faults more or less at right angles.
- vii. Ground support is to be installed progressively as the decline is developed. All surface drill holes which could be intersected by early development or connect through fracture zones should be plugged to avoid high pressure water flooding the working.
- viii. Manholes will be provided as per MMR 1961.

04.01.07 General

The following specifications are required to be interpreted in tandem with the awarded work, as applicable.

1.1 EXCAVATIONS

(i) Extent of Excavations

All the rocks within the neat line shall be excavated and no rock projections shall fall within the limits of the neat line. No payment will be made for rock excavated beyond the limits of the neat line in good ground conditions. In good ground, the neat line of excavation will be as indicated in the Drawings, except in those instances where the specifications/Drawings call for an increased excavation to accommodate concrete lining. The Contractor will be paid for excavation within the neat line at the rates mentioned in Schedule of Work.

In any excavation, over break up to 5% by volume in good ground may be allowed without any payment or. Over break beyond this limit will be made good by the Contractor at its own cost and in the manner approved by the Engineer-in-Charge without any extension of time. In excavations for winzing, drive, cross cuts, ramp including stripping in shaft, or winze, over break will be estimated at an interval of every one meter and in excavation in raise and raise stripping the over break will be estimated for sections at an interval of every two metres along the axis of the excavation. In all the cases payments shall be made as per quantity given in drawing for individual item or the actually executed whichever is lower.

No under excavation of any nature will be permitted at any section of the excavation.

(ii) Bad ground condition

- (a) Wherever rock strata encountered is of the friable nature, loose fissure, open fault, highly faulted, fractured such that by normal blasting it shatters and breaks the rock beyond neat line of excavation rendering increase of muck handling, support and associated work, it should be referred to Engineer-in-charge who shall take decision of whether the strata qualifies to be termed as “bad ground”.
- (b) For determining the ground condition of the rock following criteria will be considered: -
 - Rock quality designation (R.Q.D.);
 - Requirement of temporary support.

- (c) In case of bad ground certified by Engineer-in-Charge based on above criteria, and in case of over break beyond five percent (5%) by volume, payment for over break excavation and concrete lining will be made at the rate of forty percent (40%) and seventy five percent (75%) respectively of the rates for the items.
- (d) Wherever bad ground is encountered and it is certified by Engineer-in-charge, the Contractor shall take such precautions and follow such methods as decided by engineer in-charge so as to have minimum over break.
- (e) Excavations for man holes, as per MMR 1961 shall be done using special blasting techniques without any extra charge.

(iii) Blasting Damage

The Contractor will be held responsible for any damage due to blasting and all blasts must be done in a manner such that it will cause least damage to excavation walls and prevent shattering of excavated areas, installations, buildings, foundations, equipments, structures etc.

(iv) Special blasting technique

The Contractor may be asked to undertake “special blasting technique” at places where the nature of rock of work so demands. The special blasting technique shall include controlled blasting like smooth blasting, chipping of rocks or any such other techniques as may be proposed or adopted by the Contractor using proper tools.

- (v) Wherever the Job is of the nature requiring the presence of /approval of/ written permission from any of the statutory body, covered under any Applicable Laws, it shall be obtained by HCL.

The Bidders shall incorporate in their offer a technical write up illustrating the technology proposed to be adopted in the execution of the work. The technology for shaft stripping, deepening and relevant parameters shall also be detailed out in a sequential manner as given below:

- a) Means of breaking the ground.
- b) Method of mucking and muck disposal.
- c) Means of supporting the shaft sides, insets and interim support of the same, whenever required.
- d) Ventilation system.

1.2

FENCING AND BARRICADES

The Contractor shall at its own cost erect and maintain fencing and barricades required in connection with execution of Work to guard or protect: -

- a) Excavations, scaffolds and platforms
- b) Hoisting area,
- c) Areas adjudged hazardous by Mining mate/ foreman engineer in-charge/ Asstt. Manager/ Manager.
- d) Owner's existing property likely to be damaged by Contractor's operation,
- e) Unloading spots, and
- f) Any other place as directed by the Engineer-in-Charge.

1.3 **SUPPORT**

Loose Rock

Slabs which cannot be scaled down will be secured by rock bolts or in any other manner as directed by the Engineer-in-Charge.

1.4 **Temporary Support:**

- (a) Wherever necessary, temporary ground support shall be provided/erected and maintained so as to keep the area in safe condition till the permanent support is provided/erected.
- (b) If in the opinion of the Engineer-in-Charge any other type of support is necessary, the Contractor shall comply with the instructions.
- (c) The Contractor shall be paid for supports at the rates provided in Schedule of rates, if rates are not provided in Schedule then at mutually agreed rates.

1.5 **CONCRETE**

This section of the specifications supplements the drawings pertaining to mixing, testing and placing of reinforced cement concrete.

Concrete placement shall always conform to the following conditions: -

- (a) Concrete shall not be poured until all surfaces with which it will come into contact are scaled, washed and free from dirt, loose rock, oil, hardened mortar or other objectionable coating or debris etc. Immediately prior to pouring, the Contractor shall examine space behind formwork and shall remove any loose wall rock.
- (b) In saturated formations, the Contractor shall install weep pipes to prevent mixing of water with freshly poured concrete. Engineer-in-Charge may require the grouting of these weep holes after the concrete has set. Quick setting cement shall be used as and when required.
- (c) In saturated formation where a build-up of hydrostatic pressure is probable, the Engineer-in-Charge may order the installation of additional reinforcement or thicker lining or both. Alternatively the Engineer-in-Charge may specify the installation of weep holes pipes for

pressure relief. Discharge of weep holes will be collected in water garland or diverted to main channel (drain) of the mine.

- (d) The Contractor shall maintain a record of all pours showing dates, quantities, locations, weather and temperature conditions, a tabulation of the code numbers of all test cylinders cast and the result of all slump tests. A copy of these records will be made available to the Engineer-in-Charge by the Contractor as and when required.
- (e) The Contractor will notify Engineer-in-Charge at least 24 hours in advance of all pours so that Engineer-in-Charge shall arrange the measurement of actual excavated area and consequently the actual concreting done and a HCL's representative could be present for inspection prior to and during the pour.
- (f) Concrete shall be properly vibrated until maximum density is attained. Lined surfaces must present a smooth homogeneous surface when forms are removed.

No additives of any kind shall be used without the written approval of the Engineer-in-Charge. Reinforcement shall be free from dirt, paint, grease, oil, flaking, rust and other destroyers of bond.

1.6 **Formwork**

- (a) All formwork used shall be furnished by the Contractor and must be approved by the Engineer-in-Charge prior to their use. Design and construction of the formwork must be such that the true shape and alignment is maintained throughout. The lining emplaced shall be free from bulges, surface honeycombs and other defects. The mortar leakage should be minimum. Formwork shall be maintained free from dents, twists and bends and should be sufficiently strong, so that true dimension of the work is obtained. Wherever reinforcement steel is to be used, it shall be secured in a manner preventing displacement during concreting.
- (b) Concreting rates shall be inclusive of providing all material, transporting to site, mixing, pouring, placing, shuttering work required, bending, tying and placing reinforcement steel and related works.
- (c) The concreting rates shall also include cost of work required for obtaining smooth finished surface which may require chipping, plastering etc.

1.7 **ISS/BIS Specifications:**

- (a) All reinforced and plain concrete shall conform to IS 456-1978.
- (b) Concrete shall be lined as per IS 516-1959.
- (c) Portland cement shall conform to IS 269-1976.
- (d) Fine and coarse aggregates shall conform to IS 383-1970.
- (e) All reinforcement shall conform to IS 432-1982 or IS 1139-1966.
- (f) Formwork and stripping time shall conform to IS 456-1978.

1.8 **LINES AND GRADES**

It may be necessary at times to discontinue portions of the Contractor's work in order that the Engineer-in-Charge/Surveyor may make routine measurements or surveys in the interest of better accuracy of the results. On request of the Engineer-in-Charge/Surveyor the Contractor shall discontinue the Contractor's work to such an extent as may be necessary for this purpose.

No payment shall be made for the cost, the Contractor bears for any work or for delay occasioned by the Engineer-in-Charge/Surveyor's establishing or checking lines or grades or making other measurements or by the Engineer-in-Charge's inspections. No extension of time will be allowed for such delays.

The Contractor shall furnish all field engineering including alignment, gradients, dimension, etc. for the Contractor's work to the Engineer-in-Charge/Surveyor whenever asked for. All lines and gradients shall be subjected to checking and approval by the Engineer-in-Charge. Such checking shall not, however, relieve the Contractor of his responsibility for accuracy of engineering work.

Contractor shall protect and preserve all survey stations till end of the work unless the Engineer-in-Charge directs their earlier removal.

1.9 **SYSTEM OF MEASUREMENT**

Measurement shall be taken along the defined center line of the excavation.

On the first working day of every calendar month, the work completed during the previous month shall be measured by Engineer-in-Charge/Surveyor in the presence of the Contractor's representative. Similar measurement will be done when any part is completed and may become unapproachable, provided the Contractor gives not less than 24 hours notice. These measurements shall be recorded and signed by both the parties and shall be binding on both the parties. If such notice having not been given or consent not being obtained, the same shall be made accessible at the Contractor's cost.

The joint measurement as mentioned above will be for quick payment of advance against the bills. The Engineer-in-Charge/Surveyor will inform the Contractor to do the rectification in respect of shape, size, gradient etc. if any and the next payment of advance against the bills will be withheld till the rectification work, if any, is carried out completely by the Contractor to the satisfaction of Engineer-in-Charge/Surveyor.

1.10 **ALIGNMENT**

It shall be the Contractor's responsibility to excavate all declines, ramps, drives, crosscuts, raises, winzes and other excavations to correct alignment, gradient and dimensions. Survey stations for HCL as shall provide control of lines and gradient and when necessary but day-to-day checking of the alignment and gradient shall be the responsibility of the Contractor.

1.11 **ROCK BOLTING**

The Contractor shall drill holes and install grouted type rock bolts with bearing plates in the grid pattern at the places approved by the Engineer-in charge. The installation of these rock bolts will be accepted only after successful pull test which shall be conducted in the presence of the Engineer-in-charge's representative. For the pull test to be successful, the

rock bolt should withstand a minimum pull of 7 tonnes. The contractor to carry out Pull test for the 10% of the installed rock bolts.

1.12 **INSTALLATION OF BELL SIGNAL IN SHAFT**

The following conditions should be fulfilled for the installation of shaft signals:

The Cables should be DGMS approved armoured PVC control cable. Suitable number of cores shall be provided in the cable for the ultimate shaft depth of 500m. The minimum size of cable shall be 1.5 sq. mm.

The bell boxes used in Underground levels should be of M.S. not less than 1.5 mm and IP 45 approved boxes. The bell box should be accompanied with power indication and bell push light indication should be used. The bell signal should be of lockout system bell with banks man panel board and engine room level indicator.

The Underground signal should be received to banks man only and only one level signal communication should be there and other level should be indicated by buzzer signal. The panel board should accompany with standby level bell and engine bell.

There should be separate circuit for engine to banks man bell so as it should be independent of other signals.

The cable lowered should be fixed firmly to the joists used therewith by using wooden clamp with MS plates. The glands used should be of mechanical type brass glands.

In each level, junction box should be used for cable connection for further levels and separate bell box should be used. The connection made in the junction box should be clearly marked by ferrules on the leads and proper terminal connections.

Each bell box should consist of fuse controls for each level independently.

Provisions should be made for battery back up.

Voltage for signal should not exceed 30 Volts.

Provision should be made for gate interlocking with winders. Winders should not start, when ground/ inset level gates are opened.

Clear indications should be given to the driver for keps in-out selector of men, materials, stuff, skip change.

1.13 **REINFORCEMENTS**

Reinforcing bars for concrete shall be “TMT bars with strength requirement conforming to IS: 1786-1985” of Grade Fe 415 / Fe 500 from SAIL/ TISCO / RINL.

1.14 **FABRICATION OF STEEL STRUCTURES**

The Contractor shall be responsible for design and detailing of steel structures & connections. Fabrication drawings shall be prepared based on design drawings of steel structures. Detailing shall be such that erection shall be convenient and free from all interfaces, drilling and cutting at site. The design of connection shall provide adequate strength for transfer of force in the structural elements, as indicated on design drawings.

The details under fabrication includes, but not limited to the following:

Preparation and supply of material indents, bolt lists bought out items list.

Preparation and submission of fabrication drawings, modification /rectification sketches, as made drawings, erection drawings, and bill of materials, bolts lists and shipping documents for approval of the Engineer-in-charge.

Preparation of design calculations for non-standard connections, temporary bracings, etc for approval of HCL.

Procurement and collection of all steel materials from stock-yards/ stores, including loading, transportation, unloading and stacking and storing on skids or supports.

Procurement and collection of all consumables like bolts nuts, washers, electrodes, paints, shims, packs, etc., including allowance for spares and wastage.

Cold straightening of section and plates, whenever they are bent and kinked.

Fabrication of all steel structural components covered under tender drawings, design drawings and generally described under the scope of the project.

Making arrangements for and conducting tests, such as chemical analysis, physical and mechanical tests on raw materials where specified / as directed by the Engineer-in-charge.

Making arrangements for providing all facilities for conducting ultrasonic, X-ray or gamma ray tests of all important but weld joints, getting the tests conducted by reputed testing laboratories making available test films / graphs, reports and interpretation.

Control Assembly of steel structural components at Shop, wherever required.

Preparation of steel structural surfaces for painting as provided in the specifications / drawings.

Application for one primer Coat of painting at Shop, as specified in the design drawing/ specifications.

Loading, transportation from fabrication workshop to site of erection and unloading of all steel structural components / unit lies.

1.15 Site inspection and waste rock disposal:

The Bidder shall inspect and acclimatize the transport route at the site and waste rock disposal locations before submission of their quotation.

The Bidder shall be responsible for proper stacking, leveling, dozing of the waste rock.

1.16 DIAMOND DRILLING

- i. Diamond Drilling of sub-vertical/angular/horizontal diamond core drilling, with acceptable core recovery of not less than 90%, if less, it shall have to be substantiated with justifiable geological reasons.

- ii. Minimum acceptable core size shall be not less than “AX” (Outer Diameter of core not less than 27 mm).
- iii. Measurement of bore-hole deviation by multi-shot borehole camera or similar state of art technology recording degrees, minutes and seconds at every 30 m depth interval, which may also be decided by the Engineer-in-charge as per the requirement. The contractor shall provide the film of measurement to the Engineer-in-charge.
- iv. Detailed Core logging, including lithological details, structural features e.g. joints, veins, foliation, mineralization pattern; visual estimation of rock components and other associated minerals, Rock Quality Designation (RQD) etc, core splitting sample preparation and dispatch to the laboratory for analysis.
- v. The core shall be serially numbered; arrow marked, packed in polythene tubes and packed in core boxes. The boxes will be serially numbered and all the details of the borehole indicated on the cover of the boxes. The core shall be coloured photographed for records. These photograph shall be indexed serially bore hole wise. The album of the core photographed shall be made available to HCL.
- vi. Sampling of core at every one meter of the run. In the mineralized portion the sample length shall depend upon the intensity of mineralization, wherein the sample length may be less than one meter; however in any case the sample length shall not exceed one meter. Sample preparation shall be as per standard operating procedure.
- vii. Core sampling and processing will be as per the standard operating procedure, i.e. core will be split vertically into two identical half’s as per the mineralization pattern/density, one half shall be sampled and the other half of the split core will be stored back in the core box for future reference and records. The split core shall also be colour photographed and indexed for records and made available in album form.
- viii. One half of core shall be crushed and pulverized to the required mesh size and two identical samples prepared as per standard sampling procedure. One half for chemical analysis, the other will be preserves/stored for check analysis and records for future use/reference.
- ix. All samples shall be analyzed for Cu, and two samples per borehole shall be analyzed for Pb, Zn, Ni, Co, Cd, Bi, Sb, Mo, Si, Al, Mg, K, Na, Ca, Ag, Au, Fe, Cr, LoI, etc. by high resolution analytical tools besides copper. Chemical analysis to be carried out at reputed recognized laboratories, which shall also be cross checked at random by HCL.
- x. The sampling and logging will confer to internationally accepted standards, norms and format.

1.17 **Site inspection and waste rock handling:**

The Bidder shall inspect and acclimatize the waste disposal network at surface before submission of their quotation.

Waste rock generated during development in underground will be hoisted through the decline and will be dumped on surface within a radius of 500mts. Waste rock management like dozing of waste rock will be the responsibility of the contractor.

Waste rock generated can be used for construction purpose related to this Chapri Mine Project.

1.18 **Schedule of Items as appendix to this chapter**

Please refer Price Schedule attached with the document

04.02 MATERIAL HANDLING EQUIPMENT

A. DOUBLE GIRDER EOT CRANE

General

- i) EOT cranes shall be designed, manufactured and tested in accordance with the latest revision of IS: 807, IS: 3177 and other standards as applicable.
- ii) The crane components shall be standardized to keep the number of spares to the minimum.
- iii) All parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structures. All electrical cables shall be so laid that they are not liable to be damaged and can be easily inspected and maintained and when necessary any damaged cable can be accessed and replaced individually.
- iv) All components for cranes of identical capacity and duty shall be interchangeable. Cranes of the same capacity and duty shall be identical in all respect unless otherwise required.
- v) No cast iron parts shall be used except for electrical equipment and no wood or other combustible material shall be used unless specifically mentioned otherwise. Deviations, if any, to this clause shall be permitted only with the specific approval of the Purchaser.
- vi) All machinery or equipment included under this specification must be equipped with safety devices and clearances to comply with recognized standards and Purchaser's requirements along with safety codes and statutes prevalent at the place of installation of the equipment.
- vii) For welded construction such as that of bridge girders, end carriages, rope drums, gear-boxes etc. steel shall be as per IS: 2062-1992 quality. For welding these members low hydrogen electrodes shall be used.
- viii) All wheels, couplings, open gears etc. shall be provided with covers, opening on strong hinges. All heavy covers shall be provided with inspection windows.
- ix) Where down shop leads are located below runway rails, guards shall be provided on the crane to prevent the hoist ropes from coming in contact with down shop leads. PVC shrouded DSL are preferred.
- x) All bolts except those with nyloc nuts shall be provided with grip lock nuts or spring washers.
- xi) For outdoor cranes all electrical and mechanical equipment which are exposed to weather shall be completely covered or made weather proof. The covers shall be segmental to facilitate easy dismantling and assembly.
- xii) The end-carriages shall be fitted with substantial safety stops to prevent the crane from falling more than 25 mm in the event of breakage of a track wheel, bogie or axle. These stops shall not interfere with the removal of wheels.

- xiii) Fasteners for pedestal blocks, motors, gear-boxes etc. shall be easily removable from the top. Studs or body bound bolts shall not be used as fasteners for mechanical items except for fixing cover.
- xiv) Power & control cables shall be clamped in-groups separately. All trailing cables shall be clamped with PVC or non-metallic clamps. Group de-rating factor shall be appropriately taken according to the recommendations of the cable manufacturers based on the method of laying and number of cables being laid together.
- xv) Guards of approved design, which will push forward off the track, any object placed across it, shall be attached to each end of the end carriages.
- xvi) Parts of steel frames carrying machinery shall be provided with doubling plates of adequate thickness, riveted or welded and machined to true surface.
- xvii) Defects in the material like fractures, cracks, blow holes, lamination, pitting etc. are not allowed. Rectification of any such flaw is permissible only with the approval of the Purchaser.
- xviii) **Tolerances:** The Tenderer / Supplier shall ensure that the crane shall be manufactured as per the tolerances specified below :

(i)	Span over LT wheels	:	+ 6 mm upto 40 metres
(ii)	Wheel base		
	• L T	:	+ 5 mm
	• CT	:	+ 3 mm
(iii)	Difference in diagonal		
	• LT	:	+ 5 mm
	• CT	:	+ 3 mm
(iv)	Long travel wheel alignment	:	+ 1 mm
(v)	Tilt of wheels or balancer axle	:	+ 1 mm/1000 mm
			(Horizontal & Vertical)
(vi)	Trolley wheel gauge	:	• + 3 mm upto 7500 mm span
		:	• + 5 mm above 7500 mm span
(vii)	Trolley track gauge	:	• + 3 mm upto 7500 mm span
		:	• + 5 mm above 7500 mm span
(viii)	Difference in height between trolley rails (H) in relation to the trolley track gauge (S) shall be within the following tolerances:		
	`S' (mm)		`H' (mm)
	Upto 2500	:	4
	Above 2500 and upto 4500	:	6
	Above 4500	:	10
(ix)	Horizontal bend of girder in plan	:	Span / 2000

- | | | | |
|--------|---|---|------------------|
| (x) | Shift of the web plates of main & end girders from vertical over height 'H' measured near the mid span & close to the main diaphragm. | : | H / 200 |
| (xi) | Twist of the main girder | : | Span / 1500 |
| (xii) | Axis of the flange plates from the axis of the beam | : | H / 250 |
| (xiii) | Tolerances on camber | | |
| | • Upto 4 mm | : | (+) 4
(-) 0 |
| | • Above 4 mm and upto 8 mm | : | (+) 5
(-) 0 |
| | • Above 8 mm and upto 16 mm. | : | (+) 6.3
(-) 0 |
| | • Above 16 mm and upto 31.5 mm | : | (+) 8
(-) 0 |
| | • Above 31.5 mm and upto 63 mm | : | (+) 10
(-) 0 |
| (xiii) | Over buffer length
(Over buffer dimension on two sides shall be same) | : | + 5 mm |
| (xiv) | Height of centre of buffer
(from top of track rail) | : | + 5 mm |

TESTING: The crane after erection shall be tested as follows:

- i) Insulation and other tests mentioned in IS: 3177-1999 shall be carried out.
- ii) **Deflection Test:** The deflection test of the bridge girders shall be carried out as per IS: 3177-1999 After the deflection test with safe working load, the crane shall be tested for deflection with 25% overload and there shall not be any permanent set after the removal of the load.
- iii) **Speed Tests :**
 - a) All motion of the crane shall be tested with rated load on all notches at the time of commissioning of the crane at site and the speeds shall be attained within the tolerance limit.
 - b) All motions of the crane shall be tested with 25% over load in which case the specified speeds need not be attained but the crane shall show itself capable of dealing with the overload without difficulty.
- iv) **Brake Tests :**
 - a) The hoist brakes shall be capable of braking the movement with rated as well as overload. However, the braking path with rated load shall not exceed hoisting speed/120

for class 2 duty cranes.

- b) The long travel and cross travel brakes shall be capable of arresting the motion within a distance in meters equal to 10% of the speed in meters/min. and the retardation due to braking shall not exceed the values as given in the table below:

Working condition	Retardation, according to percentage number of driving wheels, (in m/sec ²)		
	100	50	25
Outdoor (When $\mu = 0.12$)	0.9	0.45	0.25
Indoor (When $\mu = 0.2$)	1.5	0.75	0.40

Legend μ = Friction Factor

- v) The crane shall be completely assembled and tested in the Supplier's works for full load and 25 % overload on hoisting and cross traverse motion, in presence of Purchaser's representative in addition to other tests as specified in IS: 3177- 1999.

STRUCTURAL DETAILS:

- i) The crane bridges shall be of welded double/single web box construction and shall be designed as per IS: 807 and/or AISE NO. 6. The materials of construction shall be weldable mild steel in compliance with the relevant standard. However, high strength weldable structural steel also may be used wherever required in compliance with the relevant standards.
- ii) The crane bridge girder maximum rolled length should be upto 12-m span shall be in one piece. Girders above 12 m span may be spliced. The number of such splices shall not exceed 2 upto 36 m span. Beyond 36 m span, the number of splices may be 3. Splices shall be designed to resist all the forces and moments to which it is subjected to, plus 50% thereof. Wastage during fabrication shall be considered.

However, in no case the strength developed by the splice shall be less than 50% of the effective strength of the material.

Splices shall be proportioned and arranged so that the gravity axis of the splice is in line with the gravity axis of the members joined so as to avoid eccentricity of the loading.

- iii) Black bolts shall not be used in the main structure of the cranes.
- iv) Cross travel rail shall be fixed to the bridge girders by clamping only and not by welding.
- v) Transverse fillet welding on load carrying members shall be avoided. All butt welds on tensile zone shall be X-rayed.
- vi) Plates, bars, angles and where practicable other rolled sections used in the load bearing members of structures shall not be less than 6 mm in thickness.

- vii) The end carriages shall be of double web plate box construction and shall be connected to the girders by welding at shop or by large gusset plates and fitted bolts to ensure maximum rigidity. Drop stops and jacking pads shall be built-in features of the cranes. Full length chequered plate platforms shall be provided along both sides of the cranes in order to ensure easy access to crane crab, long travel gears and other parts. Safety railings shall be provided on crane bridges and crab frame. Access to the operator's cabin shall be via staircases only and not through ladders. Platforms to facilitate inspection and dismantling of long travel wheels and main current collectors shall be provided.
- viii) Operator's cabin shall be of welded construction and located below bridge girders. Closed operator's cabin shall be provided with adequate glazing to ensure good vision in all directions and glazing shall be accessible for cleaning from cabin itself.
- ix) The closed cabins shall be equipped with circulating and exhaust fans whereas open cabins shall have only circulating fans.
- x) Air-conditioned cabins, if provided, shall be provided with double glazing & heat insulation. The temperature inside the cabin shall be maintained at 25±20 C.
- xi) All the cabin floors shall be covered with heat and electrically insulated material. The cabin shall also be equipped with adjustable swivelling type upholstered chair.
- xii) The crab frame shall be made of steel plates and rolled sections in welded construction. Crab frame shall be fabricated in one piece if there are no transport limitations. If the trolley is fabricated in more than one piece due to transport limitation, the design of the splice shall be such that one unit of mechanism mounted on one part of the trolley, does not come over the other part.
- xiii) Foot-walks shall be of sufficient width to give at least 500 mm clear passage at all points except between railing and bridge girder where this clearance may be reduced to not less than 440 mm.
- xiv) The platforms along the bridge girders and over the crab shall allow convenient access for replacement, inspection, lubrication etc. for different mechanical and electrical components.
- xv) The minimum thickness of chequered plates shall be 6 mm O/P for indoor cranes & 8 mm O/P for outdoor cranes.

MECHANICAL DETAILS:

- i) Rope drums

Rope drums shall be of cast steel or fabricated out of rolled steel plates. Fabricated drums shall be stress relieved before machining. The grooves of the drum shall be smooth finished. Rope drum shall be flanged at both ends.

ii) Rope sheaves

Rope sheaves shall be of cast steel or fabricated out of rolled steel plates.

iii) Wire ropes

The wire rope shall be hemp cored for all cranes. Ropes shall be regular right hand lay as per IS: 2266-1989. The construction of the ropes shall be 6 x 37 up to 16 mm diameter and 6 x 36 above 16 mm diameter.

iv) Hook block

The sheaves shall be fully encased in closed fitting guards fabricated out of steel plates. Smooth opening shall be provided in the guards to allow the free movement of rope, and holes shall be provided for drainage of the oil.

v) Gears & gear-boxes

Straight and helical spur gearing shall be used for all motions. Worm & bevel gearing may be used in exceptional cases with the specific approval of the Purchaser. All first reduction gears shall have helical teeth. All pinions shall be integral with the shaft. All gears shall be hardened and tempered alloy steel having metric module. Overhung gears shall not be used.

Surface hardness for pinion shall be 255 to 300 BHN and for gears it shall be 215 to 260 BHN. Difference in hardness of pinion and gear shall not be less than 20 BHN. All cast steel gear shall be tested by Gamma Ray. All gears shall be enclosed in oil tight gear-boxes. Gearboxes shall be of high grade cast iron/cast steel or fabricated and split at each shaft centrelines. Fabricated gearboxes shall be stress relieved before machining. For Cross travel and Long travel motions, vertical gear-boxes with 'T' split may be used.

vi) Connection between rope drum & gear-box

One of the following arrangements shall be adopted for connecting the rope drum with the gear-box.

Flexible joint, incorporating flexible geared coupling housed within the drum. Fully flexible geared coupling between the drum and gearbox.

Drive of the drum by means of spur ring mounted on the drum shall be avoided as far as practicable.

vii) Wheels

Crab/crane wheels shall be double flanged. Wheels shall be mounted in anti-friction roller bearing housed in 'L' shaped bearing brackets for easy removal during maintenance. Flangeless wheels with guide rollers are also acceptable.

Solid wheels shall be of forged rolled/cast steel. Wheels from 400 mm diameter and above may consist of hardened, rolled / forged steel tyre of not less than 60 mm thickness, shrunk on to cast iron centre.

viii) Coupling

Motor shaft shall be connected to the gearbox-input shaft through flexible shock absorbing coupling. Rotating parts shall be suitably covered by 3.15-mm thick sheet steel hinged covers for safety. In case of single motor central drive for Long travel motion, output shaft of the gear-box shall be connected to the line shaft through half geared couplings. Intermediate lengths of the line shaft may be connected through solid flange couplings. Half geared couplings with floating shaft shall be provided between the wheel and the wheel and the line shaft.

ix) Bearings & bearing housings

Anti-friction bearings shall be used throughout except where required otherwise for technical reasons.

x) Buffers

Spring loaded type buffers shall be provided on all the 4 corners of the bridge girders and the end carriages for cross and long travel motions respectively.

xi) Brakes

The brakes shall be provided for all motions on the high-speed pinion shaft of the gear train. For hot metal hoists, two brakes shall be used per motor.

xii) Lubrication

Grouped grease lubrication system shall be used for class M3, M5 and M7 duty cranes. Lubrication of the gears and pinions in the gear-boxes shall be splash fed from the sump. In case of three reductions, vertically mounted gearbox (having limited motion), an oil pump shall be fitted to ensure lubrication of all gears.

B. SINGLE GIRDER US / EOT CRANE

General

01. The single girder crane shall be designed, manufactured, assembled and tested in accordance with IS: 807-2006, IS: 3177-1999, IS: 3938-1983 and other relevant codes & practices for cranes as applicable.
02. The components of the hoist shall be designed, manufactured, assembled and tested in accordance with IS: 3938-1983.

03. All working parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structure.
04. All electrical cables shall be so laid that they are not liable to be damaged and can be easily inspected and maintained.
05. For out-door cranes all electrical and mechanical components which are exposed to weather shall be completely covered or made weatherproof. The covers shall be in segments to facilitate easy dismantling and assembly.
06. No cast iron parts shall be used except for electrical equipment and no wood or other combustible material shall be used unless specifically mentioned otherwise.
07. Where DSL/festoon cables are located below runway rails, guard shall be provided on the crane to prevent the hoist ropes from coming in contact with festoon cables. PVC shrouded DSL are to be fixed.
08. All bolts except those with nyloc nuts shall be provided with grip lock nuts or spring washers.
09. All trailing cables shall be clamped with PVC or non-metallic clamps.
10. Steel frames carryings machinery shall be machined to true surface.
11. Under-slung/ EOT cranes shall be provided with maintenance platform (C-type) at one of the gable ends. The maintenance platform shall be so provided that it can be approached from the staircase from the ground.

Structural Design

01. The crane structure shall be designed in accordance with IS:807-2006.
02. The bridge girder shall consist of main and an auxiliary structure where necessary.
03. End-carriages shall be fabricated from rolled steel sections/plates or both, welded together to form a box.
04. End-carriages shall be of ample strength to resist all stresses likely to be imposed on them under severe conditions, including collision with other cranes or stops. The length of the end-carriage shall be such that no other part of the crane is damaged in collision.
05. Black bolts shall not be used in the load bearing structures of the crane also high tensile friction grip bolts shall not be used unless approved by the purchaser.
06. Bolts used in shear shall be fitted into reamed holes.
07. Transverse fillet welding on the load carrying members shall be avoided.
08. All butt welds on structural members, subject to tensile stress, shall be x-rayed

09. Plates, bars, angles and where practicable, other rolled sections used in the load bearing members of the structure shall be not less than 6 mm thick.
10. Steel sections and plates, used for construction shall be of IS: 2062 -2006 quality.

Mechanical Equipment

01. Rope drums

Rope drum shall be of cast steel or fabricated out of rolled steel plates. Fabricated rope drum shall be stress relieved before machining. The grooves of the drum shall be smooth finished.

02. Wire rope

The wire ropes shall be of regular right hand lay hemp cores as per IS: 2266-2002. However, Ropes working under water and in corrosive atmosphere shall be galvanised and shall have steel core. For rope arrangement with 2 falls wire rope, shall be of non spinning type.

03. Rope Sheaves

Rope sheaves shall be of cast steel or fabricated out of rolled steel plates.

04. Rope Guides

Suitably designed rope guides with pressure ring/rope tightened shall be provided for each lead of rope from the rope drum to prevent the rope from overriding, loosening or rope coming off the groove.

05. Wheels

For under slung cranes hoist block, the wheels shall be single flanged with straight/taper tread to suit the track beams. In case of steel plant duty cranes the combination of wheel diameter and rail size shall be ensured. Wheels shall be of forged/rolled/cast steel with minimum hardness of 200 BHN in case of single girder under slung cranes running on rolled steel joist and 300 BHN for EOT cranes and for under slung cranes/hoists running on wear resistant flats welded to rolled steel joists. Min. dia. of CT & LT wheels for under slung cranes shall be 200 mm.

06. Long travel drive

For Single girder EOT Crane

Individual wheel drive (one wheel in each end-carriage) shall be provided when the crane span exceeds 13 meters. All parts of the long travel drive shall be located above the platform and easily accessible. The gear-box mounted on platform with foot mounted motor and brake shall be connected with driving wheel by means of locating shaft and flexible geared coupling. The use of open gearing, chain and sprocket, pulley and belt etc. is not permitted.

For Single girder Under slung Crane

Drive arrangement located at either end of each end carriage shall be provided. Flange mounted geared motors may also be used.

07. Hoist and cross-travel drive

The hoist and cross travel motions shall be combined in one block, which shall be designed as per IS: 3938-1983. It shall be ensured that skidding does not occur under any condition.

The minimum no. of poles of motor shall be as given below:

	Hoist	CT	LT
No. of poles	6	4	4

08. Gearing and Gear-boxes

Straight and helical spur gearing in metric module shall be used for all motions. Worm gearing shall not be used. All gears shall be of hardened and tempered alloy steel with machine cut teeth. Hardness for pinion shall be 220 BHN and for gears it shall be 200 BHN. All gearings shall be enclosed in oil tight gear-boxes. Fabricated gear-boxes shall be stress relieved before machining.

09. Bearings and Bearing Housing

Ball and roller anti-friction bearings shall be used throughout unless otherwise specified. Antifriction spherical roller bearings shall be provided for live axles of travel wheels. Housings shall be split on shaft centre line to permit removal of the shaft. The underside of the base of each bearing pedestal shall be machined and shall bear upon a machined surface.

10. Couplings

For Hoists of capacity 5T & above, the motor (Foot mounted B3 type) shall be connected to its gear drive by a flexible coupling. Flange mounted motors (B5) may be used for Hoists of capacity up to 5T and also for all CT/ LT individual drives. In case of single motor central drive for CT/ LT motion, foot mounted B3 type motors shall be connected to its gear drive by a flexible coupling. Output shaft of the gear-box shall be connected through solid flange couplings. Half-geared couplings with floating shaft shall be provided between the wheel and the line shaft.

11. Hook blocks

Hook blocks shall be of enclosed type leaving openings for ropes only so that ropes do not run off the sheaves. Standard swivelling shank hooks, mounted on thrust bearings shall be used unless otherwise specified.

12. Brakes

DC Electro-magnetic Shoe brakes shall be provided for Hoist motion of capacity 5 T & above. DCEM Disc brake may be provided for Hoist motion of capacity below 5 T. CT & LT Motion shall be provided with DCEM disc brake. Brakes shall be provided on the high speed pinion shaft of the gear –train.

13. Buffers

The crane shall be provided with rubber buffers on the four corners of the end-carriages unless otherwise specified. For electrically operated hoists, steel stops at all the four ends of the track beam shall be provided.

C. ELECTRIC HOIST

General

Supply of electric hoists shall be as per specific requirements. The hoist shall conform to relevant IS as applicable.

The supply shall include hoist with necessary attachments as required. The hoists shall also conform to various safety codes and electricity rules as applicable at the place of installation.

Cast iron and wooden parts shall not be used anywhere in the hoist except in electrical. Ball and roller antifriction bearing shall be used. Swivelling type standard shank hook mounted on grease lubricated antifriction thrust bearing shall be provided.

The electric hoists shall be designed in accordance with the latest edition of IS: 3938-1983, class-II duty. The hoist shall be of pendant operated.

All motions of the hoist shall be provided with fail safe electrically operated DC electro - magnetic brakes.

Limit switches shall be provided for all motions.

Non spinning type wire rope shall be used.

The electrical items of the hoist shall confirm fully to the stipulations made under the electrical specification,

For outdoor hoists, motors, brakes & other equipment shall be covered to suit to outdoor operations.

All trailing cables shall be clamped with PVC or non-metallic lamps.

Defects in the materials like fractures, cracks, blowholes, or laminations are not allowed.

The other details shall be as indicated in specification for Single Girder crane above.

D. MANUAL TRAVELLING HOIST

General

Supply of manual travelling hoists shall be as per specific requirements. The hoist shall conform to IS 3832 & other relevant standard as applicable.

The hoist shall be of reputed make. The supply shall include hoist with necessary attachments as required.

The hoists shall also conform to various safety codes as applicable at the place of installation. Ball and roller antifriction bearing shall be used.

Swivelling type standard shank hook mounted on grease lubricated antifriction thrust bearing.

Pulleys used for operating mechanism shall have suitable guards to prevent the operating chains from coming off.

Load chain shall be calibrated type. Minm factor of safety for load chain shall be 5.

All open gearing etc. shall be suitably covered.

INFORMATION TO BE FURNISHED BY THE TENDERER

CRANES:

1. Crane No.
2. No. Off
3. Type of Crane
4. Supplier/ Make
5. Capacity (t)
6. Span (m)
7. Duty Class
8. Speeds (normal & Creep) m/ min
 - a) Main hoist & creep
 - b) Aux. Hoist & creep
 - c) Cross travel
 - d) Long travel
9. Height of lift (m)
 - a) Main hook
 - Above floor
 - Below floor
 - b) Aux. hook
 - Above floor
 - Below floor
10. Crane rail height above floor (m)
11. Max wheel load (t) (without impact)
12. Type of cabin
13. Type of hook:
 - a) Main hook
 - b) Aux hook
14. Location (Indoor/ Outdoor)
15. Hook approaches (m)
 - a) Main hook (DSL Side / Opposite Side)
 - b) Aux hook (DSL Side / Opposite Side)
16. No of rope falls, dia, construction, & breaking strength for
 - a) Main hoist
 - b) Aux hoist
17. Gantry rail size

18. Crab rail size
19. Over buffer dimension (m)
20. Wheel base
21. Wheel diameter for
 - a) LT wheel
 - b) CT wheel
22. Handling attachments details:
23. Special features (weighing device etc)
24. Motor: (Type, kW, rpm, starts/ hr, enclosure class, insulation etc)
 - a) Main hoist
 - b) Aux hoist
 - c) Cross travel
 - d) Long travel
25. Type of control for each motion with corresponding characteristic curve :
26. Method of obtaining creep speed:
27. Power supply
 - Power supply S.L.D:
 - Electric equipment specification
28. Control voltage
29. Ambient temp/ Environment
30. Type of Lubrication
31. Total weight of the crane (t)
32. Break up of crane weight (t)
 - a) Structural
 - b) Mechanical
 - c) Electrical
33. Total weight of the crab (t)
34. Code of design
35. General arrangement drawing, incorporating the front and side elevations, plan, hook approaches, location of cabin / pendant, down shop lead, clearance dimension, handling attachments / wheel load diagram and other relevant characteristics of the crane.
36. List of deviation from the Purchaser's specification (to be furnished in enclosed format only)
37. Detail of radio remote controls/operations
38. Any other information

ELECTRIC HOIST

- a.) Make :
- b.) Type :
- c.) Capacity :
- d.) Height of lift :
- e.) Speed (MH / CT) :
- f.) Power feeding arrangement :

MANUAL TRAVELLING HOIST

- a) Make :
- b) Type :
- c) Capacity :
- d) Height of lift :
- e) Tractive effort :

04.03 Steel Structural Work

- 01 Steel structural work shall cover all building structures viz. columns, beams, storage bins, roof structures, wall structures, platforms, crane girders, monorails, bracings, ladders, staircases, handrails, etc. The work shall also include sheeting work for roofing and side cladding in various junction houses, buildings and conveyor galleries. Total structural work shall be complete in all respects for proper functioning of all the plants and equipment.

Steel Structures

- Columns (rolled section or built-up), Column bracings.
- Stairs, ladders and crossovers with safety hoops.
- Handrails, Roof Handrails.
- Walkways with chequered plate.
- Working platforms, maintenance platforms, Gable Platforms.
- Bins, Roof Trusses, Roof Girder.
- Crane Girders, Monorail Beams & Supports.
- Purlins, Floor Beams, Sheeting Posts, Side runners, Louvers, Bracings, Sag angles, Sag rods, wind-ties on roof.
- Steel gates, doors, shutters, metallic partitions.
- Wind girders, Gutters and Down comers.
- Roof & side Cladding with Colour coated metallic sheets.
- Rail & Rail Fixtures.

- 02 Design Considerations

General

Design of steel structures shall be done in accordance with IS: 800 - 2007 or any equivalent international code of practice. The following loads shall be considered while designing the structures:

- All live loads shall be in accordance with IS: 875 in addition to the technological loads indicated by the equipment manufacturer / supplier.
- Wind loads shall be in accordance with IS: 875(Part-3) -2015
- Seismic loads shall be in accordance with IS: 1893-2015 part IV
- For design of bins and loading hopper IS: 9178 (Part I to III)-1979 shall be followed.
- Temperature load.
- Dynamic load factor due to impact from vibratory / reciprocating machinery, motor, etc.

Resonance in Structures

Structures supporting vibratory / reciprocating equipment shall be designed so as to obviate occurrence of resonance. The ratio of applied frequency to natural frequency shall not lie within the range of 0.7 to 1.4.

03 Material of Construction

The material for the structures to be designed shall be as follows:

- i) All rolled sections and plates up to 20 mm thick shall conform to Grade- E250 & quality A of IS:2062-2011 and shall generally be of tested quality(semi-killed).
- ii) Plates beyond 20 mm thick and up to 40 mm thick subjected to dynamic loading shall conform to Grade-E 250 & quality BR as per IS:2062-2011. (rolled in killed condition)
- iii) Plates beyond 40mm shall conform to Grade-E 250 & quality BR as per IS: 2062-2011 in normalized and ultrasonically tested quality.
- iv) High strength micro-alloyed steel shall conform to SAIL-MA 350 HYA/HYB (SAIL product).
- v) Steel sheets shall conform to IS: 1079-2009.
- vi) Chequered plates shall conform to IS: 3502-2009
- vii) Steel tubes for structural purposes shall conform to IS: 1161-2014 Grade YSt-240).
- viii) Crane rails shall conform to IS: 3443-1980.
- ix) Collectors and down-comers shall be ERW410 pipes conforming to IS:3589-2001.
- x) Roof and side sheeting shall be with 0.5mm BMT permanent color coated metal sheets as per IS:15965-2012.

All black hexagonal bolts, nuts and lock nuts shall conform to IS: 1363-2002 and IS: 1364- 2002 (for precision and semi- precision hexagonal bolts), Washers shall conform to IS: 2016:1967.

Due to non-availability of specified materials, suitable substitutions may be provided with the consent of the Engineer. Such substitution shall be incorporated in the "As-built" drawings.

All the items are to be cut as per requirements of the drawing. If joints are to be provided in any item in order to meet requirements of size and shape, cutting plan showing locations of joints shall be prepared for consideration of Engineer. Joints provided shall be incorporated in "As built' drawings. Rolling and cutting tolerances shall be as per IS: 1852: 1985.

Only tested materials shall be used unless use of untested materials for certain secondary structural members is permitted by the Engineer-in-charge. If test certificate for the material is not available from the main producer, the following tests shall be carried out at the discretion of the Engineer-in-charge:

Chemical Composition

Mechanical Properties

Weld ability test

Where steel castings are to be used the, same shall conform to IS: 1030: 1998.

Bolts and Nuts

Black hexagonal bolts, nuts and lock-nuts shall conform to IS: 1363: 2002. Precision and semi-precision hexagonal bolts, screws, nuts and lock-nuts shall conform to IS: 1364:2002.

Electrodes

Mild steel electrodes and high tensile steel electrodes shall conform to IS: 814:2004. Electrode to be used for submerged welding shall conform to specification IS: 7280: 1974.

04 Method of Construction

Steel structures to be fabricated shall generally be of welded construction. Covered electrodes will conform to IS: 814–1991. Elements will be fabricated in largest possible dimensions optimal with the transport requirement so as to minimise site work. Site connection will be by permanent bolts.

05 Fabrication

Fabrication of all structural steel works shall be in accordance with IS: 800. Fabricated structures shall conform to tolerance as specified in IS: 7215–1974.

Storing of Materials

Materials shall be stored and stacked properly ensuring that place is properly drained and is free from dirt. It shall be ensured that no damage is caused due to improper stacking.

Materials preparation

Cut edges shall be finished smooth by grinding or machining wherever necessary. Sufficient allowance (3 mm to 5mm) should be kept in the items in case machining is necessary. Cutting may be affected by gas cutting, shearing, cropping or sawing. In gas cutting of high tensile steel, special care is to be taken to leave sufficient metal to be removed by machining so that all metal that has been hardened by flame is removed. Sufficient shrinkage allowance (@ 1 mm/m) shall be kept wherever heavy welding is involved.

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

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

Drilling and Punching of holes

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

Holes for bolted connection should match well to permit easy entry of bolts. Gross mismatch of holes shall be avoided. Only drilled holes are accepted. No gas cutting hole to be done.

Assembly for fabrication

Fabrication of all structural steelwork shall be in accordance with IS: 800-2007 and in conformity with various clauses of this specification, unless otherwise specified in the drawings.

Fabrication of structures shall preferably be taken up as per the sequence of erection. All erection shall bear erection mark no. and reference drawing number at a prominent location of the structures for easy identification at site.

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

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

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

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

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

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

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

If extra joints are required to be provided in column, crane girder etc, approval should be obtained from the Engineer-in-charge. However, as general guidance following is suggested.

Splice joints of column and crane girder shall of full strength butt weld and wherever possible shall be located at zones of minimum or substantially lesser stress.

Splice joints of flange and web should preferably be staggered (minimum 500mm staggered).

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

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

The threaded portion of each bolt shall project through the nut at least by one thread.

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

Welding

All metal arcs welding shall be carried out as per IS: 9595-1996.

Submerged arc welding of mild steel and low alloy steel shall be as Per IS: 4353-1995.

Electrodes shall be stored in a dry place. Electrodes whose coatings are damaged due to absorption of moisture or due any other reason shall not be used.

Low Hydrogen electrodes and flux for submerged welding shall be dried at 250 -3000 C for one hour in drying oven before use.

For suitability of wire flux combination, procedure test shall be carried out as per IS: 3613-1974 if so required.

Welding shall be done by electric arc process. Generally submerged arc, automatic & Semi-automatic welding shall be employed. Only where it is not practicable, manual arc welding may be resorted to. In case of manual arc welding recommendations of electrode manufacturer is to be strictly followed:

Welding surface shall be smooth, uniform, free from fins, tears notches or any other defect which may adversely affect welding.

For multi run weld deposit, the next run should be done only after thorough removal of slag and proper cleaning of surface.

Fillet weld shall have the correct profile with smooth transition into parent metal. Dressing of welds, if specified, shall be done by such method which does not cause grooving and other surface defects on the weld or on the parent metal.

All butt welds shall start and end with run on and run off plates. All such plates shall be carefully trimmed off by gas cutting after welding is over.

Fillet welds shall not be stopped at corners but shall be returned round them.

If butt weld is to be ground flush with the surface of the member as per drawing adequate reinforcement shall be built up and then the same shall be chipped off and ground flush. The grinding is to be done in the direction of stress flow till the transverse marks are eliminated.

Welding shall not be done under such weather conditions, which might adversely affect the efficiency of the welding.

Manipulators shall be used wherever necessary and shall be designed to facilitate welding and ensure that all welds are easily accessible to the operators.

Stress relieving after welding shall be done if especially called for in the drawing or specification. Ends of structural members and portions of gussets receiving welding at site shall be left unpainted.

06 Inspection

All structures will be offered for inspection by the client. Material certificate for the fabricated structures will also be provided.

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

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

Contractor shall make all necessary arrangements for Stage inspection by the Engineer-in-charge during the fabrication at shop and incorporate all on the spot instructions / changes conveyed in writing to the Contractor.

Material improperly detailed or wrongly fabricated shall be reported to the Engineer-in-charge and shall be made good as directed. Minor misfits which can be remedied by moderate use of drift pins, and moderate amount of reaming and slight chipping may be corrected in that manner; if in the opinion of the Engineer-in-charge the strength or appearance of the structure will not be adversely affected. In the event the Engineer-in-charge directs otherwise, the items will be rejected and a completely new piece shall be fabricated. The cost of correcting errors shall be to the account of the Contractor.

The Engineer-in-charge/Engineer shall have the power:

- a. To certify, before any structure is submitted for inspection, that the same is not in accordance with the contract, owing to the adoption of any unsatisfactory method of fabrication.
- b. To reject any structure as not being in accordance with specifications and drawings.
- c. To insist that no structure or parts of the structure once rejected is resubmitted for inspection / test, except in cases where Engineer-in-charge authorized representative considers the defects as rectifiable.
- d. If, on rejection, of structure by Engineer-in-charge the Bidder fails to make satisfactory progress, within the stipulated period, Engineer-in-charge: shall, be at liberty, to cancel the contract and fabricate or authorize the fabrication of the structures at any other place he chooses, at the risk and cost of the Bidder without prejudice to any action being taken in addition to terms of General Conditions of Contract.

The Engineer-in-charge's decision regarding rejection shall be final and binding on the Bidder.

The specifications prescribed various tests at specific intervals for ascertaining the quality of the work done. If the tests prove unsatisfactory, company / shall have the liberty to order the Bidder to re-do the work, done in that period and / or to order such alterations and strengthening that may be necessary at the cost of the Bidder and the Bidder shall be bound to carry out such orders failing which the rectification/redone will be done by the Engineer-in-charge through other agencies and the cost recovered from the Bidder.

Notwithstanding any inspection at the workshop the Engineer-in-charge shall have the liberty to reject, without being liable for compensation any, fabricated members or materials brought to site that do not conform to specifications / drawings.

All rejected materials shall be removed from the site, of fabrication by the Bidder at his own cost and within the time stipulated by Engineer-in-charge.

07 Erection of Steel Structures

Erection of structures, alignment of all structures, Tolerances for erection of steel structures shall be as per IS: 12843–1989. Erection shall be carried out in accordance with IS: 800.

Testing of welding:

The Engineer-in-charge may order ultrasonic/radiographic die penetrate test limited to 5 to 10% length testing of welded structure if necessary. Such test will be limited to 1% of length of weld.

Rectification of defects in welds

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

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

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

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

08 Painting

Painting system to adopt shall be as follows :

Surface preparation: — Surface cleaning shall be done as per Grade St 3 according to Swedish Standard SIS055900

Primer paint: - Two coats of zinc phosphate in phenolic alkyd medium (DFT = 35 microns/coat).

Finishing paint:- Two coats of Polyurethane (DFT=50 microns/coat) after intermediate coat of paint.

Total DFT of paint after finishing shall be 170 microns.

04.04 COMPRESSED AIR FACILITIES

04.04.01 SCOPE OF WORK & SERVICES

The scope of work of the Tenderer shall cover design, manufacture, shop testing, painting, supply, transportation to site, handling at manufacturer's works as well as at site, erection, testing at site of all the plant & equipment and connected utilities of compressed air plant, commissioning and final handing over of all plant and equipment with connected accessories. The Compressors and air receiver shall be complete with all materials and equipment whether specifically mentioned herein or not but required for satisfactory operation of the compressed air plant. The design basis of air compressors and air drying units are indicated in Clause-02.00.

The compressed air plant shall comprise of following main units:

1. Five (5) Nos (4W+1S) single / multi stage, oil flooded, Air cooled, rotary screw air compressors each capable of delivering continuously minimum 1500cfm at a delivery pressure of 7 kgf / cm² (g) complete with electric drive motor of suitable matching capacity and all its accessories & auxiliaries including the following for each compressor set and the total system.
 - a) Intercoolers, aftercooler, moisture separator with auto drain trap station.
 - b) Complete suction air system with filter cum silencer, pipes, fittings, etc.
 - c) Complete discharge air system with pipes, valves, fittings, silencer, etc.
 - d) Control & Lube oil system.
 - e) Complete piping system within the battery limit.
 - f) Complete Blow off system with silencer, valves, pipes, fittings etc.
3. Two no (2) no. air receivers.
4. All necessary interconnecting pipes, valves, fittings including supports and supporting structures inside building and within battery limits.
5. Drain pipelines from compressed air station to nearest drain/drain pit.
6. Miscellaneous structures, access platforms for operation and maintenance of equipment parts, valves, instruments, etc. forming part of the equipment.
7. All anchor bolts & nuts, washers & base frame for equipment.
8. Handling & hoisting facilities
9. Complete Electrics facilities
10. All Control & Instrumentation facilities

11. Telecommunication system as applicable.
12. Fire fighting system
13. General Instructions, Painting, General specification on quality system, Inspection & Test of Plant & Equipment at manufacturer's premises, submission of drawings & documents etc. as per relevant chapters of this specification.
14. Initial fills and consumables i.e., lubricating oil, grease, seals, fillers, etc. for commissioning.
15. Commissioning spares.
16. A set of special tools & tackles for repair and maintenance.
17. List of spares for two years of operation & maintenance.
18. Ventilation System
19. All civil & structural works including compressor building, building structures, toilets, pipe supports foundation, stairs, platforms, etc.
20. Required Illumination facilities.

04.04.02 Equipment Specification (Technological)

A. Air compressors

1. Five (5) Nos (4W+1S). air cooled, single / multistage, oil flooded rotary screw type air compressors each capable of delivering continuously 1500cfm at a delivery pressure of 7 kgf / cm² (g) (tentative requirement) at outlet of after cooler shall be supplied with matching accessories / facilities, etc. Tenderer can also offer compressor of 'higher capacity', if the required air for copper extraction activities is greater than 1500 cfm for smooth and trouble free operation. Minimum two nos oil filters need to be installed (in series) at the outlet of the each compressor.

One (1) set of compressor and electric drive motor shall be complete with the following major auxiliaries & accessories.

- Dry type suction air filter cum silencer.
- The compressor shall have capacity control with constant discharge pressure over full range. For this purpose suitable air intake control valve with other connected system shall be provided.
- Each compressor unit shall be complete with electric motor drive of suitable capacity. Driving motor shall have adequate margin not less than 10% over the power requirement at motor terminal (considering motor efficiency) at maximum capacity of the compressor.

- Each compressor set shall be identical in design, construction and performance and all the components shall be inter changeable. Compressor shall be designed for continuous duty and parallel operation. All the compressor parts/sub-assemblies shall be duly accessible for maintenance. Unbalanced forces and moments of the rotating parts shall be minimum to ensure least vibration and noise.
- The thickness of casing shall be sufficient to withstand maximum pressure and temperature.
- Suitable lubrication system for moving parts shall be provided. Lubrication system shall be complete with necessary oil filters / strainers. Oil coolers, oil pumps, oil tanks, oil distributors, level indicators, piping, fittings and valves, etc. hand priming, if required to start shall also be provided. Lubricating oil pipes, fittings, valves, tank, etc. shall be of stainless steel.
- Lubrication system shall also be provided with oil pressure and temperature indicating instruments and safety devices against loss of pressure of oil or high oil temperature.
- Base frame, Foundation bolts, nuts & washers for the compressor.
- Interconnecting pipework between compressor & after cooler, after cooler & air receiver alongwith non return valve, isolating valve at the discharge side of the compressor & air receiver, tees, reducer/expander.
- Companion flanges, nuts, bolts and gaskets for all types of flanged connections in pipes, valves and equipment.
- MS duct with suitable insulation at the outside of the duct to be provided from the compressor radiator outlet to outside of the building for driving out the exhaust gas and keep the building temperature normal. Care should be taken that in any case there will no recirculation of the hot exhaust air.
- Noise level must not exceed 85 dB (A) at source.

B. Air Receiver

Design of air receiver shall be vertical self supporting of cylindrical design with dished ends at both ends. The air receivers (two nos) shall be designed for a capacity of 10 m³ and working pressure of 7.0 kgf/cm² g and shall be supplied with all necessary accessories. The air receivers shall be designed, manufactured and tested according to IS 7938-1976 and IS 2825-1969 (RA 1984), class 2. The material of construction for shell and dished ends shall be as per IS- 2002, Gr. 2/SA 516 grade 70 or equivalent.

Air receivers shall be complete with safety valves, manhole nozzle with weld neck flanges and cover having devit arrangement, vent connections at highest point of dished end for release of air during hydro test, pressure gauges and transmitter for local and remote measurement, nozzles for air inlet and outlet connections with weld neck flanges, drain nozzle at lowest point complete with isolation valve, auto trap station with manual bypass valve & arrangement. Base frame, Lifting lugs, foundation bolts, companion flanges with bolts, nuts, gaskets for inlet & outlet nozzles and other valves shall also be supplied.

C. Pipe work, Valves & Specials

- Piping layout must follow good engineering practice. Proper attention shall be paid to obtain full functional requirement of air and oil piping with a layout which provides sufficient clearance for various auxiliaries, other equipment and operating personnel, easy access for operation and maintenance, convenient supporting arrangement.
- Except where otherwise specified, all pipes shall be provided with butt welded connections and with flanged joints only at the connections with equipment, vessels and valves. Pipes laid inside the R.C.C. trenches shall be supported at intervals on steel sections and the arrangement shall facilitate easy maintenance.
- Valves in the air line shall be of gate/r globe or ball type. Direction of flow shall also be marked on the valve body.
- All the globe valves shall be designed to prevent erosion of valve seats when the valves are operated in throttled conditions. Design of valves shall be such that it will permit packing of glands while under pressure.
- Non return valves shall be of dual plate (SS) spring design. Solenoid valves shall have heavy duty, double impregnated tropicalised coil and shall be suitable for operating temperature and for operation continuously energised in tropical climate. The solenoid valves shall be of bronze body with stainless steel trim. The coil shall be suitable for continuous duty. The enclosure shall be water tight, dust tight and the valve shall be suitable for mounting in any position.
- All the valves shall be of PN 10 rating for water line and PN 16 for air line. The valves with flanged ends shall be provided with flanged ends having raised face, serrated finish. The drilling of the flanged ends shall be done as per IS:6392-1971 (RA 1988) .

Valves of size NB 250 - 400 shall be gear operated type.

Gate & Globe valves below 50 NB shall conform to IS:778-1984 (RA1990).

Non return valves shall conform to IS:5312-1984 (RA 1990) and shall have dash pot arrangement.

- All pipelines shall be provided with drain connections, generally at the lowest point for removal of accumulated condensate or water and also for draining of the water after hydro testing of the erected pipe work. Vents with valves shall be provided at highest point of the pipe line.
- The drain piping shall have drain pocket followed by a connection of drain pipe with isolation valve. Line shall be provided with slope towards the drain point.
- MS Pipes of following specification shall be provided for air applications.

NB 15 -150 : ERW, Black, Medium pipe having plain ends as per IS:1239 Part-I – 1990.

- NB 150 & above : ERW, Black pipe of minimum thickness 6.35 mm having plain ends as per IS:3589-1991.

- Pipe fittings conforming to IS:1239 Part-II - 1992 shall be provided for pipes of size up to NB 150. Fabricated fittings manufactured from the pipes shall be provided for pipes of sizes NB 200 and above.
- Complete pipe network after erection shall be hydraulically tested at a pressure of 1.5 times the working pressure. The pipe network shall be subjected to the test pressure for a minimum period of 4 hours.
- All the over ground piping and equipment shall be painted as per Specification on Painting (Chapter- 06.00).
- Pipe supports comprising pipe shoes, saddles, base plate, clamps with nuts and structural members like channels, angles etc. shall be supplied. While finalising the location of supports, the maximum permissible spacing between adjacent supports shall be as given in the table below :

Nominal Dia of Pipe -----	Maximum span for liquid Service in metres. -----	Maximum span for Air Service in metres. -----
25 mm	2.0	2.5
40 mm	3.0	3.0
50 mm	3.5	4.0
80 mm	4.0	4.5
100 mm	4.5	5.0
150 mm	5.0	6.0
200 mm	6.0	6.5
250 mm	7.0	8.0
300 mm	7.0	9.0
350 mm	7.5	9.5
400 mm	8.0	10.0

Velocity in pipelines shall be considered as follows:

Air : 12 m/sec (max.)

D. ERECTION, TESTING AND COMMISSIONING

1. The erection of all plant and equipment shall be carried out according to the latest engineering practices and according to the drawings, specifications, Instructions etc. duly approved by the Purchaser/Consultant.
2. The Contractor shall supply all required manpower, tools and related equipment, all hoisting equipment, all necessary scaffoldings, all necessary transporting equipment, consumables. Construction and erection materials, petrol, diesel oil, kerosene, solvents, sealing compound, tapes, brazing and soldering materials, welding and brazing gases, erection bolts, nuts and packing sheets/compounds, temporary supports, wooden blocks, spacers, templates, jute and cotton wastes, sand/emery paper etc. as required for the satisfactory completion of work.
3. After erection, all equipment having moving part, subject to pressures or voltages shall be given trial operation. The trial operation shall consist of 72 hours of continuous operation. All modifications and rectifications required during the trial operation or required for proper operation shall be done at his own cost by the Contractor as accepted by the Purchaser/Consultant.
4. Rotating equipment shall be checked for proper direction of rotation and shaft alignment. Equipment subject to pressures shall be carefully examined for leakage. All equipment, such as pressure taps, temperature measurement connections, flow measurement devices etc. shall be provided by the Contractor.
5. Before giving call for final inspection, all the documents shall be furnished to the Purchaser. The record of manufacturing details, inspection and tests carried out by the successful Bidder shall be made available to the final inspecting authority. However, approval and final inspection at the manufacturing works shall not relieve the successful Bidder of responsibility of replacing at his cost any defective part/material which may be detected by the purchaser during erection and commissioning or guarantee period.
6. All materials required for fabrication, construction, testing and inspection shall be supplied by the Contractor. No material shall be free issue to the Contractor.
7. No equipment or part item shall be dispatched without final inspection and issuance of inspection certificate.
8. All equipment, assemblies, sub-assemblies shall be shop tested as per relevant standards and the test certificates shall be submitted by the supplier.

E. PREFERRED MAKES

1. ELGI EQUIPMENTS LTD Kolkata-
2. AERZEN MACHINES (INDIA) PRIVATE LIMITED
3. Ingersoll Rand,
4. Atlas Copco
5. Kirloskar Pneumatic,
6. Chicago Pneumatic,
7. Eliat,

8. Cooper,
9. Sulzor,
10. Corken (USA)

In addition to the above makes , any other manufacturer may be acceptable subject to approval of the Purchaser / Consultant.

DRAWINGS/DOCUMENTS TO BE FURNISHED

The Successful Bidder shall submit the following drawings/ documents: -

a) Along with the tender

1. Process flow diagram indicating the consumption figures complete with temperature, pressure and quality requirements.
2. P&ID of each circuit of the complete showing all the consumers, flow rate, pipe diameters, broad parameters of each equipment, instruments, interlocks, etc.
3. Pipeline materials and specifications considered for various systems.
4. General arrangement drawings of pump showing tentative dispositions of various equipment and piping.
5. Catalogues, literatures and GA drawings of all equipments and valves.
6. List of special tools and tackles.
7. List of commissioning spares.
8. List of spares for two years of normal operation and maintenance with item wise prices.
9. Specification and capacity of all equipment, valves etc. offered by the Tenderer.
10. Details of various drives, instruments, handling & hoisting facilities, air conditioning & ventilation facilities, etc.
11. Tentative Bill of Quantities covering all equipments, valves, strainers, pipelines, etc. and associated civil, structural, electrics, instrumentation, handling & hoisting facilities, air conditioning and ventilation facilities etc.

b) For Approval

1. Process flow diagram indicating the consumption figures complete with temperature, pressure and quality requirements.
2. Process & instrumentation diagrams for the various systems indicating location of all instruments, alarms and interlocks functions using ISA symbols.
3. List of instruments comprising bill of materials and instrumentation data sheets.
4. Layout of piping system indicating pipe routing, location of supports, valves and other fittings as required.
5. Data sheets, characteristic curves and technical details of all the equipments, valves and piping.
6. List of safety interlocks.
7. Test procedures for preliminary and final acceptance tests.
8. Quality Assurance Plan.
9. All equipment and piping sizing calculations.
10. Test certificates for the following:
 - Material test certificate for all major equipment and their components.
 - Hydraulic test of equipment, pipe fittings & valves.
 - Static and dynamic balancing of all rotary parts/ equipments
11. Any other drawing/ documents as required by the Purchaser.

b) For Reference and Record

1. The successful Bidder shall submit required sets of all the approved drawings, documents and manuals for Purchaser's record and use. After erection of equipment, the Contractor shall submit one set of linen tracings/ reproducible in required number of prints along with soft copies in CD (in AutoCAD format) of each "As built drawings".
2. Operating and maintenance manual.
3. Spare parts recommendation and price list.
4. Instruction for erection, testing and commissioning.
5. Manufacturer's test certificates.
6. Lubrication schedule and quantity and quality of lubricant for one year's normal operation.
7. Various equipment assembly drawings and bill of material.
8. Welding procedure.
9. Hydraulic test logs.
10. Equipment GA drawings and bill of materials.
11. Characteristics curves of the pumps, motors and other equipments.
12. Operation and maintenance manuals for all equipments, valves along with soft copies.
13. Test and calibration certificates.
14. Warranty/ guarantee certificates.
15. Technical literature, catalogues and manufacturer's drawings for all brought out equipment, valves and other items.
16. All inspection/ test report/ certificates.

Any other drawing/ documents as required by the Purchaser / Consultant.

04.05 CIVIL WORK

04.05.1 Site Visit

Before submission of tender, the Bidder shall inspect the site to study the nature and extent of work involved and also to obtain first hand information regarding site condition. The Bidder shall consider all such aspects in the quoted rate carefully and no claim whatsoever shall be entertained later on the plea of ignorance of site conditions.

04.05.2 Soil Characteristics

In the absence of the Soil investigation of the designated area net allowable bearing capacity of 18 t/sqm was considered at a depth of 2m from FGL .After the investigation was carried out the same will be provided to bidders . Parties may refer the document for information. No pile foundations are envisaged.

04.05.3 In the event of any discrepancies between drawings and specifications, it may be noted that drawings shall supersede the specifications. Similarly in case of any discrepancies between description in

- a) Drawings
- b) Schedule of items(BOQ)
- c) Specifications

the provisions in the schedule of items shall prevail.

04.05.4 Working Drawings

Three copies of working drawings shall be issued to the successful Bidder for construction purposes. Drawings shall be issued in phased manner conforming to detail project schedule and review of site progress from time to time. Contractor shall submit monthly programme for execution of works for various units in advance to facilitate smooth flow of drawings.

04.05.5 Bench Mark

Standard bench mark reference pillar indicating the absolute level and reference axes shall be indicated to the contractor. Contractor shall construct all other survey pillars required by them for survey work with reference to the bench mark pillar. Contractor shall take all precautions to protect the survey pillars from being damaged / dislocated during progress of work, by providing suitable barbed wire fencing around the survey pillars.

04.05.6 Site Instruction Book

For issuing site instructions to contractor by purchaser/consultant, the contractor shall maintain triplicate order books with pages numbered. All written site instruction shall be given on this book which shall be signed by the contractor as token of his acceptance of the same. One carbon copy of the instruction shall be left in the book for contractor for his taking necessary action and record. Any instruction given to the contractor in the order book shall have the same force as that of any instruction conveyed to the contractor through a registered letter.

04.05.7 **Dimensions**

Figured dimensions shall prevail in preference to scaled dimension. Large scale details will supersede small scale details shown in drawings. In case of discrepancy between the two, the contractor shall obtain clearance of engineer before proceeding with work.

04.05.8 **Sequence of work**

Contractor shall plan the sequence of all works so as to achieve the desired progress keeping in mind overall safety and stability at all points of time.

If due to a particular design or specification or availability of machines or any other reason, a particular sequence of operation is demanded by the engineer due to which some interruptions are inherent to any one or more types of work or items of execution, then no claim for such interruption shall be entertained and contractor shall have to follow the sequence as instructed by the engineer.

04.05.9 **Damages**

Any existing services or other properties if damaged or demolished during the course of execution either willingly or negligently, shall be repaired and re-erected to its original shape & size by the Contractor at his own cost.

The Contractor will take all precautions against damages due to rain and storm and no liability shall rest with the purchaser for any loss for redoing of any work on this account.

Existing underground services coming in the way of trench or foundation excavation etc. have to be adequately supported by the Contractor at his own cost so as to avoid any damage to those services. In case of any accidental damage, the Contractor shall arrange to rectify and reinstall those services immediately at his own cost.

04.05.10 **Quality Assurance**

- a) To ensure quality of construction, the contractor shall ensure inspection and testing of all materials and works at his own cost conforming to specifications.
- b) All defective materials / works which do not conform to the specifications shall be rejected / dismantled and removed from site by the Contractor at his own cost.
- c) The Contractor shall provide a site laboratory with equipment and shall maintain and engage qualified technical personnel at site to run the laboratory at his own cost. All routine tests shall be conducted at site.
- d) For those tests which are not possible to be carried out at site laboratory, Contractor shall arrange to send requisite samples to approved laboratory outside the site and get those tested as required entirely at his cost.
- e) Before starting any concreting or erection work at site, the stage passing certificates have to be obtained from the engineer in the formats prepared after mutual discussion and agreement.
- f) Before covering up any work within excavated pits, clearance has to be taken from engineer in respect of completion of said works as per drawing and specification.

04.05.11 **Construction Materials**

- a) All construction materials needed for civil works shall have to be arranged and procured by the Contractor. Unless otherwise specifically mentioned in the Schedule of Items,.
- b) Responsibility for ensuring the quality materials shall rest with the Contractor. If the contractor uses the materials without any check on quality which may result in poor quality work, then removing and redoing such defective works shall be at contractor's cost. No claim whatsoever shall be entertained later.
- c) Tools, tackles & labour: The contractor shall make his own arrangements for all tools, tackles and labour including hutment etc. The successful Bidder has to make own arrangements for water and power required for construction and other purposes.

04.05.12 **Safety**

The Contractor shall ensure that the safety requirements are met in respect of men, materials, adjoining structures, equipment etc. and shall be totally responsible in case any mishap occurs due to negligence or otherwise. In this connection the contractor shall strictly adhere to the rules norms and regulations as applicable..

04.05.13 **Scope of Work**

The scope of work relating to this package is to execute all the civil engineering works pertaining to following buildings at ground level on item rate contract basis.

Major units and facilities and its indicative sizes are given below:

1. Compressed Air Station (24m L X 12m W X 6.5m H)
2. Water tank at Hill Top (25m L X 25m W X 4m D)at +215m level
3. Mixing tank (11m L X 11m W X 4m D) at ground +150m level
4. Drinking Water collection tank (2.5m L X 2.5m W X 2.5m H with staging height of 4m) at +150m level
5. Pipe pedestals (Approx 110 No) as per requirement
6. Pits for cooling tower, 2 Nos 6m X3.5m X 3.0m
7. Bunker Building ((12m L X 6m W X 17m H)
8. Electrical Buildings (Two in No)
 - MRS ((24m L X 9m W X 8m H), G+1 , Switchyard : 45m X 8m
 - LT (12m(L) X 16m(W)X4.5m (H)
9. Building for Winder House (15m L X 12m W X 12m H)
10. FAN House along with evasse, 2 in No (7m L X 7m W X 5m D)
11. Banks man cabin adjacent to the vertical shaft (3m L X 3m W X 4m H)

04.05.14 **Specification for Civil Work**

All civil works shall be as per latest CPWD standards. However, for specification of Civil works not available in CPWD standards, specification shall be shall be as per relevant IS standards.

04.05.15 **Other Contract Conditions**

- a) Basically this is being an item rate contract, payments for the works executed

(applicable for permanent works) will be made as per items provided with Bill of Quantities. Bidder to quote the item rates suiting to the descriptions provided with BOQ.

- b) The Bidder shall be deemed to have satisfied himself as to the accessibility to site by existing roads and feasibility of taking material and equipment to the site of work and suitability of site for the proposed work.
- c) Before submitting their quotations, the Bidder is advised to study all drawings, specifications and documents enclosed with the tender and also visit site and acquaint himself of all the conditions prevailing at site. After acceptance of tender, no claim whatsoever shall be entertained on ground of ignorance of site condition/special local working conditions etc.
- d) The Bidder may obtain clarifications, if any, from the office of Purchaser to understand the completeness of work before submission of his offer.
- e) The contractor shall submit samples of various bought out items, materials, etc. for approval of Purchaser before procurement of the same for use in works.
- f) Contractor shall arrange to make all temporary roads, stores, underground vats for soaking of bricks, office, labour colonies and other enabling facilities as required by them at their cost and maintain the same till completion of the contract and dismantle all temporary facilities and clear the debris from site after which the final payment shall be released to the contractor. However, before taking up construction of any temporary facilities, prior approval of Purchaser shall be obtained.
- g) The Contractor shall not offload the contract or part thereof to any sub-contractor without written permission of Purchaser. Any approval given by the Purchaser for sub-letting of work shall not absolve the contractor of his responsibility/liability under the obligation of the contract.
- h) Purchaser may, during progress of work, order the removal of part / whole of such work already executed that is found not to be in accordance with drawings and/or specifications / instructions. No extra claim shall be entertained for re-executing or altering of such works. Similarly any materials brought to site and rejected by Purchaser shall be removed from the site by the contractor immediately at their own expense.
- i) One reference benchmark pPurchaser from where the survey lines and levels are to be extended by the contractor. Contractor shall provide and carryout all survey work as required for laying out the premises properly and carryout the work throughout to true lines and levels as indicated in drawing and specification. All survey works to be done shall be in the scope of contractor.
- j) All testing of samples, works as required for ensuring proper quality, shall be carried out by the contractor as per instruction of Purchaser. All these tests shall be carried

out by the contractor at their own expense. All manufacturers' test certificates received by contractor for various materials and guarantees etc. shall be passed on to Purchaser.

- k) The contractor shall be held responsible for proper performance of the entire work for a period of one year after issuance of completion certificate by Purchaser. Any defects as may be noticed during such period shall be attended to and made good by the contractor at their own expense. In case the contractor fails to carry out such rectification in time, Purchaser reserves the right to get the rectification work done through other agencies at the risk and cost of the contractor.
- l) The contractor shall work in close coordination with other agencies working at site and shall not cause any hindrance in their work.
- m) If due to design or other stipulations in the bid or requirements at site, a particular sequence of overall construction has to be followed due to which certain interruptions to any one or more items of work are inherent, no claims for such interruptions will be admissible.
- n) The enclosed bid documents are deemed to be sufficient for the bidder to assess the nature and quantity of work involved and to quote his prices for the above job. No price increase on account of deviations from the bid documents will be admissible.
- o) All handling and transport charges of raw materials including double handling as required for completion of the work in accordance with time schedule are deemed to be included in the quoted rates.
- p) If assistance is required by Contractor in obtaining permits/proprieties in allotment of controlled/scarce materials if any, the same may be extended by Purchaser by way of issue of recommendation letter, essentiality certificate etc., to Government Authorities. Delay, if any, in obtaining the materials will not constitute a ground for claiming any compensation or extension of time. However, on being satisfied such delay may be taken into account by the Engineer, for grant of extension of the completion of milestone (s). Decision of the Engineer on this regard shall be final, binding and conclusive.
- q) The Contractor shall at his own cost properly store all materials brought by him to the work site to prevent damage due to rain, wind, direct exposure to sun etc., and also from theft, pilferage etc. The Contractor shall maintain stocks of all materials required by him for proper & speedy execution of work for at least three months' normal consumption.
- r) The Contractor shall provide his own measuring/surveying equipment for carrying out the entire work.
- s) The contractor shall be held responsible for setting out, leveling and aligning work at his own expense.

- t) Should the Contractor wish to deviate from any specifications or details shown on the approved drawings and/or Technical Specifications, he shall obtain written approval from Purchaser before carrying-out such deviations.
- u) The contractor shall follow all safety norms throughout the period of work. Provisions of Bureau of Indian Standards and other sound engineering practice shall be followed for the same. The contractor shall also abide by the safety regulations of the owner and other directives given by the engineer from time to time. The contractor has to depute a qualified safety engineer. Many times it may so happen that the working hours might be drastically reduced or increased to meet certain safety requirements and the contractor shall be bound to meet these requirements without any arguments for time and financial implications.
- v) The contractor shall take all precautions for rains, storms etc. and no liability shall rest with Purchaser for any loss on cost of re-erection, rectification etc. due to these factors.
- w) Contractor shall make all arrangements for accommodation of their staff and labour at their own cost.
- x) The contractor shall not use any explosive in the works without written permission from Purchaser. If permitted, the contractor shall follow all statutory safety norms for use of explosives, storing in magazines etc. and employ licensed blaster for carrying-out such operations.
- y) The contractor shall not remove any material or equipment from construction site without written permission from Purchaser.
- z) Bidders shall spell out in detail Quality Assurance.

04.05.16 **Rate for Extra Item & Measurement of Work**

a. **Rate for Extra Item**

In case it is found necessary to execute any item of work which is not included in the schedule of items, the rates for such extra item shall be fixed as per the following procedure.

- Where the extra works are of similar character and/or executed under similar conditions as any of work appearing in the schedule of quantities, then the rates for such extra item shall be derived from the contract rates of similar/closest item of work provided.
- Where the nature of extra item is such that the rate for the same cannot be derived as per procedure(a) above, then the rate shall be established based on the market rates and taking into account ~~10%~~ 15% over cost of labour and materials to cover supervision, overheads

and profit. The labour material and other such coefficients/factors may be adopted from CPWD Analysis of rates for such items

b. Measurement of work

Measurement of work shall be carried out from the working drawings/sketches issued by purchaser and mode of measurement shall be as specified in this document or as per CPWD. However the latest IS: 1200 can be followed for items not covered in CPWD specifications

The civil BOQ is as below:

DSR no	Item no	Item description	Unit	Total qty
2.6.1	EW-1	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains , including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. (Working space beyond foundation shall be considered for payment as indicated in CPWD specifications for all earth work items)		
		In all kinds of soil	cum	1900
2.11	EW-2	For excavation for depth exceeding 1.5 m up to 3m .		
		In all kinds of soil	cum	500
2.12	EW-3	For excavation for depth exceeding 3m up to 4.5m .		
		In all kinds of soil	cum	150
	EW-4	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge.		
2.7.1		In ordinary rock	cum	600
	EW-5	For excavation exceeding 1.5 m in depth and up to 3m		
2.11		In ordinary rock	cum	200
2.12	EW-6	For excavation for depth exceeding 3m up to 4.5m .		

		In ordinary rock	cum	100
	EW-7	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means in foundation trenches including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge.		
2.7.2		In hard rock requiring blasting	cum	600
2.11	EW-8	For excavation in foundations exceeding 1.5 m up to 3m depth		
		In hard rock requiring blasting	cum	200
2.12	EW-9	For excavation for depth exceeding 3m up to 4.5m .		
		In hard rock requiring blasting	cum	100
2.25 and 2.26.1	EW-10	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 3.0 m.(Payment for filling will be made for the qty of authorised excavation)	cum	1500
NS	EW-11	For back filling of foundations beyond 3m up to a depth of 4.5m	cum	200
1.1.2	EW-12	Transportation, carriage and disposal of surplus excavated earth, soft/ decomposed rock up to a distance of 3KM , including loading, unloading, stacking, levelling, dressing etc. by mechanical or manual means with all bye-works complete as per specification and instruction of the engineer	cum	1200
NS	EW-13	Earth work in excavation for cutting at locations of buildings to required level including disposal of earth to low lying areas including leveling compaction up to 1 KM distance	cum	62000

		Section –(CC)PLAIN & Reinforced Concrete		
		Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant Engineer-in-charge Note : Excess/less cement used than specified in this item is payable/ recoverable separately. All works up to plinth level		
4.20.1.2	CC-1	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum	cum	420
4.20.1.1	CC-2	M-15 grade plain cement concrete screed over roofs etc. (cement content considered @ 240 kg. /cum)	cum	95
5.37.1	CC-3	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying , excluding the cost of centering, shuttering finishing and reinforcement, including cost of admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer-in-charge per approved design mix, including pumping of concrete to site of laying but excluding the cost of entering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/recoverable separately)	cum	740
5.37.2	CC-4	All works above plinth level up to floor V level	cum	370

5.34.1	CC-5	For providing richer mixes at all floor levels. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum	cum	1400
5.35	CC-6	Add for using extra/deduct for less cement in the items of design mix over and above the specified cement content therein.(Applicable for all items of concrete)	quintal	1500
5.22.6	CC-7	Steel reinforcement for R.C.C. work including cost of steel, transportation to site, storage, straightening, cutting, bending, placing in position and binding all complete up to plinth level.	MT	302
	CC-8	Centering and shuttering including strutting, propping etc. and removal of form for all heights :		
5.9.1	a)	Foundations, footings, bases of columns, etc. for mass concrete	Sqm	700
5.9.2	b)	Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc	Sqm	3000
5.9.3	c)	Suspended floors, roofs, landings, balconies and access platform	Sqm	1960
5.9.5	d)	Lintels, beams, plinth beams, girders, bressumers and cantilevers	Sqm	950
5.9.6	e)	Columns, Pillars, Piers, Abutments, Posts and Struts	Sqm	450
5.9.7	f)	Stairs, (excluding landings) except spiral-	Sqm	60
5.9.15	g)	Small lintels not exceeding 1.5 m clear span, moulding as in cornices, window sills, string courses, bands, copings, bedplates, anchor blocks and the like	Sqm	10
5.9.19	h)	Weather shade, Chajjas, corbels etc., including edges	Sqm	5

5.11.1	i)	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc., including cost of de-shuttering and de centering at all levels, over a height of 3.5 m, for every additional height of 1 metre or part thereof Suspended floors, roofs, landing, beams and balconies (Plan area to be measured)	Sqm	2500
		Section –BRICK MASONRY (MN)		
NS	MN-1	Brick work with non modular fly ash bricks conforming to IS:12894,class designation 10 average compressive strength in foundation up to plinth in :Cement mortar 1:6 (1 cement : 6 coarse sand)	cum	50
6.34.2	MN-2	Brick work with non modular fly ash bricks conforming to IS:12894,class designation 10 average compressive strength in super structure above plinth level up to floor V level in :Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	425
6.45.2	MN-3	. Half brick masonry with non modular fly ash bricks of class designation10, conforming to IS :12894, in super structure above plinth and upto floor V level Cement mortar 1 : 4 (1	sqm	170
		Section –MISCELLANEOUS (MS)		
10.2	MS-1	Providing and fixing mild steel inserts made from plates , angles, pipes, round holding down bolts with nuts and washer plates complete.	kg	3500
NS	MS-2	Supplying and providing good quality granite boulders of 250 mm thick below floors using boulders of 200mm size including all bye works as per specifications and instructions of engineer in charge	cum	250
4.17	MS-3	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	sqm	170

22.6	MS-4	Providing and laying water proofing treatment on roofs of slabs over screed concrete laid in slope 1:100 (screed concrete will be paid under separate item) by applying cement slurry mixed with water proofing cement compound of reputed make like consisting of applying	sqm	1200
		a) after surface preparation, first layer of slurry of cement mixed with water proofing cement compound as per manufacturer specification		
		b) Laying second layer of Fibre glass cloth when the first layer is still green. Overlaps of joints of fibre cloth should not be less than 10 cm.		
		c) third layer of 1.5 mm thickness consisting of slurry of cement mixed with water proofing cement compound as per manufacture specification. This will be allowed to air cure for 4 hours followed by water curing for 48 hours.		
		d) fourth and final layer is 25mm thick protective screed to be laid in panels by providing chicken wire mesh. For the purpose of measurement the entire horizontal surface area will be measured. The product performance shall carry guarantee for 10 years against any leakage		
22.22	MS-5	Providing and mixing integral crystalline admixture for waterproofing treatment to RCC structures like water tanks, at the time of transporting of concrete into the drum of the ready-mix truck, using integral crystalline admixture @ 0.80% (minimum) to the weight of cement content per cubic meter of concrete) or higher as recommended by the manufacturer's specification in reinforced cement concrete at site of work.	kg	1400
	MS-6	Providing and fixing in position 25mm thick pre-moulded joint filler in expansion joints	sqm	30

04.06 ROAD WEIGH BRIDGE

04.06.01 GENERAL

Weigh Bridge shall weigh the mined out copper ore which will be transported to Mosabani Beneficiation plant for further concentration from Chapri Mine

04.06.02 Intent & Specifications

- a) The intent of this specification is to enable the tenderer to submit comprehensive offer for design, supply, civil work, erection, testing, stamping by Weights & Measures Department of Jharkhand state and commissioning of 100 T road weigh bridges for weighment of miscellaneous road vehicles viz. trucks, dumpers, tippers, trailer etc. carrying incoming/outgoing materials for which technical specifications are indicated
- b) 02.02 In case of any increase or decrease in no. of weighbridges, bidder shall be informed during tender discussions.
- c) 02.03 The intent of this specification is to appraise the bidder of his involvement / commitment for this package to enable him to submit a detailed comprehensive offer as specified in this document. The bidder shall base his offer on the information contained in this specification.
- d) 02.04 The bidder shall study the specification along with related documents and satisfy himself thoroughly regarding suitability of the plant and equipment and system, specified in the tender document and take full responsibility for guaranteed operation of the equipment with respect to output, reliable working as well as ease of operation, inspection and maintenance including replacement with minimum down time.

- e) 02.05 All equipment / system shall be complete in all respects and any equipment or accessories not covered in the technical specification but essential for proper design and operation shall be deemed to be included in the scope of the tenderer.
- f) 02.06 The bidder shall satisfy himself before submission of the offer, the nature and location of work place, kind of equipment, facilities, service, etc. needed during performance of work, general and local conditions as well as all other matters which can, in any way, affect the work covered in this specification.
- g) 02.07 If the tenderer needs any clarifications in respect of any point of this specification, he may do so, by submitting a letter in duplicate to the Purchaser sufficiently in advance before submitting the tender.
- h) 02.08 The successful bidder shall be responsible for coordinating the supplies covered in the different parts of this specification from different sources and execute the contract within agreed time schedule.

The bidder shall endeavor to use maximum indigenous equipment / facilities which may be available in India / be manufactured in India by Indian associates based on manufacturing drawings to be supplied by the bidder / his sub-suppliers. If any component of the equipment is to be imported, the same shall be arranged by the supplier. No foreign exchange or import license for import of equipment, component, spares or raw materials will be arranged or provided by the Purchaser.

- i) All the equipment and supplies shall be suitable for the tropical climatic conditions prevailing at HCC Chapri site.

04.06.03 INSTRUCTIONS TO TENDERERS

- The execution of civil works shall be supervised by the supplier, irrespective of whether the civil work is executed by themselves or by their sub-agencies.
- The successful tenderer shall be the sole custodian for all the items received at site till commissioning and handing over to the Purchaser. He shall also be solely responsible for any loss/damage of equipment during this period.

04.06.04 Price of Equipment

- i. The price shall include cost for design, engineering, supply, Civil works, erection, testing, stamping by Weights & Measures Department and commissioning of weigh-bridges complete with civil & structural work for weigh bridge room along with necessary spares. Bidder is requested to give break up price along with installation charges and necessary civil works for construction of weigh room.
- ii. Item wise prices and weights for essential and other spares necessary for two years operation & maintenance shall be submitted by the bidders. However prices for the same shall not be included in the contract price.

04.06.05 SCOPE OF WORK

- a) The scope of work shall include design, supply, civil work, erection, testing, stamping by

Weights & Measures Department Orissa and commissioning of 100T Road weighbridges, construction of weigh house including supply of A/C, lightings fittings, furniture, cables, conduits, etc and their laying at each location together with dispatch, loading / unloading / handling of weigh-bridges equipments/materials and its protection during erection, commissioning till final handing over to purchaser. The weigh-bridges specified shall be complete in all respect and all components and accessories required for completion of same (whether indicated or not in the specification) shall be included by the tenderer within the price quoted in the offer.

- b) The tenderer shall include in their offer the civil work required for construction of weigh-bridges, foundations for load cells, approach road, approach ramps and weigh-rooms for housing the consoles, printers etc. The offer shall also include the necessary facilities like lighting (inside and outside), air-conditioning etc. for the weigh-room.
- c) All electrical works for erection/commissioning of the weigh bridges shall be under the scope of the tenderer. A single power supply at $415\text{ V} \pm 10\%$ will be made available within 500 (Five hundred) meters from the weigh-bridges room by the Purchaser. Laying of cables within this battery limit including weigh-bridges and weigh-room shall be within tenderer's scope.

However, an additional unit of online uninterrupted power supply, 2.5KVA with minimum 30 minutes backup time (UPS batteries SMF lead acid batteries) should be provided for uninterrupted operation during power failure at each location. (Preferred make are Emerson/IL Kota/DBpower)

The Electrics for the project will also include L.T. power for 100T weigh bridges, illumination and air conditioning of weigh house.

- d) Arranging tools, tackles and test weights as required for testing / stamping by Weights & Measure Department / commissioning at site on returnable basis and all necessary commissioning spares shall be included in the scope of tenderer. The list of commissioning spares shall be furnished in the tender.
- e) All necessary labour, cranes, transport equipment, welding machines, compressors etc. required during erection, testing, commissioning shall be arranged by tenderer himself.
- f) The bidder shall make arrangement for imparting training to the personnel of employer at site during commissioning of weigh bridges. Also bidder's scope shall include giving training to employers 4 personnel for 6 days at supplier's works.
- g) All the weighing system shall have arrangement facility to connect with LAN system in future.
- h) All the weighing system shall have facility to display and generate report of weighing system (gross weight) through its inbuilt console, simultaneously during weighment independent of PC. Tenderer scope shall also include supply of PC and its peripherals for each weigh bridge for further data processing and to have enhanced storage facility. The supplied hardware and software should work in normal PC.
- i) Control room of all the weigh bridges shall have air conditioner, false ceiling and illuminated through decorative power LED lighting both for indoor and outdoor.

- j) All electrical / electronics equipment / component shall be strictly as per reputed make if not mentioned in TS.
- k) Makes of all bought out items shall be from the reputed makes unless otherwise mentioned in this TS.
- l) Electrical surge and lightning protection shall be provided for load cells and their junction boxes.
- m) All outdoor junction boxes shall be non metallic robust type similar to HENSEL make.
- n) The items offered shall comply with statutory requirements of Govt. of India & Govt. of Jharkhand as well as latest provisions of Indian Electricity rules
- o) The Bidder shall submit test certificates for all the tests conducted during manufacturing and inspection in Three (3) copies along with the supplies. Material test certificates and other relevant technical documents shall be submitted in three (3) copies along with the supplies for each weigh bridge.
- p) The bidder shall inspect the site and satisfy himself regarding the workability of the system and the space available for the same. He will design, construct, fabricate & install equipments accordingly. No claim shall be allowed on the grounds of ignorance of site conditions.
- q) This Specification covers design, manufacture, assembly, testing, packing, supply and transportation to site, erection and commissioning, Stamping and Verification & Fulfillment of P.G. Parameters of all the Weigh Bridges.
- r) The bidder shall study the relevant drawing / specifications and shall visit site, before quoting. The bidder shall be deemed to have studied the complete tender specification and made himself familiar with its contents before quoting.
- s) All the load cell cable will be laid separately in one and half inch size concealed GI conduit pipes from load cell to junction box inside the panel in weighing cabin. This method of cable laying is to be followed in all weighing systems.

04.06.06 TECHNICAL SPECIFICATIONS

- a) **100 T road weigh bridges for weighment of miscellaneous road vehicles viz. trucks, dumpers, tippers, trailer etc. carrying incoming/outgoing materials.**

Basic Requirements

The road weigh-bridges shall conform to the following basic parameters:

- | | | | |
|----|----------------------------|---|------------------------|
| a) | Number required | - | Two (2) |
| b) | Type | - | Electronic (Pit less) |
| c) | Weighing capacity | - | 100 tonne / 100,000 kg |
| d) | Carrying capacity/strength | | 150 tonne |
| e) | Platform | | |
| | - Type | - | Single platform type |

	- Size	- 18 m x 3 m
f)	Minimum load cell / capacity of each load cell	- 8 nos / 45T
g)	Weight range	- 0 kg to 100,000 kg
h)	Resolution /Least count (e)	- Minimum 20 Kg, adjustable type
i)	Accuracy	- +/- 1.5e (e= Resolution)
j)	Weigh indication	- In metric tonne/Kg by a six digit digital display to read 100,000 kg and simultaneously recording and printing. Net weight shall be recorded and printed
k)	Calibration	- Software calibration with auto zero and auto gain
l)	Signal equipment	- Audio and visual warning for over capacity
m)	Ambient temperature	- Maximum 50 Deg.C
n)	Relative humidity	- Maximum 100% (Maximum temperature and maximum humidity are not likely to occur simultaneously).
o)	Mode of weighment	- Stationary
p)	Weigh room	- Common weigh room for the 2 road weighbridges.

b)

Equipment Details

In general all the equipments and facilities of 100 T road weigh bridges shall meet the parameters laid down below. These weigh-bridges should be supplied, erected and commissioned in complete in all respect as a individual units and should have all the facilities indicated below.

System

- I. The system shall be made of electronic integrated circuits consisting of micro-processors with high operational reliability, long life and standardized connections. The micro-processors shall be based with programming facility for auto calibration with auto zero and auto gain
- II. The system shall be capable of being interfaced with a computer situated at a distance apart.
- III. The best achievable accuracy under the most difficult operating conditions shall be indicated.
- IV. Stopping, re-starting, acceleration and deceleration of auto vehicles, rolling back are likely to occur on the weigh-bridges platform. The system shall be capable of absorbing the effects of these actions and sudden impact load.

Frame and Platform

The frame shall be of rigid construction to resist vibration. All load carrying structures shall be designed for heavy duty and shall be of adequate section to resist permanent deflection. The frame work shall be strong enough to resist side way movement both in longitudinal and transverse directions. The provision of tie rods and constrainers are to be

provided suitably. Structural platform design calculation of the weigh bridges to be submitted and approved.

For Road Weigh Bridges 3 m approach slab shall be provided on both sides of the platform. Further the ramp on both sides shall have slope of approx. 1 in 20. Similarly, there should be minimum 650 mm gap between PCC and the bottom most part of the platform structure. For road weigh bridges, the cover plate is to be fixed on the platform by welding in place of bolting.

The platform shall be covered with checkered plates of adequate strength. Capacity, strength, weight, size and materials of platform shall be mentioned.

Load cells

Load cells shall be of internationally reputed make viz. HBM, Molen, Rice Lake, Flintec, Siemens, Sartorius Mechatronics, Schenck, Vishay transducers, sansotronics confirming to OIML / NTEP standard. Also, load cells shall be of conventional strain gauge type and shall have in-built surge protection devices. They shall have adequate overload capacity. Test certificate of each load cell is to be provided along with calibration details

Load cells shall be hermetically sealed to prevent moisture and dust penetration. Smooth and flat bearing plates shall be used in contact with spherical load points and shall be provided with load cells. These plates shall be of carbon steel hardened to RC 50-55 and of minimum 25 mm thickness. In addition, a mounting plate of steel of adequate thickness shall be provided below the load cell.

Load cells shall be splash and dust-proof. The enclosures shall conform to protection category IP 68. These shall be environmentally insensitive against damp and pollution and should be temperature compensated as they may be subjected to large temperature variations from 0° to 55°.

Output signal from the load cells shall be large enough to make it insensitive to the electrical disturbances.

Load cells shall be capable of giving very accurate readings throughout their range with error being less than 0.02%. They shall be calibrated such that they transmit a standardized output signal of specified accuracy throughout the temperature and load ranges.

Electronics

a) Digital Weight Indicator (DWI)

- Micro processor based with memory to store weighment data for more than 2000 vehicles.
- Should have min 25 mm digital display and real time clock to display date and time.
- Shall be enclosed in a sealed cabinet for preventing manipulation.
- Should have built in high degree of protection against all forms of electromagnetic & radio frequency interfere.
- Analog test zero and test range signal shall be available built in to the systems.
- Facility to permit individual load cell adjustment.

- Shall have automatic zero maintenance and asymmetric load compensation.
- Shall have diagnostic test facility.
- Analog input, dual slope analog digital converter with filter.
- Auto zero maintenance feature for eliminating the need of frequent zero setting should be 0-250 kg.
- The range of manual zero switch should be 0.05% to 0.5% easily selectable.
- The range of tare switch should also be selectable type.
- Make of weighing electronics shall be from HCC's latest preferred make list unless otherwise mentioned in this TS

b) Computer requirements for each weigh bridge

1. The following are technical specification for computer hardware, operating system, application software and networking deliverables required for each weigh-bridge in their respective location. The load cell signals will be connected to the Digital Weight Indicator system. Only serial communication line from Digital Weight Indicator will be connected to the PC.

2. Personal Computer minimum configuration:

Intel Core-I3 / I5 Processor, 3 GHz or above, 4 GB Ram, 320 GB Hard Disk, Combo Drive: CD R/W And 12x DVD, 104 Keys Keyboard, Optical Mouse, Ethernet LAN Card 10/100/1000, 19" TFT colour monitor, 1 Serial Port, 1 Parallel Port, 4 USB Ports, Operating System – Windows 7 Professional with media and license, Antivirus Software: Norton/ McAfee / Etrust or Equivalent (Latest Version) with media and license. However, model shall be latest at the approval stage.

(Permitted Make: Hp / Lenovo / Dell)

3. Serial card to be fitted inside the PC

PCI based 4-port RS-232 serial interface card, with surge protection, with connection cable having 9 pin D-type connectors. Driver software with media for this card.

(Permitted Make: Advantech/Specialix/Dlink/Moxa)

4. Dot Matrix Printer:

9 pin, 136 columns, 128 character set, NLQ traction cum friction feed, Cables & Connectors, speed-360 cps draft at 12dpi/100cps LQ at 12 dpi

(Permitted Make: WEP / TVSE)

5. UPS for each PC :

600 VA line interactive with surge protection with necessary cable, connectors.
(Permitted Make: APC / WEP / TVSE / Emerson)

6. Application program with menu, data input screen, printing of weighment report as per HCC user requirement is to be supplied for computerised operation of the weigh-bridge system. The bidder to discuss with HCC user during detailed engineering.
7. Communication requirement specification between Weigh-Bridge-Controller and PC
 - a. The bidder has to make available at least one RS-232 serial port in each Weigh Bridge Controller exclusively for connection of PC.
 - b. The RS-232 port serial cable pin connection details are to be provided by the bidder.
 - c. The bidder has to supply Communication Cable, with matching connectors for serial communication of Weigh-Bridge controller to PC-Com port for each supplied PC.
 - d. Protocol details: RS-232 communication hardware and software protocol details such as Baud-Rate, Parity, Data-Width, Stop-Bit, whether communication is on interrogation from the PC or on continuous output from the Weigh Bridge Controller. Exact data exchange formats for receiving of weight data from the PC to server are to be provided by the bidder. Bidder may note that continuous serial output from Weigh-Bridge-Controller is preferable.
 - e. The bidder has to provide a Personal Computer based test program (preferably in Visual Basic or Visual C++) along with the source code which will demonstrate weight receipt when run on the PC.
 - f. There has to be facility to send the weighment details over FTP to the SAP server.

d) Reports

- Automatically calculated net weight to be printed along with customer information, material information (type/source), gross and tare weight along with time, date, serial no. etc.
- Creation of reprints/list prints on the basis of:-
 - a) Date Wise
 - b) Vehicle wise
 - c) Material wise
 - d) Customer wise
 - e) Month and year wise
 - f) Car No. wise. Etc. as per shop's requirement

e) Auxiliary Equipments (for each weigh bridge)

- On line uninterrupted power supply system (UPS 1 Nos.) of required rating based on MOSFET Technology, PWM type inverters, with min 1/2 hr. battery back up.
- Battery shall be SMF with lead acid batteries.

Miscellaneous

The bidder shall include in his offer the miscellaneous facilities such as electrical, AC. 2 nos. (1.5 t capacity split type), 36” ceiling fans- 2 nos., 2 nos. table, 4 nos. chairs and indoor & outdoor illumination with decorative LED lighting etc. for each weigh room. In case of common weigh room one additional table to accommodate PC & printer shall be provided.

Proper earthing of all electrical installation will be carried out as per IE rules and IS: 3043. Special RF earthing will be provided for electronic installation. Separate earthing for power and electronics should be provided. Earthing to be done separately for each weigh bridge. Bypass jumpers to be provided for each load cell. All electrical and electronic equipments shall be designed for prevailing climatic conditions of Orissa and adequate protection against environmental pollution, humidity, voltage traction system, line transients etc. Lightning protection shall be provided to avoid damage / mal functioning in the equipment. Protection shall be provided for all the sub system like load cells, weighing system electronics, JBs, PC & Printer, Power equipment and battery back up etc.

Protection shall be provided at different stages as detailed below:

- i. Power line protection at distribution level.
- ii. Power line protection at equipment level.
- iii. Protection for power / signal / data lines.

The common weigh room of the weigh-bridges shall have minimum 1 no. CO₂ (4.5kg capacity) and 2 nos. DCP portable fire extinguishers (6kg capacity) to cope up with fire as fire fighting facilities and to be supplied by the bidder as part of the package. The extinguishers shall be conforming to IS:15683-2006.

General

All parts of equipment shall be easily accessible for maintenance/removal.

Adequate arrangement against over loading shall be provided with audio and visual signal.

Necessary tools required for normal maintenance shall be supplied with the equipment.

Safety devices shall be provided to protect the weighing and processing system against impact loading and to comply with the requirements of statutory regulations.

Workmanship

All components of the weigh-bridges shall be manufactured with materials of tested and approved quality and of best workmanship. The weigh-bridges shall be shop assembled for

checking accuracy of parts except where the assembling is required to be done at site. A certificate to this effect shall accompany the equipment when delivered.

Painting

All items of weigh-bridges shall be thoroughly cleaned and painted with two coats of red oxide primer. The type and colour of finish paint to be used will be finalised at the time of placement of order.

Mechanical contact surface, if any, shall be treated with anti-corrosive coating.

Stamping and Verification

The weigh-bridges shall be got verified and stamped at the place of installation from Weights and Measures Dept. of Jharkhand by supplier as required under Weights and Measures Act.

Civil Works

This section of the specification covers entire civil engineering work for buildings, technological facilities described elsewhere in this specification on a Turnkey basis for Road Weigh bridges

The proposed facilities are to be installed in an area near Chapri Copper mining area at Ghatshila, Jharkhand and of HCC. The bidder has to visit the site and acquaint himself of the site condition and collect all such data as may be necessary for preparation of his offer. The scope shall cover complete civil engineering work for the proposed plant within its battery limit, on turnkey basis including design supply of all materials and execution. No extra claim whatsoever, on account of site condition/ non-availability of data shall be entertained.

01.02 OPEN FOUNDATION:

01.02.01 Design Net Allowable Bearing Capacity in Soil

- a) The maximum value of Net Allowable Bearing capacity shall be the limited to **10** ton/m².
- b) The above Design Net Allowable Bearing Capacity shall be applicable for any founding depth greater than 2.0 m from TL, neglecting any increase in bearing capacity with Depth.
- c) Minimum depth of foundation is 2.0 m from TL.
- d) The maximum width (B) of shallow foundation shall be restricted to 3.0 m.

- e) The above Bearing Capacities are applicable for adjacent footings with clear spacing not less than their average width.
- f) For Design purpose, Ground Water Table (GWT) shall be considered at TL.

The major civil works involved for installation of the proposed road Weighbridge shall be as given below:-

1. 2 nos. of 100T Road weighbridges

- a. These weigh bridges will have one weigh room for both weigh bridges of tentative size 6mx4m with minimum clear height of 3m above plinth level. The weigh rooms shall be provided with architectural finish and wash basin with mirror and water facility with all-round drain and apron
- b. Approach road (bituminous WMM type as per MORT&H specifications) of length 100m for each weigh bridge on both sides put together. Approach road shall be of 7m width and 2m berm on either side.
- c. 3m approach RC concrete on either side of weigh bridge (In between weigh bridge and approach road)

In addition to the facilities indicated above, provision of electrical and water supply facilities required for completing this package are also under package contractor's scope and if the same is provided by Client, if available, it will be on chargeable basis.

The materials and services shall include but not be limited to the following:

- i. Earthwork for foundations, pits, trenches, basements, tunnels, drains, sumps, sewers, etc. including final grading up to +/-500mm with disposal of surplus earth within 3 KM inside Plant premises.
- ii. Reinforced concrete for raft foundations, spread footings or strip footing, as required in foundations (based on soil report) Channels, tunnels, basements, pits, trenches, sumps, etc.
- iii. Sub-grade work for all foundations, flooring, trenches, pits and other underground structures Floors at ground level shall be minimum 150mm thick over grade slab with 100 mm thick blinding concrete.
- iv. All doors, windows, gates, etc.
- v. Reinforced concrete work in columns, beams, floors, slabs, frames and other superstructures
- vi. All masonry work in superstructure and partition and foundations as required. Masonry work shall be using fly ash cement bricks if available within 50 Km from plant site or using cement concrete solid blocks as per IS-2185.
- vii. All finishing work in flooring, wall-cladding and ceiling.
- viii. All plumbing, rainwater drainage, sanitary sewerage works as required.
- ix. Removal of all materials, cleaning, and handing over of site in a workable manner.

It shall include all works required for completeness of the project. All the materials and workmanship shall conform to relevant Bureau of Indian Standard norms and specifications.

Design parameters

- i. Loading, design of structures, permissible stresses and other design criteria shall generally be in accordance with the latest edition of relevant I.S. Codes and practices, viz., IS – 456; IS – 885; IS – 1893; IS – 2984; IS – 3380; IS – 1886; IS – 432; etc.
- ii. Guidelines on material and workman ship have been given in General Technical Specifications (Civil chapter) and the same may be referred.
- iii. All buildings and supporting structures including connections and foundations shall be designed to withstand the most adverse combination of loads.
- iv. Rigidity of the building structures in both directions and stability of structures for worst combination of loadings shall be ensured. Other precautions like waterproofing, dust proofing, protection from heat, sound and corrosion etc. shall also be considered.
- v. In design of various structures, seismic forces of the proposed site shall be considered in design as required.
- vi. Design and execution of civil works shall be as per relevant IS codes. In design of foundations water table shall be considered at ground level.
- vii. Bidder to submit drawings with calculations, load data in soft (readable & editable) and hard copies for approval. Bidder to use STAAD PRO software for analysis and submit soft (editable) and hard copy calculations for approval.

Concrete and reinforced concrete structures

- i. Concrete and reinforced concrete structures including superstructures and underground construction shall be designed and constructed in accordance with I.S. Codes. However, concrete of following minimum grades shall be used:

Levelling courses	:	M7.5B
Floor PCC	:	M 10B
R.C.C.	:	M 25C
For flooring / paving etc.	:	M 20C grade concrete may be used.
- ii. The mix-design shall be adopted for proper strength, workability and service requirement.
- iii. Additives and retarding agents for concreting. floor hardening additives, acid resisting and integral waterproofing compounds shall be added to the concrete depending upon requirements.

Finishes

- i. All floor finishes shall be as per B.I.S./ as per Architectural specification and shall meet the functional requirements.
- ii. The wall finishes shall be as per B.I.S./ as per Architectural specification and shall meet the functional requirements .
- iii. The roof finishes shall be as per B.I.S./ as per Architectural specification and shall meet the functional requirements

All concrete roofs exposed to weather shall be provided with polymeric water proofing treatment as per manufacturer specifications over base screed laid in a slope of 1:100. Drainage of rainwater from roof shall be ensured by rainwater down comers and proper slope. Water proofing of pit walls and raft shall be considered as per latest technology (polymeric water proofing) of reputed manufacturers like CICO, SICA, FOSROC.

All doors and windows shall be provided as per technological requirements. Doors shall be provided with hydraulic door closures

Drainage and sewerage

- i. All rain water drainage, sanitary, and plumbing system for weigh rooms and open areas shall be provided, as required. Water storage tanks (minimum 1000lit) shall be provided on top of weigh room slabs for water supply. Water point shall be made available by HCC with in 150m from weigh room.
- ii. All service pipelines, water supply, plumbing and other utility pipelines and electrical wiring within the ancillary and auxiliary buildings of RC/ Masonry construction, will be concealed within the masonry, concrete work etc.
- iii. All surface drains shall be covered with pre cast slabs/ gratings, as per requirements wherever necessary.

All drains with in battery limit with connection to main system outside battery limit shall be under the scope of bidder. Drains around buildings shall be of masonry and road side drains and drains shall be of RCC.

The contractor shall submit all basic engineering, schematic and subsequently detailed civil engineering drawings along with relevant load data and design calculations for client/consultant approval as indicated under **APPENDIX- I** as per schedule/ documentation requirements

APPENDIX - I

List of Civil Engineering Drawings and Documents for Approval/Information

Group – 1: For Approval

Item No.	Description
1.	Drawing numbering system
2.	List of drawings, with drawing Nos. and title
3.	Basic design criteria and loading for all buildings, structures and foundations.
4.	Site plan/layout drawing with battery limit in 1:500 scale
5.	Design calculations along with load data for buildings, foundation for equipment and structures, auxiliary etc, (design calculations shall be submitted along with or before submission of G.A. and design drawings).
6.	General arrangement plan and sectional drawings with all dimensions and details for foundation of equipment and structures , auxiliary facilities etc.
8.	Layout and sectional details of drainage, sewerage network with all invert levels slopes, sizes, dimensions, manholes top level etc.

Group – 2: For information and comments, if any

Item No.	Description
1.	Detail reinforcement drawings.
2..	Detail of bolts, inserts/ embedment , coverings, etc.

Standards

The components of weigh-bridges shall be designed, manufactured, assembled and tested generally in accordance with IS:9281 (Part-3)–1981, reaffirmed in 2006 and IS:9281 (Part-4)-1985, reaffirmed in 1991. Where suitable Indian Standards are not available, the equipment shall conform to generally accepted codes and practices.

GUARANTEE

The supplier shall give the following material and performance guarantee for each weighbridge.

Material guarantee – The equipment shall be free from any defect due to faulty design, material and/or workmanship.

Performance guarantee – The equipment shall be guaranteed for trouble free operation for one year from date of commissioning of individual system. The defect liability period shall be one year from the date of issue of commissioning certificate for the individual system.

- 1) The Performance Guarantee Test for Individual system shall be conducted within a time schedule and details of test procedure, test schedules shall be submitted by successful bidder and approved by the Employer.
- 2) The successful bidder shall supervise the complete weighing operation from starting until end of PG test period given below and shall take full responsibility of operations. Employer shall make available operation and maintenance personnel for this purpose.

- 3) Necessary instruments, tools, tackles, consumables, personnel and other facilities required for conducting performance guarantee test shall be arranged by successful bidder.
- 4) All the consumables required, upto successful commissioning shall be supplied by the successful bidder.
- 5) All performance Guarantee (PG) parameters as specified in the TS are to be demonstrated during the PG test.
- 6) Precondition for performance Guarantee tests if any, shall be clearly specified in the offer by Successful Bidder.

Commissioning

The successful bidder shall conduct commissioning test and establish 100% satisfactory performance of the system supplied by him in terms of repeatability and accuracy of the system.

DOCUMENTATION

The successful tenderer shall submit to the Purchaser technical data sheets/catalogues for all items, all general arrangement and detail drawings along with calculations (civil & structural drawings) showing all views, cross sections and bill of material and all electrical/electronic drawings for approval in six (6) sets within a period of one month from the date of placement of order.

The following documents/drawings/data sheets shall be submitted but not limited to below in six sets of hard print and 2 CD's containing editable soft copy of drawing/design calculation.

A. For Approval

- i) Layout & General arrangement drawing for weigh bridge and weigh room.
- ii) Electrical and electronic circuit diagrams
- iii) Drawings & Design calculations for weigh room & weigh bridge foundations and structural platform

B. For Information

- i) All catalogues, technical data sheet, literature for all items.
- ii) Operation and maintenance manual
- iii) Drawings for fast wearing parts
- iv) List of spares with part numbers.
- v) Test and inspection certificates of different items

C. As-built drawing (1 set of reproducible and six sets of hard prints and 2 CD's containing the editable soft copies)

- i) All as-built drawings / documents
- ii) All test certificates
- iii) All drawings/documents under information category

INFROMATION TO BE FURNISHED BY TENDERER

The information required below regarding the equipment offered shall be submitted along with the tender, supported by literatures, information sheets etc. to enable the Purchaser to have a complete conception of the weigh-bridges offered. The tenderer may also furnish any additional information to bring out the specialties and advantages of the equipment offered.

Load Carrying Structures

- a) Capacity/strength in tonnes
- b) Platform size and material of construction
- c) Details of load cells and their life span
- d) Details of load transfer mechanism from platform to display unit.

Sensing Device and Accuracy

- a) Details of sensing devices
- b) Details of weighing system electronics and data processing electronics including print out control
- c) Details of automatic calibration system
- d) Special features and advantages of the equipment, if any.
- e) Weigh range
- f) Least count
- g) Accuracy
- h) Details of voltage and frequencies of electric power required.

Visual Display Unit

Details of display arrangement.

Recording and Printing System

- a) Details of recording and printing unit including electric circuit diagrams
- b) Time cycle for printing mechanism
- c) Key board arrangement for entering additional information.

Weigh Station and Foundation

- a) Drawing of weigh station showing the requirements of power points etc.
- b) Maximum and minimum distances of the weigh station from the weigh-bridges.
- c) Details of foundation for housing the equipment with drawings.
- d) Volume of work.

The major dimensions of the various units of the weigh-bridges shall be indicated in mm.

Safety Devices

- a) Particulars of safety devices provided.
- b) Details of tamper proof devices provided. Elaborating sketches may be included.
- c) Protection of load cells/weighing electronics/PC against surge voltage/lighting

Total weight of the weigh-bridges with a broad indication of various segments/main units shall be given in tonnes.

Miscellaneous

The tenderer shall furnish the following:

- a) Layout and General Arrangement drawings.
- b) Safety instructions
- c) Details of services to be rendered during guarantee/warranty period.
- d) Provision of constant voltage transformer as power stabilising unit
- e) Arrangement for stand by power supply for retention of memory.
- f) Details of consumables required for the operation for a period of six months.
- g) List of firms/establishments where similar equipment are in use/operation.
- h) Protection against lightning
- i) The tenderer network for sales and services in India.
- j) List of exclusions, if any, from the offer.
- k) List of deviations from the specification, if any. (These deviations should not affect the performance of the equipment).
- l) List of imported components indicating their availability for replacement.
- m) Provision of self diagnostics system.
- n) Various components of the weighing system to be offered shall be from HCC's latest preferred make list unless otherwise specified in this TS

04.07 WATER SYSTEM

04.07.01 GENERAL

Dewatering of underground mines, distribution of industrial water (underground dewatered water) for process to underground mines and drinking water distribution have been envisaged for Chapri-Sideswar block mines.

04.07.02 Scope of work

- i) The scope of work of the bidder shall include design, engineering, manufacture/fabrication, assembly, testing, shop painting, packing and sequential delivery FOR site, transportation of materials to site, unloading, unpacking and storage at site, watch and ward, handling at site, complete civil & structural works, road approach to new units, erection of the structures, mechanical equipment, pipelines, electrical equipment, instruments and other accessories, final painting, testing and commissioning as specified for dewatering system, distribution of industrial water (underground dewatered water) for process to underground mines and drinking water distribution as specified in this chapter.

- ii) Supply of pipeline supports, thrust blocks/ anchor blocks, structural stockades, bridges, R.C.C pedestals etc. for over head / on-ground /underground pipelines.
- iii) Supply of all technical literature, drawings & documents, general arrangement drawings, assembly & sub-assembly drawings of all the plant & equipment, construction & erection drawings, as-built drawings, operation & maintenance manuals, manufacturing drawings, etc.
- iv) Piping network flushing fluids, chemicals & consumables.
- v) First fill of oils, lubricants, chemicals reagents and other consumables etc.
- vi) The plant and the system / sub-systems being provided by the Successful bidder shall be complete in all respects and any equipment or material not specifically mentioned in this specification, but required for safe, efficient & smooth operation and guaranteed performance of the plant shall be deemed to be included under the scope of work of the Successful bidder.
- vii) Successful bidder to undertake the necessary route-survey for the pipe-routing. Successful bidder shall submit the same to the Employer to verify the feasibility of the route engineered by the Successful bidder.
- viii) Supply of consumables
- ix) Two years operation & maintenance spares list shall be submitted by successful bidder after detailed engineering.
- x) Supply of special tools, tackles for construction, erection, operation and repair & maintenance of the plant & equipment.
- xi) Supply of erection, testing & commissioning materials
- xii) Inspection and performance testing of individual equipment and system as a whole.
- xiii) Construction water shall be arranged by the Successful bidder as defined in technological chapter.

04.07.03 Water system shall in general comprise of following facilities,

- a) Dewatering System,
- b) Make up water system for process & equipments etc.
- c) Drinking water system,
- d) Interplant Pipelines
- e) Water System facilities covers in technological chapter,

a) Dewatering System.

The successful Bidder shall provide necessary dewatering facilities of underground mines water, its collection in over ground storage tank for further reuse in back filling mixer.

Dewatering pumping System:

Total flow of 2126m³/day shall be dewatered from underground mining of 6th level. Water shall be pumped from 6th level sump to 4th level of sump and from 4th level to top hill sump through centrifugal pumps. One no. of additional pumping system from 2nd level to top hill sump shall be provided. Details of mechanical equipments for pumping shall be considered as per Table.

Dewatered Sump for storage of water:

- i) Dewatered collection tank at Hill Top: 25x25x4.0 m³ civil tank at hill top (level ~+215m) shall be provided.

b) **Make up water system for process & equipments etc.**

Make-up water shall be required for process cooling of machines e.g. drill machine etc., for makeup of mixing tank.

Water from top hill storage sump shall be used as make-up for the above needs.

Pipeline distribution from top hill storage sump to all levels of underground mining with isolation valves shall be provided.

Water for mixing in excavated soils are required to refill the excavated soil in underground mines. For the same, water pipe with isolation valves from top hill sump to mixing tank shall be provided. A RCC civil tank (back filling mixing tank) of size 11x11x4.0 m³ at ground level (~+150m) of capacity 400m³ shall be considered. Pumping from this tank to different consumers has been elaborated in technological chapter.

Mechanical equipments for pumping shall be considered as per Table.

c) **Drinking water system.**

Drinking water shall be in scope of Bidder. This drinking water shall be filled through drinking water tankers into a RCC sump of capacity 10m³ capacity. Drinking water tanker shall be arranged by bidder to fulfill the drinking water requirement of 400 persons. For storage of drinking water on ground RCC tank of 10m³ capacity shall be provided. Drinking Water Collection Tank: 2.5x2.5x2.5 m³ civil tank with epoxy painting at staging height +4m at mining area ground level (approx: 150m) shall be considered.

A distribution line (GI pipe) from ground water tank to Administrative Building, Mine Office, other auxiliary buildings and to all levels of mining along with isolation valve at header and valves at tapping points shall be in the scope of Bidder. Drinking water pipe for underground mining shall be routed through central shaft. Adequate support with supporting structures shall be provided for piping inside the central shaft.

A PVC drinking water tank of 1 m³ capacity shall be considered at the roof of two storey administrative building. Necessary pumping shall be provided to fill this Over head tank.

One no. Stainless steel water cooler at ground level shall be considered in Administrative building.

- Number of Taps/ faucets : 2
- Storage capacity : 150 Litres

- Nominal Cooling Capacity : 150 Litres/hr

d) Interplant Pipelines

Process industrial water, dewatered water, make-up water and drinking water lines will generally be laid on pedestal. Process and cooling water lines shall be laid over-ground preferably on pedestal / structural trestles.

All piping supporting structures etc. will be in scope of bidder.

e) Water System facilities covers in technological chapter

Following facilities shall be referred as per technological portion:

- For details of all underground sumps in all mining levels,
- Mining development facilities pertaining to water system comprising pumps, sumps and pipe etc.
- Pumping system after mixing tanks,

04.07.04 **Design Norms**

Efficiency, reliability and flexibility of operation and maintenance will be the guiding criteria of the design of the water system for the proposed plant. Mechanical equipment shall be followed as per table.

Following design criteria for water system shall be followed for design:

04.07.04.01 **Design Criteria for Pumping System**

Structural platform with ladder shall be provided so that the valves can be easily accessible for operation and maintenance.

All sumps shall be provided with drain and overflow connections leading to the nearest storm water drain.

The pumping station inside the underground mines shall be provided with proper ventilation, electrics, illumination, instrumentation.

Pumping station shall be provided with adequate drainage facilities with necessary side slope, channels, etc. leading to drainage sump of suitable capacity.

All pumping station sump shall be provided with low level alarm and the pumps shall be provided with dry running protection.

Each pump shall have independent suction. The delivery line of each pump shall be connected to the main header.

Rubber Expansion joints near the pumps on both suction and delivery lines shall be provided wherever necessary.

An isolating valve shall be provided on the suction line of each pump and another motorized isolating valve together with a non-return valve shall be provided at the delivery line of each pump.

The pipe network and valves within the pumping station shall be adequately supported so as to avoid undue stress on the pumps.

Minimum clear gap to be kept between equipment to equipment should be 1000 mm.

04.07.04.02 **Design Criteria for Pipe Work**

The term pipe work referred herein generally cover pipes, fittings (such as bends, tees, reducers, plugs, nipples, sockets, unions, flanges, crosses etc.).

Pipe work is intended to convey fluids such as different qualities of water and effluents.

The pipe work shall be designed, manufactured, assembled and tested as per the latest standards, codes and recommendations of the Bureau of Indian Standards, ANSI, ASTM, AWWA, or other equivalent international standards. Pipe work shall be complete in all respects including all accessories essential for proper installation, operation and maintenance, even though such items are not specifically mentioned in the specification.

Mild steel / Carbon steel pipelines shall be used for dewatering system, cooling system make-up water system. GI pipe shall be used for drinking water system. HDPE/ UPVC/ CPVC piping shall be used for pumping of the chemicals.

Pipelines shall be laid over ground on the civil pedestal as far as possible. Inside the central shaft, pipe shall be supported properly.

As far as possible all the pipelines shall be laid together along the piping corridor. The piping corridor shall be parallel to and by the side of roads.

Valves for size DN250 and above shall be gear operated.

The pipe network shall be provided with air release valves at high points and drain valves at the lower points.

Wherever pipelines are crossing roads and railway tracks, they shall be laid below rail/road for traffic movement with hume pipe (NP4 type).

Valves provided on the over-ground pipe network shall be provided with civil platforms and access ladders.

Provision shall be made for support of piping which may be disconnected during maintenance work. All large pipes and all long pipes shall have at least two supports each arranged in such a way that any length of piping or valve may be removed without any additional supports being required.

Pipe supports shall be capable of supporting the pipelines under all conditions of operation.

All the buried pipelines shall be laid with a nominal slope towards the drain point.

All the buried pipelines shall be laid as far as possible at a depth of about 1200 mm, below finished ground level (i.e. the top of the pipelines shall be 1.2 m below the finished ground level).

Isolation / drain valves, air release valve provided on the buried pipe network shall be housed in suitably sized covered valve pit and the valve pits shall be of self draining type. Air release valves shall be provided at the highest points of each sector of the pipeline and drainage valves shall be provided at the lowest points of each sector of the pipeline.

Wherever the buried pipelines are crossing the roads and tracks, they shall be suitably encased with mild steel pipes or reinforced concrete casing pipes (NP4 type) of size given as per following.

Encased pipe diameter	Encasing pipe (For Flanged pipe) size (mm)	Encasing pipe (for welded pipe) size (mm)
Upto 100	300	250
150	400	300
200	500	400
300	600	400
350	600	500
400	700	600
500	800	700

Coal tar based anticorrosion tape as per IS: 15337 – 2003 shall be provided for protection of underground mild steel pipelines. The thickness of tapes shall be 3 mm upto pipe diameter DN 300 mm and 4 mm above pipe diameter of DN 300 mm.

04.07.04.03 **Laying Buried Pipelines**

All buried pipelines shall be laid with earth cover sufficient to avoid damage from pressure of vibration caused by the surface traffic. Minimum earth covering over the pipe shall be 1200 mm from the finished ground levels. For laying of buried pipelines earth work in excavation, back filling and acceptance of trenches etc. shall be as per IS: 5822-1994 and IS: 3114-1994 and IS: 12288-1987

04.07.04.04 **PIPE SPECIFICATION**

- A) Black Pipes DN 15 to DN 50 as per IS:1239, Heavy grade

- B) Pipes above DN 150 as per IS:3589 -2001,Gr Fe410
 Pipe Thickness :
 DN 200 - 6.3mm
 DN 250 - 6.3mm
 DN 300 – 7.1mm
 DN 350 - 8.0mm
 DN 400 and above 12mm
 Pipes of sizes more than 500mm shall be spirally welded.

- C) Carbon Steel G.I (Galvanised Iron) : Pipes DN 15 to DN 150 as per IS: 1239 - Heavy grade

- D) HDPE/ UPVC/ CPVC pipe : For handling chemicals.

04.07.04.05 **Design Criteria of Pumps**

Horizontal Centrifugal Pumps:

All the dewatering pumps are horizontal centrifugal type with negative suction self priming.

The pumps will be designed, manufactured and tested as per IS: 1520-1980, IS: 5120-1977 R.A.1991, IS: 9137-1978 R.A.1993 or as per international standards acceptable to the Purchaser and will be suitable for the required duty conditions and capacities.

The pumps and their auxiliary equipment shall be suitable for the required duty conditions and shall be designed and constructed for continuous duty at full load.

The centrifugal pumps shall be suitable for a capacity range of 25% to 125% of duty point capacity without under vibration or over heating.

The pumps shall be so designed as to have a stable non overloading characteristics, capacity head curve shall be continuously from shut-off point to operating point and shall be suitable for parallel operation of pumps.

Maximum size of impeller shall not be selected during selection of pumps.

The motor capacity shall have a margin over its BHP absorbed at the pump shaft at duty point and the margin shall be 25% for motors of rating upto 15 kW, 20% for motors of rating 18.5 kW to 160 kW and 15% for motors of rating above 160kW. The above margin shall be in addition to temperature de-rating. However motor kW rating shall be considered as per table.

The equipment and auxiliaries shall be designed for quick and economical maintenance. The equipment shall be easily dismantable without disturbing the suction and delivery pipe connections.

The equipment design shall incorporate provisions for reduction in noise level.

The rotating elements of the pumps shall be checked for critical speed in bending as well as in torsion. The critical speeds shall be at least 30% away from the normal speeds for units with flexible shafts and at least 20% away from the maximum operating speed in case of stiff shafts.

All passages inside the pump casing and impellers, which may be inaccessible to machining, shall be ground to a smooth finish as far as practicable.

The direction of rotation shall be clearly marked either by incorporating it on the casing or by separate metal plate arrow securely fitted to the casing.

- The head-Vs-discharge characteristics of the pump shall be continuously rising from the duty point to the shut off point without any zone of instability. The required duty range for a pump shall be on the stable portion of its head capacity curve close to the best efficiency point. The head developed at the best efficiency point shall be close to the required differential pressure so that throttling is not required at pump discharge. The power-Vs- discharge characteristics shall be non-overloading type.
- The pump shall be so selected and installed that the available NPSH is not lower than the required NPSH even in the most adverse operating conditions.
- The pump shall be of proven make and design having material of construction which is the best of its kind for the particular application and shall be manufactured using best engineering practices under strict quality control. Each pump shall be tested as per the standards stipulated elsewhere in this document. The test shall include hydrostatic test, static and dynamic balancing tests, performance tests material tests and motor routine tests.
- The pump shaft and bearing shall be adequately sized to take the unbalanced forced due to mal-operation. The pump gland shall ensure proper sealing without excessive tightening of the packing. Proper cooling and flushing arrangement for the gland shall be provided wherever required.
- All moving parts of the pump shall be adequately guarded to prevent any injury to operating personnel.
- Pumps shall be designed and installed keeping in view the easy accessibility of its parts for maintenance. All end suction pumps shall be of back-pull-out design and shall be provided with spacer coupling of adequate length.
- Each pump shall be provided with adequate safety interlocks including overload and dry running protection.
- Dismantling joints shall be provided on the delivery side of large size pumps to facilitate quick maintenance, wherever required.
- All pumps shall be provided with suitable lifting attachments and each pump installation shall have suitable handling facilities.
- Vibration readings, etc. of new installation shall be supplied.
- Pumps shall be installed and commissioned as per manufacturer's instructions. A continuous running for 72 hours shall be required before final acceptance is given to the pumping installation.
- The rotating elements of pumps will be dynamically balanced and over stressing should not occur due to sudden failure of power, Reverse rotation should not damage the pumps.
- The pumps shall be so designed as to have a maximum flow capacity of not less than 110% of the rated flow capacity.

MOC of Dewatering Pumps:

Sl. No.	ITEM	MATERIAL
a)	Casing	2.5% NCI
b)	Impeller	CF8M
c)	Shaft	En8 / SS410
d)	Shaft sleeve	SS410 (H)
i)	Gland	CI FG 220
p)	Base plate	MS Fabricated

MOC of Cooling Water Pumps:

Sl. No.	ITEM	MATERIAL
a)	Casing	CI
b)	Impeller	CF8M
c)	Shaft	En8 / SS410
d)	Shaft sleeve	SS410 (H)
i)	Gland	CI FG 220
p)	Base plate	MS Fabricated

MOC of Chemical Dosing Pumps:

The MOC of chemical dosing pumps should be non corrosive and polypropylene based.

04.07.04.06

Design Criteria For Valves

Isolating valves, drain valves, air release valves, wherever necessary, shall be provided for the complete pipe network including cross-country pipeline.

All valves shall be suitable for service conditions i.e. quality of fluid, flow temperature and pressure under which they are required to operate.

Valves shall be provided on pipe network for isolation of pipe section and equipment, control of pressure and flow, venting, draining etc. They shall be suitably located considering ease of operation and maintenance.

All valves shall be provided with hand wheel and position indicator. The face of each hand wheel shall be clearly marked with words “Open” and “Shut” with arrows adjacent to indicate the direction of rotation.

Valves shall be provided with suitable extension spindle and head stock assembly wherever required. In case gears or bevel system are used, these shall be of cast steel with machine cut teeth.

Non-return valves shall be of Dual plate check valves.

The body end ports shall be circular. The area of the flow way between the body end ports shall not be less than the area of a circle of which the diameter is the nominal bore size of the valve.

Float operated valve shall be preferably be right angled pattern complete with ball float, level and other accessories.

MATERIAL SPECIFICATIONS FOR VALVES

Sl No.	Valves	Size, DN (mm)	Rating	Material of Construction			End details	Other details
				Body	Ball / Disc / Wedge	Stem		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	Ball Valves	15 to 40	Class 800	ASTM A105	ASTM A 351 Gr. CF8M / SS316	SS316	Screwed / Socket welded	Floating ball, three piece bolted construction, full bore, PTFE seat, lever operated.
2.		Above 40	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A351 Gr. CF8M / SS316	SS316	Flanged as per ANSI B16.5 / IS6392 table-17	Floating ball, two piece bolted construction, full bore, PTFE seat, lever operated, gear operated for DN350 & above.
3.	Non metallic Ball valve	All size		CPVC	Ball - CPVC Seat - PTFE	CPVC		CPVC ball valve shall be provided. Handle - Polypropylene
4.	Butterfly Valves	Upto 150	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A351 Gr. CF8M / SS316	SS410	Wafer / Lug type	Seat - PTFE / EPDM, Self lubricated PTFE lined bearing for both driven & non driven end, MS hand wheel.
5.		Above 150	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A351 Gr. CF8M / SS316	SS410	Flanged as per ANSI B16.5 / IS6392 table-17	Seat - PTFE / EPDM, Self lubricated PTFE lined bearing for both driven & non driven end, lever operated upto DN300, gear operated for DN350 and above, MS hand wheel.

Sl No.	Valves	Size, DN (mm)	Rating	Material of Construction			End details	Other details
				Body	Ball / Disc / Wedge	Stem		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6.	Globe Valves	15 to 40	Class 800	ASTM A105	ASTM A 216 Gr. WCB + 13% Cr Overlay	SS410	Socket welded	Rising spindle
7.		Above 40	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A 216 Gr. WCB + 13% Cr Overlay	SS410	Flanged as per ANSI B16.5 / IS6392 table-17	Rising spindle, Back seat & ring - 13% Cr steel, gear operated for DN350 & above.
8.	Gate Valves	15 to 40	Class 800	ASTM A105	ASTM A 216 Gr. WCB + 13% Cr Overlay	SS410	Socket welded	Rising spindle, seat ring - 13% Cr, Handwheel - MS.
9.		Above 40	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A 216 Gr. WCB + 13% Cr Overlay	SS410	Flanged as per ANSI B16.5 / IS6392 table-17	Rising spindle, Face ring & body seat ring - 13% Cr steel, gear operated for DN350 & above, Handwheel - MS.
10.	Non return Valves	15 to 40	Class 800	ASTM A105	SS410	NA	Screwed / Socket welded	Lift-check type
11.		Above 40	Class 150 / PN16	ASTM A 216 Gr. WCB	ASTM A351 Gr. CF8M / SS316	NA	Flanged as per ANSI B16.5 / IS6392 table-17	Dual plate type, Body seat - EPDM / Nitrile rubber
12.	Float Valves	15 to 40	PN10	IS210 Gr.260	IS210 Gr.260	LTB-2	Screwed / Socket welded	Lever / Fulcrum - MS (Galvanised), Float - Tinned copper / Cu, Disc Face ring/ gasket - Neoprene rubber, Bucket - Leather, Single - beat type with balancing piston.
13.		Above 40	PN10	IS210 Gr.260	IS210 Gr.260	LTB-2	Flanged as per ANSI B16.5 / IS6392 table-17	
14.	Air Release Valves	All sizes	PN16	Cast steel ASTM A 216 GR	NA	NA		Air release valves shall be Cast Steel as per IS: 14845-latest standard total tamper proof design.

Sl No.	Valves	Size, DN (mm)	Rating	Material of Construction			End details	Other details
				Body	Ball / Disc / Wedge	Stem		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				WCB				<p>Small orifice Air release Nipple: IS 318 GR LTB2/ SS 304</p> <p>Floats small and large: Timber core with vulcanite/ rubber coating/ SS 304 /SS316</p> <p>Seat Ring: Natural Rubber IS 638 Type B</p>
15.	Foot Valves	All sizes		CI Epoxy coated			Flanged end as per IS6392, T-17	<p>Foot valves shall be as per IS:3048</p> <p>Housing, seat disc and disc plates: CI FG 260</p> <p>Strainer : SS</p>

Specification For Companion Flanges

1	Type	Raised face plate flanges, Slip-on, welded, plate fabricated, machined finish.
2	Dimensional Standard	As per IS-6392-1971 (RA'88), PN=1.6 N/mm ² as per valve rating, Table-17, drilled off centre, RF.
3	Material	C.S as per IS-2062 -1992 GR.A.
	Note: Valve flanges and matching flanges shall be drilled as per IS: 6392-1971 (RA'1988), table 17 for PN 1.6.	

Design Criteria for Rubber Expansion Joints**Material specification:**

Rubber Expansion Joints shall be made of high grade abrasive resistant natural rubber compound reinforced with adequate numbers of piles of heavy cotton duck, rayon cord, impregnated within rubber compound and further reinforced with square metal ring embedded in it. The outer exposed surface of rubber expansion joints shall be given a coating of synthetic/ neoprene rubber and further painted with chlorinated rubber based paint. Rubber expansion joints will be suitable for design temperature of 50°C and for handling water. Rubber expansion joints shall absorb vibration, shock and axial compression of 10 mm, axial elongation of 10 mm and lateral movement of 10 mm.

Control unit:

One set of control unit (stretcher bolt assembly) consisting of 3 nos. limit rod, Stretcher Bolt, Triangular Plate, Nuts, Steel Washer and Rubber Washer.

TECHNICAL PARAMETERS OF RUBBER EXPANSION JOINT

Sl. No.	Item / Component	Description / Material
1	Test pressure	18 kg/cm ² or as per relevant standards
2	Max. Pressure (operating)	12 kg/cm ²
3	Design pressure	16 kg/cm ²
4	Burst pressure	4 times design pressure (Guaranteed)
5	Leak test	18 bar (g), joint shall be kept immersed in water bath to check leak tightness.
6	Shore hardness	65±5 ⁰ Sh 'A'
6	Length	As per relevant standard
7	Material of construction	
	Body	Natural rubber compound
	Cover	Neoprene rubber

	Tie rod	Carbon steel
7	Design temperature	Normal 50 Deg Centigrade Max 80 Deg. Centigrade (Worst Case)
9	End connection	Carbon steel forged loose flanges at both ends, with dimensions as per IS: 6392, T-17

04.07.04.09

Following instruments shall be provided for Pumping System

- i. Level indicator in each sump,
- ii. Each pump shall be provided with local indication and signaling of pressure on delivery side which shall be depicted on the panel of the control
- iii. Each pump shall be provided with local indication and signaling of flow on delivery side which shall be depicted on the panel of the control

04.07.05

Erection, Testing and Commissioning

- 1) The erection of all plant and equipment will be carried out according to the latest engineering practices and according to the drawings, specifications, Instructions etc. duly approved by the Purchaser. The successful Bidder will carry out the work in the presence of and /or as per the instructions of site engineer /supervisory personnel deputed by the Purchaser. Highly skilled workmen will carry out the erection.
- 2) The successful Bidder will supply all required manpower, tools and related equipment, all hoisting equipment, all necessary scaffoldings, all necessary transporting equipment, consumables. Construction and erection materials, petrol, diesel oil, Kerosene, solvents, sealing compound, tapes, brazing and soldering materials, welding and brazing gases, erection bolts, nuts and packing sheets/compounds, temporary supports, wooden blocks, spacers, templates, jute and cotton wastes, sand/emery paper etc. as required for the satisfactory completion of work.
- 3) After erection, all equipment having moving part, subject to pressures or voltages will be given trial operation. The trial operation will consist of 24 hours of continuous operation. All modifications and rectifications required during the trial operation or required for proper operation will be done at his own cost by the successful Bidder as accepted by the Purchaser.
- 4) Rotating equipment will be checked for proper direction of rotation and shaft alignment. Equipment subject to pressures will be carefully examined for leakage. All equipment, such as pressure taps, temperature measurement connections, flow measurement devices etc. will be provided by the successful Bidder.
- 5) Erection, testing & commissioning of various equipments and piping etc will be done also inline with details given in various chapters of GTS.

04.07.06

PAINTING

All Plant, equipment, valves, piping etc. will be painted in accordance with requirements of painting as defined elsewhere.

04.07.07

Preferred Makes

S. No.	Item Description	Makes
1	Horizontal Centrifugal Pumps	Kirloskar Brothers, Mather & Platt (WILO), KSB, Sulzer.
2	Vertical Wet Pit Type Pumps	Kishor Pumps, Kirloskar Brothers, KSB, Mather & Platt (WILO).
3	Bearings	SKF/FAG/Timken
4	Rubber Dismantling Joints	BDX, CORI Engineers, D.Wren
5	Lift Check / Swing Check	L&T Valves, Steam & Mining, BDK, Kirloskar, Virgo, Oswal
6	CS Valves (Gate, Globe, NRV, Check)	L&T Valves, KSB, Steam & Mining, BDK, KBL, Virgo, Oswal
7	Cast steel globe valve	I.L.,Fisher,Audco,RK Control
8	Plug Valves	L&T Valves, Vass Ind., Xomox, Virgo, BDK, Steam & Mining.
9	Ball Valves	L&T Valves, KSB, AL Saunders, Xomox, BDK, Virgo, Oswal, Delval flow control.
10	GM & Copper Alloy Gate, Globe & Ball Valves	Leader, Kirloskar, SKM, Zoloto, IVC, Steam & Mining, BDK
11	Butterfly Valves	L&T Valves, Fouress, Kirloskar Brothers, VIRGO, BDK, XOMOX, Jash Engineering, Delval flow control.
12	PP / CPVC / UPVC Valves	Georg Fischer, Astral
13	Diaphragm Valves	Fluid System, Micon, BDK .
14	Float Valve	Leader, IM Engineers, Shiv Durga, Upadhyay, Steam & Mining.
15	Control Valve	L&T Valves, IL, MIL Controls, Darling. Steam & Mining, Shiva Durga, Leader,
16	Air Release Valve	Upadhyay, IVC, H. Sarkar, Fluid Control, Fouress, Jash
17	Needle Valves	Fischer Xomos, L&T Valves , BDK, Crane Process
18	Pipes MS ERW/Spiral Black	SAIL ,TATA, Jindal , Zenith , Man , SAW , Surindra, Bansal Skipper, Utkarsh , Bhushan, Ajantha Pipes, Venketesh Udyog, JCO Gas pipes.
19	GI pipes	SAIL ,TATA, Jindal , Zenith , Man , SAW , Surindra, Bansal Skipper, Utkarsh , Bhushan, Ajantha Pipes, Venketesh Udyog, JCO Gas pipes.
20	SS Pipes	Jindal, Lloyds, Zenith,Remi, Prakash
21	RCC Pipes & Fittings	SUR Industrial Pipes, Patel Hume Pipe, Premier Prestressed Concrete, Pragati

S. No.	Item Description	Makes
		Concrete, Hind Ceramics, Indian Hume Pipes.
22	HDPE Pipes & Fittings	Prince, gautam, Premier, Diplast, Sangir, PIL, CPE, Manikya, Hasti, Flowguard, Godavari, Maruthi, Hallmark, Vijay, Sriram Polymers, Trustline, Dutron, RIL, Oriplast, EMCO, KWH Heliplastic, Astral Polyolefins, EPP Composites.
23	UPVC, CPVC, PVC Pipes & Fittings	Oriplast, Finolex, Bharat Pipe & Fittings, Supreme Industries, EPP Composites, Astral, Georg Fischer.
24	MS Fittings / Forged Fittings / SS Fittings	Stewarts & Lloyds, Engineering Service Enterprise, Sunflex Metals, MJ Patel, Shyam Engineering, Tube bend, Chaman Metals, N.L.Hazra, Veketesh Udyog, Tube Forged, Tube Turns.
25	Wrapping & Coating for pipes	Rustech Products, HOTACO, IWL, M P Tar Products.
26	Water Cooler	Voltas, Blue Star, USHA, AquaGuard

04.07.08 Drawings/ Documents to be Furnished by the Bidder For Approval

1. Detailed drawings, GA drawings, layout and piping drawings, detail and Bill of Material (BOM) for valves, piping, drives, electric, instrumentation facilities etc. will be submitted by the Bidder as per technical requirement, technical specification and approval of Consultant.
2. General arrangement and cross sectional drawings, catalogues and technical details of all equipments as per system requirement.
3. Data sheet for all equipments, valves, required for completeness of the systems in line with technical specification.
4. List of instruments comprising bill of materials and instrumentation data sheet.
5. All equipment and piping sizing calculation.
6. Test certificates for the following:
 - a) Material test certificate for all major equipment and their components.
 - b) Hydraulic test of equipment, pipe fittings & valves.
 - c) Static and dynamic balancing of all rotary parts/ equipments
7. Layout of piping system indicating pipe route, location of supports, valves and other fittings as required.

8. Layout and piping drawings showing the tap-off point for drinking water & pipeline route to shop including requirement, dewatering system and pipeline route to discharge point.
9. Scheme and P&ID indicating Dewatering system envisaged for the above mentioned areas.
10. List of commissioning spares.
11. Two years operation & maintenance spares list shall be submitted by successful bidder after detailed engineering.

04.07.09 Drawings/ Documents to be Furnished Along With The Tender

The Bidder shall submit the following drawings/ documents along with the tender:

-

1. Layout drawing showing the battery limits of drinking water and the pipeline route to various consumers including requirement of drinking water at battery limits.
2. Scheme of drinking water, dewatering system with descriptive and illustrative literature.
3. Pipeline materials and specifications considered for various systems.
4. Duly filled in data sheets for valves and other equipments as specified in GTS as well as various data of different equipments as specified in various clauses of GTS.
5. List of commissioning spares.
6. List of special tools and tackles
7. Tentative Bill of Quantities covering all equipments, valves, hydrants, pipelines, etc.

04.07.10 Drawings / Documents To Be Furnished By The Successful Bidder For Reference And Record

1. The successful Bidder shall submit required sets of all the approved drawings, documents and manuals for Purchaser's record and use. After erection of equipment, the Successful Bidder shall submit one set of linen tracings/ reproducible in required number of prints along with soft copies in CD (in AutoCAD format) of each "As built drawings".
2. Two years operation & maintenance spares list along with price list shall be submitted after detailed engineering.

3. Instruction for erection, testing and commissioning.

4. Manufacturer's test certificates.

04.07.11

Table: Bill of Quantities for Water System

Sl No.	Description	Quantity	Unit	Tonnage / kW per unit	Total tonnage / kW	MOC	Remark
A	For dewatering of mining (flow: 2126m³/hr for 15 hr working)						
1	Pumps (Dewatering from level-6 to level-4,)	4	no	55	220	Casing: 2.5% NCI Impeller: CF8M	Flow of each pumps: 80m ³ /hr, Pump head: 110mWC, Type: self Priming HSC Pumps
2	Rubber Expansion Joint	4	nos				
3	Pipe (DN100),	400	m	14.8	5920	CS, IS1239 (Heavy grade)	(pipe shall be routed inside the shaft), Double header shall be considered for dewatering
4	Motorised Gate Valves (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	at delivery of pumps
5	NRV (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel	at delivery of pumps
6	Manual Gate (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	at suction of pumps

Sl No.	Description	Quantity	Unit	Tonnage / kW per unit	Total tonnage / kW	MOC	Remark
7	Foot valve with strainers	4	no	-	-	Body: SS Strainers: SS	at suction of pumps
B Dewatering from level-4 to hill top (surface level: ~+215m),							
8	Pumps (Dewatering from level-4 to ground floor)	4	no	132	528	Casing: 2.5% NCI Impeller: CF8M	Flow of each pumps: 80m3/hr, Pump head: 300mWC, Type: self Priming HSC Pumps
9	Rubber Expansion joints	4					
10	Pipe (DN100)	400	m	14.8	5920	CS, IS1239 (Heavy grade)	(pipe shall be routed inside the shaft), Double header shall be considered for dewatering
11	Pipe (DN100)	1000	m	14.8	14800	CS, IS1239 (Heavy grade)	Pipe length from shaft to hill top sump
12	Motorised Gate Valves (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	at delivery of pumps
13	NRV (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel	at delivery of pumps
14	Manual Gate (DN100)	4	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	at suction of pumps

Sl No.	Description	Quantity	Unit	Tonnage / kW per unit	Total tonnage / kW	MOC	Remark
15	Foot valve with strainers	4	no	-	-	Body: SS Strainers: SS	at suction of pumps
C	Connection of water pipe from Top hill tank to RCC mixing tank at ground floor						
16	Pipe (DN200)	500	m	-	-	CS, IS3589 (thk. 6.3mm)	One no. pipes of size DN200 of length approx 500m for connection of RCC hill top tank to RCC mixing tank
17	Manual Gate (DN200)	2	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	
D	Misc.						
18	CS Pipe (DN150)	1500	m	21.9	32850	CS, IS1239 (Heavy grade)	One no. pipes of size DN150 of length approx 1500m from RCC hill top tank to various levels of underground mining
19	Manual Gate (DN200)	15	nos	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	Inside the mining
20	Air Release Valves (DN50)	10	nos	-	-	Body: CI as per IS14845	
E	Drinking Water facilities (For 400 person)						

Sl No.	Description	Quantity	Unit	Tonnage / kW per unit	Total tonnage / kW	MOC	Remark
21	Filling of drinking water tank of capacity 4KL	7	nos	-	-		
22	GI Pipe (DN50)	1500	m	6.26	9390	GI, IS1239 (Heavy grade)	
23	GI Pipe (DN100)	300	m	14.8	4440	GI, IS1239 (Heavy grade)	
24	Manual Gate (DN50)	15	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	
25	Manual Gate (DN100)	2	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	
26	SS Water Cooler	1	No			Storage capacity: 150 litter	
F	Additional dewatering from 2nd level (+55m) to Top Hill						
1	Pumps (Dewatering from level-2 to Hill Top)	3	no	125	375	Casing: 2.5% NCI Impeller: CF8M	Flow of each pumps: 80m3/hr, Pump head: 230mWC, Type: self Priming HSC Pumps
2	Rubber Expansion Joint	3	nos				
3	Pipe (DN100),	300	m	4.5	5920	CS, IS1239 (Heavy grade)	(pipe shall be routed inside the shaft), Double header shall be considered for dewatering
4	Motorised Gate Valves (DN100)	3	no	-	-	Body - CS to ASTM A216	at delivery of pumps

Sl No.	Description	Quantity	Unit	Tonnage / kW per unit	Total tonnage / kW	MOC	Remark
						Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	
5	NRV (DN100)	3	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel	at delivery of pumps
6	Manual Gate (DN100)	3	no	-	-	Body - CS to ASTM A216 Gr. WCB Disc - CS - 13% Cr. Steel Stem - SS	at suction of pumps
7	Foot valve with strainers	3	no	-	-	Body: SS Strainers: SS	at suction of pumps

04.13.1.1 POWER DISTRIBUTION, DRIVES, CONTROL, & ILLUMINATION

This section covers overall description of power distribution & control system of Chapri mine for both above the surface and below ground. This section also provides design basis & specifications of major equipment related to power distribution, process-electrics, drives, control, illumination system to be supplied, erected, tested and commissioned by tenderer.

04.13.1.2 POWER DISTRIBUTION SYSTEM DESCRIPTION

Incoming power shall be tapped from 33kV outgoing terminal of JSEB metering station & received in the 33 kV outdoor switchyard comprising of Isolator, LA, CT, PT, VCB, Conductor, clamp and connector 33/3.3kV, 1x8MVA ONAN transformer. Further power shall be distributed to downstream load centers through 3.3kV VCB AIS switchboard. This switchboard shall also feed the power to High voltage consumers on surface i.e. Ventilation fans, Compressors & winder.

Switchyard shall also have future space provision for another 33kV outdoor bay and 8MVA transformer.

Minimum 1 number LT substation on surface and 2 number underground LT substation at level -4 & level -6 respectively are envisaged for distribution of power at low voltage (415 V) to different electrical consumers above & below the ground.

LT substation at surface will be single ended with one number dry type 3.3 kV/0.433 kV distribution transformer and a power control centre (PCC). This 415 V PCC will feed power to all LT consumers on the surface i.e. ventilation fans auxiliaries, compressors auxiliaries, pumps, offices, canteen & workshops.

LT substation at level 4 will have three numbers of 3.3 kV/0.433 kV distribution transformers feeding to PCC. Out of three transformers one will be standby. A 3.3 kV switchboard will be used at level -4 to distribute power to these three transformers, while this board will have incomer fed from 3.3 kV switchboard at surface as described above.

415 V PCC at level -4 will feed to local starter panels located near the loads like pumps, fans etc. transportable starter panels are envisaged for electric LHD & jumbo drills etc.

PCC will also feed to lighting/booster transformers in loop in loop out arrangements.

Scheme of substation at level -6 shall be almost identical to as described above for level-4.

04.13.1.3 ELECTRICAL SYSTEM DESIGN BASIS

Project Particulars & Climatic conditions

Name of the project	Development of underground mine of 1.5MTPA Hindustan Copper Complex, Jharkhand.
Location	HCL, Chapri, Jharkhand
Elevation above sea level	Below 1000 meters
Temperature conditions (for equipment design)	
Maximum	50 degree C
Design ambient	50 degree C
Relative humidity	100% (max)

System Data

System voltage	33KV, 3.3KV & 0.415KV
System of earthing	33 KV – Solidly earthed. 3.3KV – Resistance earthed through NGR 415V - <i>Earthed through NGR</i>
Voltage variation	33 KV, +6%, -9% 3.3KV, +6%, -9% 415V +10% and -15%
Rated frequency	50 Hz
Frequency variation	+3%, -6%
Control voltage	220V/110V DC 240V AC, +10% and -15%
Three phase symmetrical short circuit level for selection of equipment	33 KV - 25KA for 3 Sec 3.3KV - 25KA for 3 Sec 415V - 50KA for 1 Sec

04.13.2 TECHNICAL SPECIFICATION FOR SCOPE OF SUPPLY AND ERECTION OF EQUIPMENT

The scope of work of tenderer shall cover design, basic and detailed engineering, submission of drawings for approval, manufacturing, factory testing, inspection by Purchaser, packing, loading, forwarding, delivery at Plant site, loading/unloading, storage, handling of material/equipment for erection, no-load and load testing, commissioning, PG test, PAT/FAT and liquidating the defects of all electrics related to Power distribution, drives & control, illumination, communication, automation or complete & satisfactory operation of Chapri mines complex.

Tenderer shall refer the Schedule of quantities for the description of different items required in the mine & their quantities for their bidding purpose. Detailed Specification of major equipment are applicable as indicated in the subsequent clauses.

04.13.2.1 33kV VOLTAGE CLASS SURGE ARRESTORS

Lightning Arrestors at Grid Substation shall be of Station class only in 33KV System.

1.0 INTRODUCTION

The section covers the specification of 33kV voltage level, 10 kA, and Station class heavy duty, gapless metal (zinc) oxide Surge Arrestors complete with insulating base, terminal clamps, complete fittings & accessories for installation on outdoor type 33kV switchgear/transmission lines /transformers.

1.1

STANDARDS

The design, manufacture and performance of Surge Arrestors shall comply with IS: 3070 Part-3 and other specific requirements stipulated in the specification. Unless otherwise specified, the equipment, material and processes shall conform to the latest applicable Indian/International Standards as listed hereunder:

IS:2071-1993 (Part-1) : Methods of High Voltage Testing General Definitions & Test Requirements.

IS:2071-1974(Part-2) : Test Procedures

IS:2629-1985 : Recommended Practice for hot dip galvanizing on Iron & Steel

IS:2633-1986 : Method for Testing uniformity of coating of zinc coated Articles.

IS:3070-1993 (Part-3) : Specification for surge arrestor for alternating current systems. Metal-Oxide lightening Arrestors without gaps

IS:4759-1996 : Specification for hot dip zinc coating on Structural Steel and Other allied products.

IS:5621-1980 : Hollow Insulators for use in Electrical Equipment.

IS:6209-1982 : Methods of Partial discharge measurement.

IS:6745 : Method for determination of mass of zinc coating on zinc coated iron and steel articles.

ANSI/IEEE-C.62.11: Metal oxide, Surge Arrestor for AC Power Circuits.

IEC-60099-4 : Surge Arrestors

The equipment complying with any other internationally accepted standards shall also be considered if it ensures performance equivalent to or superior to the Indian Standards.

1.2

GENERAL REQUIREMENT

The metal oxide gap less Surge Arrestor without any series or shunt gap shall be suitable for protection of 33kV switchgear, transformers, associated equipment and 33kV lines from voltage surges resulting from natural disturbance like lightning as well as system disturbances.

The surge arrestor shall draw negligible current at operating voltage and at the same time offer least resistance during the flow of surge current.

The surge arrestor shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing / silicon polymeric of specified creepage distance.

The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.

The surge arrestor shall be provided with line and earth terminals of suitable size. The ground side terminal of surge arrestor shall be connected with 25x6 mm galvanized strip, one end connected to the surge arrestor and second end to a separate ground electrode. The bidder shall also recommend the procedure which shall be followed in providing the earthing system to the Surge Arrestor.

The surge arrestor shall not operate under power frequency and temporary over voltage conditions but under surge conditions, the surge arrestor shall change over to the conducting mode.

The surge arrestor shall be suitable for circuit breaker performing 0-0.3sec.-CO-3 min-CO-duty in the system.

Surge arrestors shall have a suitable pressure relief system to avoid damage to the porcelain/silicon polymeric housing and providing path for flow of rated fault currents in the event of arrestor failure.

The reference current of the arrestor shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.

The arrestors for 33 kV system shall be suitable for mounting on transformers, Bus, Line & structure as per scheme. The supplier shall furnish the drawing indicating the dimensions, weights etc. of the surge arrestors for the design of mounting Structure.

The arrester shall be capable of handling terminal energy for high surges, external pollution and transient over voltage and have low losses at operating voltages.

1.3 ARRESTOR HOUSING

The arrester housing shall be made up of porcelain/silicon polymeric housing and shall be homogenous, free from laminations, cavities and other flaws of imperfections that might affect the mechanical and dielectric quality. The housing shall be of uniform brown (for porcelain)/ Grey (for silicon polymeric) colour, free from blisters, burrs and other similar defects. Arrestors shall be complete with fasteners for stacking units together and terminal connectors.

The housing shall be so coordinated that external flashover shall not occur due to application of any impulse or switching surge voltage up to the maximum design value for arrester. The arrestors shall not fail due to contamination. The 33 kV arrestors housing shall be designed for pressure relief class as given in Technical Parameters of the specification.

Sealed housings shall exhibit no measurable leakage.

1.4 FITTINGS & ACCESSORIES

The surge arrester shall be complete with fasteners for stacking units together and terminal connectors.

The terminals shall be non-magnetic, corrosion proof, robust and of adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends. The top metal cap and base of surge arrester shall be galvanized. The line terminal shall have a built in clamping device which can be adjusted for both horizontal and vertical takeoff.

1.5 TECHNICAL PARTICULARS

The surge arrestors shall conform to the following standard technical requirements. The Insulation values shall be enhanced considering the altitude of operation & other atmospheric conditions.

System Parameters:

Nominal system voltage	:	33 kV
Highest system voltage	:	36 kV
System earthing	:	Solidly earthed system
Frequency (Hz)	:	50
Lightning Impulse withstand Voltage (kVP)	:	170
Power frequency withstand Voltage (kV rms)	:	70
Connection to system	:	Phase to earth

Surge Arrestors

Type of Surge Arrester	:	Gapless Metal oxide outdoor
Arrester rating (kV rms)	:	30
Continuous Operating voltage (kV rms)	:	25
Standard Nominal Discharge Current Rating (kA) (8x20 micro impulse shape)	:	10
Line discharge class	:	2
Degree of protection	:	IP-67
Lightning Impulse at 10 kA	:	85
Partial discharge at 1.05 COV not greater than	:	50 (PC)
Energy capability corresponding to		
a) Arrester rating (kJ/kV)	:	4.5
b) COV (kJ/kV)	:	4.9
Peak current for high current impulse operating duty of arrester classification 10 kA	:	100

Insulator Housing

Power frequency withstand test voltage (wet) (kV rms)	:	70
Lightning impulse withstand/test voltage (kVP)	:	170
Pressure Relief Class	:	40
Creepage distance not less than	:	900 mm

Galvanisation

Fabricated Steel Aticles--5 mm thick cover	:	610 g/m ²
Under 5 mm but not less than 2 mm thickness	:	460 g/m ²
Under 2 mm but not less than 1.2 mm thickness	:	340 g/m ² Castings
Grey Iron, malleable iron	:	610 g/m ²

04.13.2.2 33 kV ISOLATORS**1.0 SCOPE**

This specification provides for design, manufacture, testing atmanufactures works, delivery of outdoor station type 33KV (Local) manual operating mechanism isolating without/ with earthing blades and complete in all respect with bi-metallic connectors. Operating mechanism, fixing details etc shall be as described herein.

1.1 PARTICULARS OF THE SYSTEM

The isolators to be provided under this specification are intended to be used on 3 phase A.C. 50 cycles, effectively grounded system. The nominal system voltages are 33kV respectively.

1.2 STANDARD

The Isolator shall comply in all respects with IS: 9921 or IEC Publication No.: 129. Equipment meeting any other authoritative standard which ensures an equal or better quality than the standard mentioned above will also be accepted.

1.3 TYPE & RATING

Isolators shall have three posts per phase, triple pole single throw, gang operated out-door type silver plated contacts with horizontal operating blade and isolators posts arranged vertically. The isolators will be double break type and should have provisions for limit switch interlocking. Rotating blade feature with pressure relieving contacts is necessary i.e. the isolator shall be described in detail along-with the offer.

All isolators shall operate through 90 degree from their fully closed position to fully open position, so that the break is distinct and clearly visible from the ground level.

The equipment offered by the tenderer shall be designed for a normal current rating of 630 A for 33KV suitable for continuous service at the system voltage specified herein. The isolators are not required to operate under load but they must be called upon to handle magnetization currents of the power transformers and capacitive currents of bushings, bus-bars connections, very short lengths of cables and current of voltage transformers.

The rated insulation strength of the equipment shall not be lower than the levels specified in IS 9921 which are reproduced below:

Standard Declared voltage kv/rms	Rated voltage of the Isolator	Standard withstand positive kV (peak)	Impulse Voltage polarity	One minute power frequency withstand voltage KV (RMS)	
		Across the isolating distance	To earth and between poles	Across the isolating distance	To earth and between poles
33 KV	36kV	70kV	170 kV	100	75

The 33 KV isolators is required with post insulators but with mounting structures. The isolators should be suitable for mounting on the Boards standard structures. The isolators shall be supplied with base channels along with fixing nuts, bolts and washers for mounting on the structured.

1.4 TEMPRATURE RISE

The maximum temperature attained by any part of the equipment when in service at site under continues full load conditions and exposed to the direct rays of Sun shall not exceed 45 degree centigrade above ambient temperature.

1.5 ISOLATOR INSULATION

Isolation to ground, insulation between open contacts and the insulation between phases of the completely assembled isolating switches shall be capable of withstanding the dielectric test voltage specified above.

1.6 MAIN CONTACTS

All isolators shall have heavy duty self aligning and high pressure line type fixed contacts of modern design and made of hard drawn electrolytic copper. The fixed contact should be of reverse loop type. The various parts shall be accordingly finished to ensure inter-changeability of similar components.

The fingers of fixed contacts shall be preferably in two pieces and each shall form the reverse loops to hold fixed contacts. The fixed contacts would be placed in 'c' clamp. The thickness of 'C' clamp shall be adequate.

This channel shall be placed on a channel of adequate thickness. This channel shall be welded on an insulator mounting plate of 8mm thickness. The spring of fixed contact shall have housing to hold in place. This spring shall be made of stainless steel with adequate thickness. The pad for connection of terminal connector shall be of aluminum with thickness not less than 12 mm. The switch blades forming the moving contacts shall be made from tubular section of hard drawn electrolytic copper having outer dia not less then 38 mm and thickness 3 mm. These contacts shall be liberally dimensioned so as to withstand safely the highest short circuit and over voltage that may be encountered during service. The surfaces of the contacts shall be rendered smooth and silver plated. The thickness of silver plating shall not be less than 25 microns for 33 KV. In nut shell, the male and female contact assemblies shall be of robust construction and design of these assemblies shall ensure the same.

1. Electro-dynamic withstands ability during short circuit without any risk of repulsion of contacts.
2. The current density in the copper parts shall not be less than 2 Amp/sq.mm and aluminium parts shall be less than 1 Amp/sq.mm.
3. Thermal withstand ability during short circuit.
4. Constant contact pressure even when the live parts of the insulator stacks are subjected to tensile stresses due to linear expansion of connected bus bar of flexible conductors either because of temperature verification or strong winds.
5. Wiping action during closing and opening.
6. Self alignment assuring closing of the switch without minute adjustment.

The earthing switch should be provided with three sets of suitable type of fixed contacts below the fixed contacts assemblies of the main switch on the incoming supply side and the sets of moving contacts having ganged operation. These contacts shall be fabricated out of electrolytic copper for 33 KV isolators with earth switch and designed to withstand current on the line.

Arcing contacts / Horn : Arcing contacts are not required.
Auxiliary switches : Auxiliary switches are not required.

1.7 CONNECTORS

The connectors for isolator shall be made of Aluminium alloy LM-9 or LM-25 and shall be suitable for ACSR of WEASEL / DOG / WOLF Conductors 33 KV with horizontal and vertical takeoff arrangement. The details in regard to dimensions, the number of bolts to be provided, material and manufacture shall be furnished by the bidder for owner approval before

manufacturing. The groove provided in the connection should be able to accommodate conductor size mentioned above smoothly.

The clamps to be offered should be manufactured by gravity die-casting method only and not by sand casting process. It is necessary that suitable clamps are offered along with the isolator and also it is obligatory to give complete technical particular of clamps along with the drawing, as per details given above and also as per following detail.

1. The terminal connector shall be manufactured and tested as per IS: 5561.
2. All castings shall be free from blow holes, surface blisters, cracks and cavities.
3. All the sharp edges shall be blurred and rounded off.
4. No part of the clamp shall be less than 12 mm thick.
5. All current carrying parts shall be designed and manufactured to have minimum contact resistance.
6. Connectors shall be designed to be corona free in accordance with the requirement of IS: 5561.
7. All nuts and bolts shall be made of stainless steel only. Bimetallic sleeve/liner shall be 2 mm thick
8. Wherever necessary, bi-metallic strip of standard quality and adequate dimension shall be used.

1.8 POST INSULATOR

33 KV isolators, two numbers 33 KV insulators per stack and 9 stacks shall be supplied with each isolator. The insulator stack shall conform to the latest applicable Indian or IEC standard and in particulars to the IS; 2544 specification for porcelain post insulators. The porcelain used for manufactures of insulators shall be homogeneous, free from flaws or imperfections that might affect the mechanical or dielectric quality, and they shall be thoroughly vitrified, tough and impervious to moisture. The glazing of the porcelain shall be uniform brown colour, free from glisters, burns and other similar defects.

Insulators of the same rating and type shall be interchangeable.

The porcelain and metal parts should be assembled in such a manner that any thermal expansion differential between the metal and the porcelain parts throughout the range of temperature variation shall not loosen the parts or create undue internal stresses which may affect the electrical or mechanical strength and rigidity.

Each cap and base shall be of high-grade cast steel or malleable steel casting and they shall be machine faced and smoothly galvanised. The cap and base of the insulators shall be interchangeable with each other.

The tenders shall in variably enclose with the offer, the type test certificate and other relevant technical guaranteed particulars of insulators offered by them. Please note that isolators without type test certificates will not be accepted.

33KV Post Insulators used in the isolators should have technical particulars as detailed below:-

System Description	33KV
1. Nominal system voltage KV (rms) :	33
2. Highest system voltage KV (rms) :	36
3. P.F. Puncture withstand test voltage KV :	1.3 time the actual dry flash over voltage of the unit
4. Power frequency withstand voltage :	70
5. Impulse voltage withstand test KV (peak) :	170
6. Creepage distance mm (min) :	580
7. Tensile strength in KN :	16KN
8. Shorttime current rating for 3 Secs :	25KA

Operating Mechanism for 33KV Isolators

All Isolators and earthing switches shall have separate dependent manual operation. The Isolator should be provided with padlocking arrangements for locking in both end position to avoid unintentional operation & limit switch for interlocking. For this purpose Godrej make 5 lever brass padlocks having high neck with three keys shall be provided. The isolating distances should be visible for isolators.

The Isolators and Isolators with earth switch inclusive of their operating mechanism should be such that they cannot come out of their open or close position by gravity wind pressure, vibrations reasonable shocks or accidental touching of connecting rods of the operating mechanism. Isolators should be capable of resisting in closed position, the dynamic and thermal effects of maximum possible short circuit current at the

installation point. They shall be so constructed that they do not open under the influence of the short circuit current. The operating mechanism should be of robust construction and easy to operate by a single person and conveniently located for local operation in the switchyard. Provision for earthing of operating handle by means of 8 SWG GS wire must be made.

1.9 PIPES

Tandem pipes operating handle shall be class B ISI marked type having at least 24mm internal diameter for 33KV isolator. The operating pipe shall also be class B ISI marked with internal diameter of at least 38 mm and 33KV isolators respectively.

The pipe shall be terminated in to suitable universal type joints between the insulator bottom bearing and operating mechanism.

1.10 BASE CHANNEL

The Isolator shall be mounted on base fabricated from steel channel section of adequate size not less than 100x50x6 mm for 33KV.

To withstand total weight of isolator and insulator and also all the forces that may encounter by the isolator during services, suitable holes shall be provided on this base channel to facilitates it's mounting on our standard structures. The steel channel in each phase shall be mounted in vertical position and over it two mounting plates atleast 8mm thick with suitable nuts and bolts shall be provided for minor adjustment at site.

1.11 CLEARANCES

We have adopted the following minimum clearance for isolators in our system .The bidder should therefore keep the same in view while submitting their offers:-Description Center distance between Poles (Center to Center) i.e. Phase to Phase clearance

Distance between center lines of outer posts on same pole

33 KV Isolator 120 Cm

04.13.2.3 33 KV OUTDOOR TYPE CURRENT TRANSFORMER

1.12 INTRODUCTION

This section covers the specification of 33 kV Current Transformer suitable for outdoor service. Any other parts not specifically mentioned in this specification but otherwise required for proper functioning of the equipment should be included by the tender. The CT should be installed on separate mounting structure.

1.13 APPLICABLE STANDARDS

Unless otherwise modified in this specification, the Current Transformer shall comply with the latest version of relevant standards (IS 2165, IS 2705(I-IV), IS 2099, IS 5621, IS 2071, IS 335, IS 13947(part I), IEC 185, IEC 270, IEC 44(4), IEC 171, IEC 60, IEC 8263, IEC 815, Indian electricity Rules 2003) or better international standards. This list of standards is for guidance only. The contractor shall be solely responsible to design & manufacture the CT suitable for 33kV kV systems.

1.14 SYSTEM PARTICULARS

- a) Nominal System Voltage 33kV
- b) Highest system Voltage 36kV
- c) Rated Frequency 50Hz
- d) No of phases Three & Three.
- e) System neutral earthing -Solidly Earthed-
- f) One minute Power Freq. 70kV withstand voltage (rms)
- g) Lighting Impulse withstand Voltage 170kVp.
- h) System fault level -25kA for 3sec-

1.15 TECHNICAL PARAMETERS OF CT

- a) Type Single phase, dead tank, outdoor, oil filled & hermetically sealed
- b) Type of mounting Pedestal type
- c) Rated primary current 100/1A.
- d) Rated Continuous thermal current 120 % of rated Primary current.
- e) Rated short time withstand As per IS 2705 Pt-1 Requirement for sec. Winding
- f) Rated short time withstand 25kA (RMS) Current.
- g) Duration (for primary current 3Sec of 150amps and above).
- h) Duration (for primary current 1Sec
- i) Rated dynamic withstand 62.5Current (KA rms)
- j) Max temp rise As per IEC-185/ IS 2705
- k) Minimum creepage distance 25 mm /KV of porcelain housing(mm)
- l) One minute power frequency 3 kV Withstand voltage between Secondary terminal & earth
- m) Detail of Secondary Cores Metering Protn.

Current ratio (100/1A)

Accuracy class 0.5 5P10

Burden (VA) 30 30

Instrument security Factor ≤ 5 Accuracy Limit Factor-10.

1.16 PORCELAIN HOUSING

It shall be single piece of homogeneous, vitreous porcelain of high mechanical & dielectric strength. It will be glazed with uniform Brown or Dark brown colour with smooth surface finish. The creepage distance for the porcelain housing shall be at least 25 mm per kV.

1.17 WINDING

PRIMARY WINDING

It shall be made of high conductivity rigid copper wire. The primary winding current density shall not exceed the limit of 1.6 Amp per sq. mm for normal rating.

The design current density for short circuit current as well as conductivity of metal used for primary winding shall be as per IS 2705.

The primary terminal shall be of standard size of 30 mm dia x 80 mm length of heavily tinned (min. thickness 15 micron) electrolytic copper of 99.9 % conductivity.

SECONDARY WINDING

It shall be made of insulated copper wire of electrolytic grade. For multi ratio design, the multi ratio will be achieved by reconnection of the primary winding or secondary winding. The excitation current of the CT shall be as low as possible.

The terminal box shall be dust free & vermin proof. The size of the terminal box shall be big enough to enable easy access and working space with the use of normal tools.

The secondary terminals studs shall be provided with at least 3 nuts and two plain washers, these shall be made of brass duly nickel plated. The min. stud outer dia shall be 6 mm & length 15 mm. The min spacing between the centres of the adjacent studs shall be 1.5 time the outer dia of the stud.

1.18 POLARITY

The polarity shall be marked on each CT at the primary and secondary terminals.

1.19 TANK & HARDWARES

The CT will be dead tank type. The tank shall be fabricated of MS steel sheet of min. 3.15 mm for sides & 5mm for top & bottom. The tank will be finished with min. 2 coats of zinc rich epoxy paint externally. The inner surface shall be painted with oil resistance white enamel paint. All ferrous hardware, exposed to atmosphere shall be hot dipped galvanized.

1.20 INSULATION OIL

The first filling of oil in CT shall be in bidder's scope. The oil shall be as per IS 335.

To ensure prevention of oil leakage, the manufacturer will give following details supported by drawings:

- i) Location of emergence of Primary & Secondary terminals
- ii) Interface between porcelain & metal tanks
- iii) Cover of the secondary terminal box

Any nut & bolt and screw used for fixation of the interfacing porcelain bushing for taking out the terminals shall be provided on flanges cemented to the bushings & not on the porcelain.

If gasket joints are used, Nitrite Butyl Rubber gasket shall be used. The grooves shall be machined with adequate space for accommodating gasket under pressure.

The CT shall be vacuum filled with oil after processing. It will be properly sealed to eliminate breathing & to prevent air & moisture from entering the tank.

1.21 OIL LEVEL INDICATOR

The CT shall be fitted with prismatic type oil sight window at suitable location so that the oil level is clearly visible with naked eye to an observer standing at ground level.

To compensate oil volume variation due to temperature variation, Nitrogen cushion or the stainless steel bellows shall be used. Rubber diaphragms are not permitted for this purpose.

1.22 EARTHING

Two earthing terminals shall be provided on the metallic tank of size 16 mm dia & 30 mm length each with one plain washer & one nut for connection to the station earth mat.

1.23 JUNCTION BOX

The junction box shall be of MS sheet having thickness of 2mm, synthetic enamel painted as per procedure mentioned in General Technical Requirement (Min. thickness 55 micron). The shade of junction box shall be 697 of IS: 5. Disconnecting type terminal blocks for CT secondary lead shall be provided. The junction boxes shall be weather proof type with gaskets, as per section-I (Introduction and general technical requirements) conforming to IP-55 as per IS-13947 (Part-I).

1.24 LIFTING & MOUNTING ARRANGEMENT

The CT shall be provided with two lifting eyes to lift the CT. This shall be so positioned so as to avoid any damage to the CT during lifting for installation or transportation purpose. This shall be detailed in General Arrangement drawing.

The CT shall be of pedestal mounting type suitable for outdoor installation on steel/cement concrete structures. All the clamps, bolts, nut and washers etc. required for mounting the CT on the structure shall be supplied along with the CT and shall be galvanized. The contractor shall supply all the terminal connectors etc. required for connection to the CT.

04.13.2.4 33kV OUTDOOR TYPE POTENTIAL TRANSFORMER

1.0 INTRODUCTION

This chapter covers specification of 33kV Potential Transformer suitable for outdoor service. Any other parts not specifically mentioned in this specification but otherwise required for proper functioning of the equipment should be included by the tender.

1.1 APPLICABLE STANDARDS

Unless otherwise modified in this specification, the Potential Transformer shall comply with the latest version of relevant standards (IS 3156, IS 2099, IS 5621, IS 335, IS 13947(Part I), IEC 186, Indian electricity Rules 2003, IEC 815) or better international standards. This list of standards is for guidance only. The contractor shall be solely responsible to design & manufacture the PT suitable for 33 kV systems.

1.2 SYSTEM PARTICULARS

- a) Nominal System Voltage 33kV
- b) Highest system Voltage 36kV
- c) Rated Frequency 50Hz

- d) No of phases Three
- e) System neutral earthing ---Solidly Earthed
- f) One minute Power Freq. 70kV Withstand voltage (rms)
- g) Lighting Impulse withstand Voltage 170kVp
- h) System fault level -25 kA for 3sec

1.3 TECHNICAL PARAMETERS OF PT

- a) Rated primary Voltage 36 KV
 - b) Type Single phase potential transformer
 - c) Voltage/ Ratio(kV) 33/0.11
 - d) Rated voltage factor 1.2continuous 1.5–30seconds
 - e) One minute power freq. Withstand voltage for Primary Terminals 70 kV(rms) Secondary winding 36kV
 - f) Min. Creepage Distance 25 mm/kV of Highest System Voltage
 - g) Detail of secondary's Core I Application Metering
- Accuracy 0.5 0.5
Burden (VA) 100 100

1.4 PORCELAIN HOUSING

It shall be single piece of homogeneous, vitreous porcelain of high mechanical & dielectric strength. It will be glazed with uniform Brown or Dark brown colour with smooth surface finish. The creepage distance for the porcelain housing shall be at least 25mm per kV.

The contractor shall clearly detail in his bid the details of attaching the metallic flange to porcelain, pressure release valve and also how primary & secondary terminalsshall be brought out.

1.5 WINDING

PRIMARY WINDING

It shall be made of insulated electrolytic copper wire. The neutral end of the winding shall be brought outside for earthing. The primary terminal shall be of standard size of 30 mm dia x 80 mm length of heavily tinned (min. thickness 15 micron) electrolytic copper of 99.9 % conductivity.

SECONDARY WINDING

It shall be made of insulated copper wire of electrolytic grade. The terminal box shall be dust free & vermin proof. The size of the terminal box shall be big enough to enable easy access and working space with the use of normal tools. The secondary terminals studs shall be provided with at least 3 nuts and two plain washers. These shall be made of brass duly nickel plated. The min. stud outer dia shall be 10 mm & length 15 mm. The min spacing between the centres of the adjacent studs shall be 1.5 time the outer dia of the stud.

1.6 POLARITY

The polarity shall be marked on each PT at the primary and secondary terminals.

1.7 TANK & HARDWARES

It shall be fabricated of MS steel sheet of min. 3.15 mm for sides & 5 mm for top & bottom. The tank will be finished with min. 2 coats of zinc rich epoxy paint externally. The inner surface shall be painted with oilresistance white enamel paint. All ferrous hardwares, exposed to atmosphere shall be hot dipped galvanized.

1.8 INSULATION OIL

The first filling of oil in PT shall be in contractor's scope. The oil shall be as per IS 335. To ensure prevention of oil leakage, the manufacturer will give following details supported by drawings:

- a) Location of emergence of Primary & Secondary terminals
- b) Interface between porcelain & metal tanks
- c) Cover of the secondary terminal box

Any nut & bolt and screw used for fixation of the interfacing porcelain bushing for taking out the terminals shall be provided on flanges cemented to the bushings & not on the porcelain.

If gasket joints are used, Nitrite Butyl Rubber gasket shall be used. The grooves shall be in machined with adequate space for accommodating gasket under pressure.

The PT shall be vacuum filled with oil after processing. It will be properly sealed to eliminate breathing & to prevent air & moisture from entering the tank.

1.9 OIL LEVEL INDICATOR

The PT shall be fitted with prismatic type oil sight window at suitable location so that the oil level is clearly visible with naked eye to an observer standing at ground level. To compensate oil volume variation due to temperature variation, Nitrogen cushion or the stainless steel bellows shall be used. Rubber diaphragms are not permitted for this purpose.

1.10 EARTHING

Two earthing terminals shall be provided on the metallic tank of size 16 mm dia & 30 mm length each with one plain washer & one nut for connection to the station earth mat.

1.11 JUNCTION BOX

The junction box shall be of MS sheet having thickness of 2mm, synthetic enamel painted as per procedure mentioned in General technical Requirement (Min. thickness 55 micron). The shade of junction box shall be 697 of IS: 5. Disconnecting type terminal blocks for PT secondary lead shall be provided. The junction boxes shall be weather proof type with gaskets as per section-I (Introduction and general technical requirements) conforming to IP-55 as per IS-13947 (Part-I). One junction box shall be provided for 3 numbers of single phase CT's and PT's.

1.12 LIFTING & MOUNTING ARRANGEMENT

The PT shall be provided with two lifting eyes to lift the PT. This shall be so positioned so as to avoid any damage to the PT during lifting for installation or transportation purpose. The PT shall be of pedestal mounting type suitable for outdoor installation on steel/cement concrete structures. All the clamps, bolts, nut and washers etc. required for mounting the PT on the structure shall be supplied along with the PT and shall be galvanized.

04.13.2.5 33 kV VACUUM CIRCUIT BREAKERS

1.0 SCOPE

This specification covers design, manufacturing, testing at manufactures works, supply of 33KV Vacuum Circuit Breakers complete with all accessories required for their satisfactory operation for the sub-transmission system. The Breakers shall be used for Transformer protection or Feeder Control, in the system.

1.1 TYPE AND RATING

The circuit breakers shall be suitable for outdoor operation without any protection from sun and rain.

The circuit breakers shall have the following rating:-

PARTICULARS 33 KV

- a) Number of Poles 3 Nos.
- b) Frequency 50 Cycles
- c) Nominal System Voltage-33 KV
- d) Highest System Voltage-36 KV
- e) Interrupting Capacity at nominal system voltage 1500 MVA
- f) Rated Continuous Current 1250 Amps
- g) Short-time Current Rating for 3 Secs. 25 KA
- h) Basic Insulation Level 170 KV
- i) Power Frequency Withstand Voltage for one Minute 70 KV

- j) Total Break-time for any Current up to the rated breaking current 5 cycles (max.)
- k) Control Circuit Voltage 30 Volt D.C.
- l) Operating duty for gang operation O–0.3 Sec–CO–3 Min–CO
- m) The VCBs shall be suitable for one reclosing followed by one delayed reclosing and lock out

Minimum clearances

- a) Between Phases-430 mm
- b) Between Live Parts & Ground-3700 mm
- c) Creepage Distance-900 mm

The above are our minimum requirements. The manufacturers may offer their standard design, keeping in view our minimum requirements.

1.2 STANDARDS

The circuit breakers shall comply with the requirements of IEC 56 or IS 13118 (1991) with latest amendment thereof, except wherein specified otherwise. Equipment, meeting any other authoritative standard, which ensures equal or better quality than the standard mentioned above, would also be acceptable. The bidders shall clearly indicate the applicable standards to which their equipment's complies-with.

1.3 GENERAL

The circuit breaker shall be of porcelain clad vacuum type. The breaker, complete in all respect, shall be supplied with all accessories in-place and all internal wiring installed and terminated in the mechanism housing and the equipment shall be complete in all respects.

The circuit breakers shall provide rapid and smooth interruption of current under all conditions, completely suppressing all undesirable phenomena, even under the most severe and persistent short-circuit conditions or when interrupting small currents or leading/ lagging reactive currents. The details of any device incorporated to limit or control the rate of rise of Restriking voltage across the circuit breaker contacts shall be stated. The over voltage caused by the circuit breaker switching on inductive or capacitive load shall not exceed 3.2 times the normal phase to neutral voltage. The total break-time for the circuit breaker, throughout the range of breaker operating duty, shall be stated in the tender and shall be guaranteed. The breaker shall be fit for capacitor switching for 5 MVAR Bank. The breakers shall be provided with trip free mechanism. The circuit breakers shall be suitable for mounting on steel structures. All the structures shall be hot dip galvanized with 3 dips. Please note that cantilever type supports for mechanism box are not acceptable. The mechanism box shall have firm supports from bottom. This is necessary to minimize vibration of mechanism box, which in turn may disturb various settings. The agency shall indicate clearly the vibration level of the breaker during fault / normal ON OFF operations in all three directions.

The owner intends to operate 33 KV feeders with automatic reclosing scheme, the arrangement envisaged is as under:-On the occurrence of a fault the concerned protective relay will open the circuit breaker as per its own characteristic. Thereafter, the breakers shall re-close but after pre-set time delay, which shall be adjustable (say range 4–10 sec. or near about). There shall be no further automatic reclosing. A simple type of reclosing relay (reputed make) for this purpose shall be provided under this kind of operation. It is also necessary that the breaker shall be suitable for this reclosing duty. The auto-recloser relay is to be installed in respective indoor control panels.

1.4 SPECIFICATION FOR CIRCUIT BREAKERS

The circuit breakers shall consist of three identical phase units with a common operating mechanism. While offering the circuit breaker, the following details should be confirmed and furnished with the tender:-

- i. Complete construction details of the equipment offered. It should be noted that the breakers should be suitable for out-door duty. Indoor breakers accommodated in out-door kiosks are not acceptable.
- ii. Type, make & source of vacuum bottles with relevant details shall be indicated in the offer, clearly.
- iii. The capacity of breaker to interrupt inductive and capacitive currents shall be indicated in the offer (rating of capacitor bank should be stated and type test report shall be furnished).
- iv. Spare availability of vacuum interrupter should be confirmed by the bidder for the designed expected life of the breakers being offered.

1.5 VACUUM INTERRUPTER

The design of the vacuum interrupter shall be such that it gives trouble free operation under normal load and fault conditions throughout the life of the equipment. As the efficiency of the breaker depends on the degree of vacuum inside the interrupter, manufacturer shall ensure that the same is maintained consistently during service.

To know the residual life of vacuum interrupter, an indicator to indicate the status of contact erosion shall be provided.

The insulating ceramic body of the interrupter should have high mechanical strength and it should be capable of withstanding high temperature without any significant deterioration in its mechanical and electrical properties

The metal/ alloy used for the fixed and moving contacts shall have very low resistivity and low gas content. They should be resistant to arc erosion and the contact should have no tendency to get cold-welded under the high vacuum in the interrupter.

The interrupter design should ensure rapid de-ionization of the gap so that normal electrical strength of the gap is restored instantaneously.

The metallic bellow or any other similar vacuum sealing arrangement should be provided at the moving contact and should have a long fatigue life.

1.6 INSULATION OF THE CIRCUIT BREAKER

The insulation to ground, the insulation between open contacts and the insulation between phases of the completely assembled circuit breaker shall be capable of withstanding satisfactorily di-electric test voltage corresponding to specified basic insulation level in the standard.

1.7 INSULATORS

The basic insulation level of the Insulator and insulating porcelains shall be as specified and porcelain shall be homogenous and free from cavities and other flaws. They shall be designed to have ample insulation, mechanical strength and rigidity for satisfactory operation under conditions specified above. All insulators of identical ratings shall be inter-changeable. The puncture strength of the insulators shall be greater than the flash over value.

1.8 OPERATING MECHANISM

The circuit breakers shall be designed for remote control from the control room and in addition there shall be provision for manual operation of circuit breakers during maintenance and for local tripping and closing by the normal means. The circuit breakers shall have operation control and mechanical “open” “close” indicator, in addition to facilities for remote electrical indication. The operating mechanism shall be of the spring charging type, by electric control under normal operation. The mechanism shall be trip free electrically and mechanically. The mechanism shall be capable of performing satisfactorily, the reclosing duty cycles indicated above, within the time specified. All working parts in the mechanism shall be of corrosion resistant material and all bearings, which require greasing, shall be equipped with pressured grease fittings. The mechanism shall be strong positive quick in action and shall be removable without disturbing the other parts of the circuit breaker. The mechanism and breaker shall be such that the failure of any spring will not prevent tripping and at the same time will not cause any false tripping or closing.

The operating Mechanism should be motor operated spring charged type preferably without chain drive. The motor for spring charging shall be suitable to perform satisfactorily for input supply voltage of 230 Volt A.C. 50 Hz with a variation of plus 10 and minus 20 percent. The A.C. Motor should have overload protection. Provision should also be made for mounting of mechanism box at an adequate height and gear ratios shall be so chosen that one man should be able to charge the spring, without any additional efforts.

1.9 CONTROL CUBICLE

A common control cubicle shall be provided to house electrical, controls, monitoring devices and all other accessories, except those which must be located on individual poles. The cubicle shall be gasketed and shall

have weather-proof construction, fabricated from sheet steel of minimum 2.5 mm thickness. The type test report on degree of protection test (IP-55) shall also be furnished. The cubicle shall have front access door with lock and keys, space heater, internal illumination lamp, 3 pins 5 Amp socket with individual ON-OFF switches shall be provided in the cubicle.

For local operation following shall be provided:-a) LOCAL / REMOTE selector switch TRIP / NORMAL / CLOSE control switches with pistol grip handle

The control circuits shall be designed to operate on 30 Volt DC, as indicated in the schedule and it shall be possible to adopt to work on other voltages by simply changing the operating coils. The shunt tripping coils shall be designed to operate satisfactorily within 110% and 70% of the rated DC supply voltage and the shunt closing coils should operate up to 85% of the rated DC voltage. These checks shall be repeated during pre-commissioning checks at site before putting the breakers in service.

AC Power supply for auxiliaries will be available at 230 Volt (+/- 10% variation) single phases 50 C/s at substation. The agency shall be required to extend this supply, using proper protection, to desired location through cable.

Necessary double compression type cable glands for the cables of the operating mechanism shall be provided.

The cables used for operation are all un-armoured 2.5 sq. mm copper control cables of 1100 V grade. The cable glands shall be suitable for 1 no. 8 core and 2 nos. 4 core cables and cables as per site requirements. The gland plate should be made of non-magnetic materials and suitably drilled at site to suit the cable entry. The Circuit breaker shall be provided with trip free Mechanism so that tripping instructions could over-ride the closing instructions. An additional tripping coil shall also be provided in the trip circuit. The second coil shall have separate tripping lever arrangements in the mechanism, so as to avail full advantage of second trip coil. Also the two trip coils shall have separate fuses in the DC circuit, so that in the event of any short circuit/damage in any one of the trip coils, the supply is available to the other one.

The circuit diagram of Control circuit of VCB along with operating instructions (DOS/ DON'T) shall be embossed on metallic plate duly laminated and the same shall be fixed on the rear door of the control cubicle from inside.

1.10 WIRING

Wiring shall be completed in all respects to ensure proper functioning of the control, protection, monitoring and interlocking schemes. All the wiring shall be carried out with 1100 V grade, PVC insulated stranded copper conductor of 2.5 sq. mm as per IS: 1554.

Each wire shall be identified at both ends with permanent markers bearing wire numbers as per wiring diagram. Wire termination shall be done with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

All spare contacts of auxiliary switches etc. shall be wired up to terminal blocks in the control cubicle.

1.11 TERMINAL BLOCKS

Terminal blocks shall be of 1100 V grade, box clamp type ELMEX 10 sq. mm or approved equivalent. Not more than two wires shall be connected to any terminal. Spare terminals, equal in number to 20% of active terminals, shall be provided.

Terminal block shall be such located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

1.12 TERMINAL CONNECTORS

6 Nos. Terminal bi-metallic connector suitable for Wiesel conductors shall be supplied with each breaker. For ensuring quality and uniformity, the owner may decide to specify the design of terminal connector, the material of terminal connector and thickness of clamps. Further compliance of which will have to be done by the agency without any extra cost. Suitable earth connector for earthing connections shall also be supplied.

1.13 AUXILIARY CONTACTS

Eight numbers each of auxiliary contacts both of the normally open and normally closed types shall be provided in each circuit breaker for use in the remote indication and control scheme of the circuit breaker and for providing safety interlocking. Special contacts for use with trip coils, which permit for relative adjustment with respect to the travel of the circuit breaker contact, shall also be provided, wherever required. There shall be provision to add more auxiliary contacts at a later date, if required.

1.14 ACCESSORIES

The vacuum circuit breaker shall be supplied as a complete unit with internal wiring installed and terminated in mechanism box and equipped with the following accessories:

1. Motor operated spring charged mechanism (Motor voltage–230 V AC) 1 No.
2. Trip coil suitable for 30 V DC 2 Nos.
3. Closing Coil suitable for 30 V DC 1 No.
4. Pistol grip C.B. Control switch having Trip/ Normal/ Close position 1 No.
5. Local/ Remote selector switch 1 No.
6. Spring Charged indicator 1 No.
7. Manual operating handle for maintenance 1 No.
8. Facility for manual charging of spring 1 No.
9. Operation counter 1 No.
10. Auxiliary contacts (8 NO-8 NC) 1 Set
11. Anti-pumping device suitable for 30 V DC 1 No.
12. Terminal connectors suitable for connecting DOG/ WOLF Conductor 6 Nos.
13. Cubicle illuminating lamp with cage and switch 1 No.
14. Spare terminals connectors 20% of Total Terminals
15. Mechanical ON/OFF Indicator 1 No.
16. MCB for both AC and DC supply 1 No. each
17. Space heater and ON-OFF switch in the mechanism box 1 No.
18. Power Type 3 Pin Socket with ON-OFF switch 1 Set
19. Earthing Terminals 2Nos.
20. LED indicating lamps Complete set

Indicating Bulbs :The indicating lamps should be supplied with Low Voltage protection Circuit (LVGP) and surge suppressor circuit having LED indication. Lamp assembly should be of fire–retardant glass epoxy PCB, industrial heat resistant, fire resistant, non-HygroscopicDMC material , chrome–plated corrosion resistant solid brass bezel , polycarbonate lens in desired colour shades of Red , Green, Amber, Yellow etc. the intensity of light should be minimum 100 mcd at 20 mA . Indication lamp should be suitable to operation 30 V Direct Current supply source.

1.15 TYPE TESTS

Type test certificates on VCB for the following tests, strictly as per IS 13118, with latest amendment thereof, from any of the independent Govt. Laboratory, or at any recognized and reputed international laboratory or testing institution, shall invariably furnished :-□ Short Circuit Duty Tests

- Short Time Current Rating Tests
- Mechanical Endurance Test
- Temperature Rise Test
- Lightning Impulse Voltage withstand Test
- Capacitor Switching Duty Test for Single Bank of 5 MVAR capacity
- Power Frequency withstand Voltage Test dry & wet
- Degree of protection IP-55 for control cubicle

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.

1.16 ACCEPTANCE AND ROUTINE TESTS

All acceptance and routine tests, as stipulated in relevant standards, shall be carried out by the manufacturer, in presence of owner's representative.

04.13.2.6 ACSR Conductors

ACSR conductors 'DOG' shall be used for 33 kV overhead lines/inter connections. The conductors shall have following specification.

ACSR conductor	Nominal copper area sq.mm	Al. Conductor No/dia mm	Steel No/dia mm	Equivalent Al. Area sq.mm	Max. resistance at 20°C Ohm/km
DOG	65	6/4.72	7/1.57	103.6	0.2745

ACSR conductors shall conform to IS 398 Part-II(1986). Central core shall be made of galvanised steel wires, with zinc of uniform thickness complying with Table-1 of IS 4826 (1979) for ACSR conductors. Accessories for jointing successive lengths of conductors such as compression, twisting joints, repair sleeve shall form part of rates indicated for ACSR conductors. Clamps and connectors for connecting of ACSR conductors shall be made of alloy casting.

Bimetallic connectors/parallel groove clamp shall be used for connecting equipment terminals made of copper or brass. Bolts nuts and washers for connectors shall be made of mild steel and shall be electro galvanized and passivated to made them corrosion resistant conforming to requirements of BS 1706.

04.13.2.7 DOUBLE POLE STRUCTURE DETAILS

1.0 13 MTR, R.S JOIST POLE:

This specification covers design, manufacture, testing and supply of 150mmx150mm GI RS Joist 11 Meter long having unit weight of 34.6kg per Meter. Thickness of the web shall be 11.8mm.

All steel structures including RS joist for Line & Outdoor structures in Substations shall be Galvanized type.

150x150mm RS joist : 150 x 150 mm R.S. Joist length: 13 mtr,34.6kg/mtr

1.1 Applicable Standards:

This specification covers the manufacturing, testing before dispatch and delivery of above R.S Joists.

1.2 Standards:

The RS JOISTS shall comply with the requirements of latest issue of IS –2062 Gr –A except where specified otherwise.

1.3 Rolled Steel Joists:

RSJ DESIGNATION	150 x 150 mm ISHB
Length of Joist in Mtr with +100mm/-0% Tolerance	13 mtr
Weight kg/m with 2.5% tolerance	34.6
Sectional Area	44.1
Depth (D) of section (mm) with +3.0mm/-2.0mm tolerance as per IS-1852-1985.	150
Width (B) of flange (mm) with ± 2.5 mm tolerance for 116x100mm ISMB & ± 4.0 mm tolerance for 150x150mm ISHB, IS-1852, 1985.	150
Thickness of flange (Tf) mm with ± 1.5 mm tolerance	9
Thickness of web (Tw) mm with ± 1.0 mm tolerance	11.8
Corner radius of fillet or root (R1) mm	4
Moment of inertia Ixx(Cm ⁴) Iyy(Cm ⁴)	1640 495
Radius of gyration	

Rxx	6.09
Ryy	3.35
Flange Slope in mm	94

1.4 Dimensions and Properties :

MECHANICAL PROPERTIES:

Tensile Test :	Requirement as per IS:2062/1999 Grade-A
Yield Stress(MPa)	Min 250
Tensile Strength(MPa)	Min 410
Lo=(5.65ISo) Elongation%	Min 23
Bend Test	Shall not Crack

1.5 CHEMICAL PROPERTIES:

Chemical Composition	Requirement as per IS:2062/ 1999 Grade-A	Permissible variation over the Specified Limit, Percent, Max
Grade	A	-
Chemical Name	Fe-410W A	-
Carbon (%Max.)	0.23	0.02
Manganese (%Max.)	1.5	0.05
Sulphur (%Max.)	0.050	0.005
Phosphorous (%Max.)	0.050	0.005
Silicon (%Max.)	0.04	0.03
Carbon Equivalent (%Max.)	0.42	-
De-oxidation Mode	Semi-killed or killed	
Supply condition	As rolled	

2.0 POLE MOUNTED AIR BREAK SWITCH

33kV triple pole, manually operated, 3 phase, pole mounted, air break, isolating switch complete with 3 pole earthing blade shall be suitable for outdoor installation. Suitable mechanical interlock shall be provided between Isolator and Earth Switch. The isolator shall conform to IS 9921, Part-III (1982). The isolator shall be mounted on porcelain insulator suitable for horizontal mounting. The switchblades and contacts shall be made of silver plated copper. The contacts shall be spring loaded and the springs shall maintain the pressures at operating temperature of contacts.

The isolators are to be mounted on double pole/4- pole structure. Necessary coupling rods, operating cranks and shafts shall be securely clamped after proper adjustments to ensure perfect, smooth, gang operation from ground level. The vertical operating shaft shall be provided with guide clamps at suitable intervals, for vibration free operation. All non-current carrying metallic structure shall be painted as per IS. Locks shall be provided to facilitate locking of isolator in ON or OFF position. Further, mechanical ON/OFF positions shall be clearly inscribed using anodized inscription plates. The isolator shall conform to the technical particulars specified in this contract.

Ring Main isolator shall be off load, centre rotating horizontally mounted, gang operated type.

Tests at works : Routine tests as per IS 9921, Part IV (1985).

2.1 General Technical Particular

	33 kV
Rated voltage	33
Highest system voltage	36
Rated current	400 A
Type	3 Phase, gang operated, Air break
Installation	Outdoor
Insulation level	
P.F. withstand voltage, KV (RMS)	70
Impulse withstand voltage, KV peak	170

Rated short time current, KA RMS for	25 kA for 3 Sec
GI arcing horn	To be provided
Contact material	Silver plated copper
Terminal connectors	Suitable for ACSR conductor at incoming and on outgoing side
Type of insulator	Post type
Min. creepage distance	31.5 mm/KV.

3.0 HORN GAP FUSES

The horn gap fuse sets are to be used for protection of Distribution transformers.

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the Horn Gap Fuses shall conform to the latest revisions and amendments of the following standards:

Sl.No	Standard	Title
1	IS: 2629/1985	Recommended practice for hot dip galvanizing of iron and steel.
2	IS: 2633/1986	Method of testing uniformity of coating on zinc coated articles
3	IS:2544/1973	Specification for porcelain post insulators for systems with nominal voltages greater than 1000 volts
4	IS:4218/2001	ISO general purpose metric screw threads
5	IS:5350/1973	Dimensions of indoor and outdoor porcelain post insulators and post insulator units for systems with nominal voltages greater than 1000 volts.
6	IS:9385	Expulsion high voltage fuses for above 1000 volts.

The hardware of 33 KV Horn Gap Fuses shall be constructed out of the best quality of material suitable for weather conditions. The workmanship shall be in accordance with the modern engineering practice. All ferrous part shall be given an anticorrosive finish and it shall be hot-dip galvanized. The other parts shall be substantially non-corrosive. The details of various specific parts are as under.

3.1 Base Channel

The base channel shall be of size 75mm x 40mm of mild steel. It must be painted with two coats of aluminum paint over coating of Red Oxide Paint. The base channel should have holes for mounting post insulators and also fixing holes for mounting post insulators.

3.2 Horn Stool

Two numbers of Horn Stools of MS Flat of size 50 mm x 6m. It will be painted with two coats aluminum paint over Red Oxide coating. The Horn Stool shall be fixed on the top of the post insulators with the help electro galvanized bolts and spring washers. The Horn Stool must be rigid and strong enough for fixing the horn over the top of horn stool. Over the top of horn stool, the horn will be fixed. The horn stool shall have groove of suitable size for holding arcing horn properly.

3.3 Arcing Horn

Two numbers arcing horns of 12mm dia of MS Round Rod will be used. It shall be fitted on horn stool with the help of horn clamp, nuts, bolts and spring washers. It will be hot dipped galvanised as per IS: 2633 with latest amendments. The base of arcing horn should be projecting to 25 mm. The length of the horn/height should be maintained. The horn should be flattened slightly for tapping a hole and fixing brass thumb screw with fly nut and flat washer to tie and tighten the fuse wire.

3.4 Brass Thumb Screw

There shall be one tapped hole on each arcing horn. The brass thumb screw will be fixed in the tapped hole provided in each arcing horn. The fuse wire is to be tied with brass thumbscrew and tightened with help of fix nut (Brass) and flat washer (Brass). The length of brass thumb screw will be fully threaded and screwed upto the whole depth of the horn. The design must be such that the changing of fuse wire is convenient. There is no loose connection/contact and there should not be any possibility of thumb/jamming on account of arcing when fuse is blow off.

3.5 Horn Clamp

There shall be two MS Horn Clamp of size 50x105x6 mm fixed on horn stool with the help of bolts and nuts spring washers for fixing the Arcing Horn and Clamping the conductor. The lower part of the clamping for holding the required conductor shall be of size 50x50x6mm. This shall be made from MS Sheet and will be painted with two coats of aluminum paint over the Red Oxide coating. The clamp for 33KV Horn Gap Fuses shall be suitable for ACSR "Dog". The clamp will be of MS sheet and shall be hot dipped galvanized as per IS: 2633 (with latest amendment).

General Technical Particular

Voltage rating	33 kV, 50 Hz
Rated current	
Fuse base	400 A
Fuse link	200A
Rated breaking capacity	25kA at 33 kV

3.6 Earthing Terminal

One number earthing terminal shall be provided on the flange portion of base channel. The MS Bolt of 12mm dia and 25 mm long shall be used with flat washer for this purpose.

1.1 Pin / Disc Insulators

Sl. No.	Description	33 kV Pin Insulator	33 kV Disc Insulator
1	Nominal system voltage kV (rms)	33	33
2	Highest system voltage kV (rms)	36	3.6
3	Visible discharge voltage kV (rms)	9	9
4	Wet one minute power frequency withstand , voltage (kV, rms)	70	70
5	Impulse withstand voltage 1.2/50 micro second wave, (kV,rms)	170	170
6	Minimum creepage distance (mm)	31.5mm/kV	31.5mm/kV
7	Type of insulator	Brown glazed porcelain	
8	Metal parts	Metallic iron, hot dip galvanized	
9	Applicable standards	IS:731(1971)/ IS:3188(1980)	
10	Tests at works	As per IS	
11	Tests at site	Physical inspection	

1.2 Post Insulator

i) Nominal system voltage kV (rms)	33
ii) Highest system voltage kV (rms)	36
iii) Wet power frequency one minute with stand voltage (kV, rms)	70
iv) Power frequency puncture kV (rms)	1.3 time the actual voltage dry flash over voltage.
v) Impulse withstand voltage kV (Peak)	170
vi) Visible discharge voltage kV (rms).	9
vii) Creepage distance in mm (min)	31.5mm/kV

1.3 Fence

Type	Chain link with gate of 7mx8.5m.
Drawing indicating cross section of fence	Shall be submitted
Dimension of fence	
a) Height	2.45 m
b) Length	As per requirement / BOQ

1.4 Guard Wire

Size of GI wire	8 SWG GI wire
Drawing indicating the mesh arrangement	Shall be submitted
Weight/ Metre	0.104Kg/mtr

4.0 20 mm dia GI stay sets

Manufacturing, testing, dispatch, supply and delivery of Stay Rod for 33 kV over headline. One set of stay set consists of following items.

- Stay Rod - 1 No.
- Anchor Plate – 1 No.
- M.S. Bow along with eye hook – 2 No.
- Thimbles – 2 Nos.
- Suitable hexagonal M.S. Check nut (Ordinary) – 1 No.
- Suitable hexagonal M.S. Ratchet nut – 1 No.
- M.S. Spring washer – 2 No.
- M.S. flat Washer – 4 No.

All the components of stay shall be painted with primer of reputed make of red oxide and finished with two coats of reputed make Aluminum paint after erection of same.

Stay Wire

Material and size	7/14 GI
Angle of support (Vertical angle)	---

04.13.2.8 MILD STEEL CHANNEL, ANGLE AND FLAT

1.6 APPLICABLE STANDARDS:

The mild steel shall conform to IS: 2062 grade 'a' modified upto date or equivalent international standard for steel materials.

1.7 GENERAL REQUIREMENTS:

Material shall be supplied as per the following sizes:

100x50 ISMC channel conforming to IS: 2062 grade 'a' modified upto date or its equivalent International Standard having length ranging from 5.5 to 13.5 meters. 75x40 ISMC channel conforming to IS: 2062 grade 'a' modified upto date or its equivalent International Standard having length ranging from 5.5 to 13.5 meters.

50x50x8 mm or 6 mm ISA angles conforming to IS: 2062 grade 'a' modified upto date or its equivalent international standard having length ranging from 5.5 to 13.5 meters.

45X45X5 mm ISA angles conforming to IS: 2062 grade 'a' modified up to date or its equivalent international standard having length ranging from 5.5 to 13.5 meters. 60x65x6 mm ISA angles conforming to IS: 2062 grade 'a' modified up to date or its equivalent international standard having length ranging from 5.5 to 13.5 meters. 25X3mm, 50X6mm, 50x8mm, 75X8mm and 80X8 flats conforming to IS: 2062 grade 'a' modified up to date

or its equivalent international standard having length ranging from 5.5 to 9.5 meters.

1.8 GALVANISATION:

All above steel members shall be fabricated as per approved drawing having smooth edge, drilled circular/elliptical holes of suitable measurements.

All structural steel members and bolts shall be galvanized as per IS:4759 and zinc coating shall not be less than 610gm/sq. meter for all structural steel members. All weld shall be 6mm filled weld unless specified otherwise. All nuts and bolt shall be of property class 5.6 of IS 1367. Plain washers shall be as per IS 2016 and spring washers shall be IS:3063

04.13.2.9 33kV CONTROL RELAY PANEL AND PROTECTION & METERING

1.0 General

Unless specifically given below, all specifications are valid for relay and control panel.

Each Control & relay panel for MRS switchyard equipment shall house relay, control and metering. For 33kV each circuit breaker bay will have one relay and control/metering panel. The following equipment shall be provided on control panels.

Details of major protections for 33kV system

Sl No	Type of feeder	Protection on relay panel
1	Incomers from State Electricity board	Local breaker backup protection (LBB) Non-Direction O/C and EF Protection (51+51N) Direction O/C and EF Protection (67+67N) Distance protection and REF protection (21+21N) with auto reclose (AR) – dual protection Frequency relay (81) Check synchronizing relay (25) Grid failure protection relay comprising of Under voltage with timer (27+2) Over voltage (59) Rate of change of frequency relay (81df/dt) Phase angle measuring relay (78) Fuse failure protection (97) Under voltage protection of line CVT (27) Fuse failure protection of line CVT (97) (for alarm)
4	Bus PT	Relays for use in interlock of other feeders, incomers and buscouplers Under voltage relay with timer (27+2) Frequency relay (81) Over voltage relay (59) Fuse failure protection (97) (for alarm) Voltage selection relay

In addition to above major protection, following shall be considered as per scheme requirement.

Master trip relay

Auxiliary relays

Trip ckt & close ckt supervision relays

Check synchronizing relay

U/V & O/V relays

df/ dt , frequency relay etc.

Details of major metering for 33kV system

Sl No	Type of feeder	Meters on control panel
1	Incomers from State Electricity board	For PLANT Metering: <ul style="list-style-type: none">Tariff energy meters (both main and check meter) with provision for two meter summation metering system. (details furnish below) from out door CT and PT. Three Voltmeters for line PT(GIS)Three Ammeters from CT's (GIS)

		<ul style="list-style-type: none"> • Multi function meter (Numerical Type) • Frequency meter • ABT based tri vector energy meter with other facilities • Power factor meter • BCU comprising (MW, MVA_r, V, F, PF, 25) • Voltmeter with VSS for line CVT • Ammeter with ASS • Multifunction meter with load survey facility • Voltmeter with VSS for grid line CVT • Ammeter with ASS for grid line • Multifunction meter at grid line with load survey facility • Frequency meter • Bay control unit
4	Bus PT	<ul style="list-style-type: none"> • Three Voltmeter • Frequency meter

1.1 Components

- Mimic diagram displaying single line diagram
- Semaphore & illuminated control sw. For 220 kv isolator positioning
- Discrepancy control switch for 220 kV circuit breakers alongwith lamps.
- Semaphore indicator for circuit breaker
- Indication lamps
- Annunciation windows static facia
- Meters as defined
- Relays as defined
- Others

- a) Heater with switch
- b) Test terminal Box

Any other items required to meet the functional requirement of the scheme.

1.2 Constructional Features

- Panels (Simplex Type) shall be arranged to form a continuous board with the mimic and control equipment.
- Panels shall be vertical, free standing, Simplex type with hinged door, side terminal blocks, control signaling circuit breakers, resistors, fuses, links, isolating switches etc.
- Flush mounted meters, relays, switches, signal lamps etc on front of the panel.
- CRCA sheet steel used shall be of minimum 2 mm thickness except for doors and covers for which 1.6 mm thick.
- Provided with 75mm base channel and 15 mm anti vibration pad.
- Will have bottom cable entry.
- Provided with space heater and interior illumination lamp with switches.
- Anodised aluminum / Chrome plated inscription plate at front side of size to enable a person to read from 5 meters shall be provided.
- Painted after proper degreasing, pickling and chemical phosphating.
- Earth bus securely fixed.
- Separate DC feeder for closing and tripping coils of each breaker

- Provision of digital clock
- There shall be sufficient reinforcement to provide level transportation and installation.
- All doors, removable covers and panels shall be gasketed all around with neoprene gaskets. Ventilating louvers, if provided shall be screens and filters. The screens shall be made of either brass or GI wire mesh.
- Design, materials selection and workmanship shall be such as to result in neat appearance, inside and outside with no welds, rivets or bolt head apparent from outside, with all exterior surfaces true and smooth.
- Cable entries to the panels shall be from the bottom. Cable gland plate fitted on the bottom of the panel shall be connected to earthing of the panel/ station through a flexible braided copper conductor rigidly.
- All equipment on and in panels shall be mounted and completely wired to the terminal blocks ready for external connections. The equipment on front of panel shall be mounted flush. No equipment shall be mounted on the doors.
- Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent devices and are readily accessible
- The center lines of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The center lines of relays, meters and recorders shall be not less than 450mm from the bottom of the panel.
- All sheet steel work shall be with 7 tank process. Oil, grease, dust and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with a slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.
- After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The paint shade shall be shade 631 as per IS:5 or equivalent RAL standard.
- A small quantity of finished paint shall be supplied for minor touching up required at site after installation of the panels.
- Components i.e. Pushbuttons, selector switches, indicating lamps, annunciation system, meters etc. shall be as per requirement as mentioned in component list.

1.2.1 Wiring

- Fully wired with 1100 V grade multi stranded copper wire PVC insulation having area 1.5 sq mm . CT & PT connections and external connections shall be made with 2.5 sq.mm copper wires. The CT and PT wiring shall be done with color coded wires with no lugs in CT secondary termination.
- Wire shall not be joined or tied between the terminal points
- No bunch will contain more than twelve wires.
- Wire end shall be fitted with moisture and oil resistant insulating material having glass finish with identification number clearly engraved in black.
- All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters & troughs shall be used for this purpose.
- Wire termination shall be made with solderless crimping type and tinned copper lugs, which firmly grip the conductor.
- Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire.
- All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red coloured unlettered ferrule.

1.2.2 Terminal Blocks

- Stud or open screw type terminal blocks vertically mounted.
- Screw type terminal blocks shall be provided with brass studs of not less than 6 mm in diameter.
- In each terminal block 20% spare terminals shall be provided.
- All internal wiring to be connected to external equipment shall terminate on terminal blocks. Terminal blocks shall be of 1100V grade and 10 Amps. rating

- Disconnecting type terminal blocks for current transformer and voltage transformer secondary leads shall be provided. Also current transformer secondary leads shall be provided with short circuiting and earthing facilities.

- Size shall be 2.5 sqmm copper for CT,PT and all other circuits and 6sqmm Cu for AC/DC power supply circuits

- There shall be a minimum clearance of 250mm between the first row of terminal blocks and the associated cable gland plate or panel side wall. Also the clearance between two rows of terminal blocks edges shall be minimum of 150mm.

1.2.3 Control Supply

- The control voltage shall be 30V DC.

- Control bus shall be made out of copper rods

- For switching off supply disconnecting devices with auxiliary contacts for indication of control supply shall be provided.

- One number 240V single phase 15 A point in all panels for testing purpose.

1.2.4 Annunciators

- Static type alarm annunciators having windows shall be provided . Hooter and bell shall be provided for trip and alarm indications

- Long life lamps shall be used. The transparency of cover plates and wattage of the lamps provided in the facia windows shall be adequate to ensure clear visibility of the inscriptions in the control room having high illumination intensity (350 Lux), from the location of the operator's desk.

- All Trip facia shall have red colour and all Non-trip facia shall have white colour.

- Audible annunciation for the failure of DC supply to the annunciation system shall be provided and this annunciation shall operate on 240 Volts AC supply and shall give audible alarm, after set time delay. A separate PB shall be provided to accept and reset this.

- Similarly, a separate voltage check relay shall be provided to monitor the failure of supply (240V AC) for the above scheme. After a set delay, audible alarm shall be given.

- The annunciation system shall be capable of catering to at least 20 simultaneous signal at a time. The annunciation shall be repetitive type and shall be capable of registering the fleeting signal. Minimum duration of the fleeting signal registered by the system shall be 15 milli seconds.

- One set of the reset / accept and test push buttons shall be provided on each control panel.

- One set of the flasher relay (with its testing pushbutton) and pusbuttons for various audible alarms shall be provided common for all the control panel

- These testing circuits shall be so connected that while testing is being done it shall not prevent the registering of any new annunciation that may land during the test

- In case of static annunciator scheme special precaution shall be taken to ensure that spurious alarm condition does not appear due to influence of external electromagnetic/electrostatic interference on the annunciator wiring and switching disturbances from the neighboring circuits.

- Static annunciator shall meet the high voltage susceptibility test, impulse voltage with stand test, high frequency disturbance test – class III and fast transient disturbance test – level III as per IEC 60255.

1.2.5 Technical Particulars

Panel	CRCA sheet steel used shall be of minimum 2 mm thickness except for doors and covers for which 1.6 mm thick.
Enclosure	IP4X
Extendable feature	Yes
Illumination with door switch	Yes
Provision of cable glands	Yes
Inscription	Both sides , front & rear
Control Supply	30 V DC
Signaling bus isolation	MCB
Base channel provision	Yes

Signaling supply isolation	MCB
Control buses	As per circuit requirement
Relays	Shall be microprocessor based communicable type(IEC-61850)
Drawout feature of relays	
- Protective relay	Drawout type
- Auxiliary relay	Non-drawout type
Hand Reset contact with mechanical flag	Yes
- Master trip relay	Yes
- Auxiliary relay	As per circuit requirement
5 KV tests on relays	Yes
Instrument size	144 sq mm
Provision of test block for CT and PT circuit	Yes
PT secondary voltage	110V/ $\sqrt{3}$
CT secondary current	Refer SLD

1.2.6 Mimic diagram (On control panel)

- Coloured mimic diagram and symbols showing the exact representation of the system shall be provided in the front of control panels.
- Mimic diagram shall be made preferably of anodised aluminium or plastic of approved fast colour material, which shall be screwed on to the panel and can be easily cleaned. Painted overlaid mimic is also acceptable. The mimic bus shall be 2 mm thick. The width of the mimic bus shall be 10 mm for bus bars and 7 mm for other connection.
- Semaphore indicators are used for equipment position they shall be so mounted in the mimic that the equipment close position shall complete the continuity of mimic.
- Indicating lamp, one for each phase, for each bus shall be provided on the mimic to indicate bus charged condition.

1.2.7 Name plates and Marking

- All panels shall be with nameplate on top, with feeder / circuit description.
- All equipment mounted on front and rear side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. Further the components i.e. selector switches, pushbuttons, indicating lamps shall also have nameplate to show inscription as per control circuit drawing.
- Each instrument and meter shall be prominently marked (inside the panel) as per tag no. given in scheme.
- Name plates shall be made of non-rusting metal or 3 ply lamicaid. Name plates shall be black with white engraving lettering.

1.2.8 Miscellaneous Accessories

- Plug point : 240 V, Single phase 50 Hz, AC socket with switch suitable to accept 5 Amps and 15 Amps pin round standard Indian plug, shall be provide in the interior of each cubicle with ON-OFF switch.
- Interior Lighting : Each panel shall be provided with a fluorescent lighting fixture rated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch.
- Switches and Fuses : Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breakers (MOB).
- Space Heater : Each panel shall be provided with a space heater rated for 240 V, single phase, 50 Hz Ac supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit.

1.2.9 Earthing

- All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference for earth systems under various switching conditions of isolators and breakers. The earth bus bar shall be 50 X 6 sq. mm perforated copper with threaded holes at a gap of 50 mm with a provision of bolts and nuts for connection with cable armours and mounted equipment etc for effective earthing.

- Provision of terminating clamp and connectors, outside the panel shall be made on panel
- All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by green colour insulated copper wires of size not less than 2.5 sq.mm.
- No looping is allowed for connection of multiple components to earth bus.
- VT and CT secondary neutral or common lead shall be earthed at one place only at the terminal blocks where they enter the panel. Such earthing shall be made through links.

04.13.2.10 POWER TRANSFORMER (ONAN TYPE)

1.0 Electrical Design

- Generally as per IS 2026 - 2011.
- 3 phase core type.
- Rated output voltage ratio, vector group shall be as specified in Technical particulars for design.
- Rated frequency 50 Hz, $\pm 6\%$.
- Insulation level shall be designed according to the voltages specified below:

Nominal system voltage	3.3 kV	33 kV
Max. system voltage	3.45 kV	36 kV
One minute power frequency withstand voltage	10 kV rms	70 kVrms
Peak impulse test withstand voltage	40 kV	170 kV

- Transformers shall be capable of delivering rated current at an applied voltage up to 105% rated voltage without exceeding the temperature limits.
- Overload capacity as per IS 6600-1972 (IS-2026=Part-7:2009) unless otherwise specified.
- Shall be operable at its rated capacity at any voltage within +10% of rated voltage of the particular tap.
- Permissible maximum temperature at rated output and principal tap ambient temperature of 50 deg. C
 - Top oil (by thermometer) : 85 deg C
 - Windings (by resistance method) : 95 deg. C
 - Maximum hot spot temp : 105 deg C
- Transformers shall be designed to withstand the thermal and dynamic stresses due to short circuits at its terminals. Unless otherwise specified the duration of short circuit shall be 5 seconds for thermal stress and 0.25 sec for dynamic stress.(as per 2026-Part-V)
- The maximum temperature at the end of the specified duration shall not be more than 250 deg. C with the temperature prior to short circuit corresponding to maximum permissible overload.
- Suitably designed for suppression of 3rd harmonics (15% max) and also for 5th harmonics.
- In case of force cooled transformers, these shall be able to deliver rated power for 10 minutes even if the forced cooling fails with the winding hot spot temperature limited to 140 deg C. Where two coolers are provided, similar operation shall be permissible for 20 minutes on failure of one cooler.

1.1 Magnetic Circuit

- Low loss CRGO silicon steel shall be used.
 - CRGO sheets shall be coated with inorganic coating/carlite compatible with the sealing liquid.
 - Ducts to be provided to ensure adequate cooling wherever necessary
 - Core, framework and clamps arranged and tightened to securely hold laminations in order to prevent any settling of displacement in case of heavy shocks during transport, handling or short circuits.
- Flux density under specified over voltage or frequency conditions shall be within the maximum permissible for the laminations ,However flux density shall not be more than 1.6T at rated voltage and frequency.
- Transformers shall be designed to withstand 110% over fluxing corresponding to rated voltage.

1.2 Windings

- a. Material shall be electrolytic grade work hardened copper of high proof stress with more numbers of radial supports.
- b. Shall be pre-compressed, press board, pre-stabilization of coil.
- c. Completed core and winding to be vacuum dried in full vacuum and impregnated immediately.
- d. Shall be braced to withstand shocks due to rough handling, and forces due to short circuit, switching or other transients.
- e. Permanent current carrying conductors within winding shall be brazed.
- f. Coils shall be supported using blocks, spacers and cylinders.
- g. Insulating materials shall be compatible with transformer liquid under all service conditions.
- h. Leads to the terminal board and bushings shall be rigidly supported.

1.3 Insulation

Inter turn and inter coil insulation shall be designed such that dielectric stress is uniformly distributed throughout the windings under all operating conditions.

1.4 ON LOAD - Circuit Tap Switch with RTC Panel

- a. Externally hand operated with easily accessible links.
- b. Designed for sustained over current of at least 150% of the rated current of the winding.
- c. Shall not occupy any intermediate position between clearly marked tap position.
- d. Capable of repeated operation and withstanding short circuit forces.
- e. Tap position indicator
- f. Inspection OLTC shall not require removal of transformer core from tank.
- g. Integral handle with padlocking arrangement

1.5 Tank

- a. Welded thick gauge plates stiffened and reinforced to withstand without deformation all stresses applied during transport and operation or short circuit conditions.
- b. Oil tight welds and joints.
- c. Fully assembled transformer with its radiators, conservator and other fittings shall withstand for one hour a pressure corresponding to twice the normal head of liquid or to the normal pressure plus 35 kN/sq. m, whichever is lower, measured at the base of the tank.
- d. Plates shall be protected internally against corrosion due to insulating liquid.
- e. Provided with inspection opening and cover/with handling equipment) to provide access to bushing connections.
- f. Form of cover shall be such as to prevent any stagnant water deposit and to drain gas bubbles towards the buchholz relay
- g. Tank shall be capable of withstanding full vacuum.
- h. Tank shall have provision for connection of radiators on either side of the tank.

1.6 Conservator and Breather

- a. Conservator mounted on frame, integral with tank in such a manner that under all conditions and the lowest oil level the bushings remain under the head of liquid.
- b. Conservator volume shall be sufficient to maintain oil seal from ambient to oil temperature of 90 deg. C.
- c. Conservator takes care of the expansion and contraction of transformer oil, which takes place due to loading and releasing of load. Transformers are provided with separate air shell in the conservator which prevents direct air contact with the transformer oil.
- d. Oil filling hole with cap, and a drain valve to drain the oil completely shall be provided. One end of the conservator shall be bolted into position so that it can be removed for cleaning purposes.
- e. Silica gel breather with inspection window and oil seal shall be mounted at 1.4 m from ground level and connected to conservator.
- f. Prismatic type oil level gauge with maximum and minimum levels marked. One 150 mm diameter dial type magnetic level gauge with alarm and trip contacts shall also be provided.
- g. Conservator shall be provided with 3stage silica gel breather with oil seal and aircell.
- h. Maintenance free breather to be provided

The Transformer tank conservator shall be fitted with Maintenance-Free silica gel Breather equipped with: a humidity sensor, a microprocessor control unit (to ensure that regeneration of silica gel is activated only when transformer is exhaling), LEDs for local display, Contacts for taking error & regeneration signals to remote control room, data logger with USB Port and Over Voltage protection with in line filter. There should be no moving parts or valves to restrict or redirect air flow. No plastic parts shall be used in the construction of the breather

1.7 Buchholz Relay

- a. Double float relay as per IS 3637 - 1966.
- b. Shut off valves on either sides of the buchholz relay
- c. Pot cocks at the top and bottom of relay drain plug, inspection window, calibrated scale, terminal box with oil tight double compression type brass gland.
- d. Potential free, self reset independent alarm and trip contacts, rated to make, break and carry 2 amps at 220 V DC. No auxiliary relay shall be used to multiply the contacts. Contacts are to be wired to the marshalling box.
- e. A pipe shall be provided from the buchholz relay to the ground level with shut off valve for release of trapped gasses/ air.

1.8 Cooling- Transformer should be equipped with Pressure Release Valve (PRV)

1.8.1 General

The cooling system provided may be either of the following or a mixed system of these, as specified.

ONAN - Oil natural, air natural

ONAF - Oil natural, air forced i.e with cooling fans

Where forced cooling is provided, the forced cooling shall be automatically started/stopped through contacts of winding temperature indicator, the settings, of which shall be separately adjustable at site.

1.8.2 Radiators

Radiators may be detachable type directly mounted or separately mounted flanged, gasketed and bolted connections shall be used for connecting the radiators to the tank.

The following accessories shall be provided for each radiator/radiator bank

- a) Top and bottom shut off valves and blanking plates.
- b) Bottom drain plug and top filling plug, air release plug
- c) Lifting lugs
- d) Thermometer pockets with thermometers in the inlet and outlet pipes (for separately mounted radiator banks).
- e) Top and bottom filter valves for each separately mounted radiator bank.
- f) Air release devices
- g) Provision for earthing
- h) 2X 50% radiator bank design

1.8.3 Forced Cooling System (if applicable)

a) For ONAF cooling system:

- i) 2x50% radiator banks shall be there, each having its own cooling fans.
- ii) 20% standby fans shall be provided on each radiator
- iii) Exhaust air from fan should not be directed towards tank.
- iv) Mounted fans on radiator should not cause vibration.
- v) The fans shall be mounted in a suitable enclosure to ensure protection against rain.
- vi) Galvanised wire mesh guard shall be provided to prevent accidental contacts.
- vii) All electric motors shall comply to IS 325. Supply Voltage shall be 415V + 10%-15%, Frequency 50 Hz +/-6% Three phase AC, Insulation class F, temperature rise limited to class B, Protection class IP55
- viii) Cooler control cabinet shall be provided fabricated of MS sheet, Protection class IP55, having starters suitable for Type 2 protection coordination for fan motors, all interlocks and indications as below:

- Control supply failure
- Power supply failure
- Fan failure in a bank

- Thermal overload trip for individual fan motors

1.9 Valves and connections

- Valves of sluice type with hand wheels (clear marking for open and close indication)
- All valves upto 25mm shall be made of gun metal. Rest of the valves shall be GM/cast iron
- Clear indication of open and closed position
- Provided with blanking plates or screwed plugs
- Padlocking facility to lock in closed/open position.
- The sizes of valves shall be as per CBIP manual

1.10 Terminations

It shall be possible to withdraw the transformer easily after disconnecting the connections without disturbing the cable terminations.

For cable termination

- Air insulated cable box suitable for the type and number of cables specified.
- Air insulated disconnection chamber with inspection opening
- Compression type brass cable glands with tinned copper lugs
- Bolted type gland plates.
- Sealing kits with associated accessories like stress relieving cones, insulating tape, trifurcating boot, HT insulating tape, etc.
- Clearances in air shall be as per CBIP manual
- For bus duct termination
- When bus duct termination is specified, flanged throat shall be provided to suit the bus duct. Flange ends and inspection openings shall have weatherproof gaskets.
- The LV flange and termination arrangement shall be matched with the existing transformer of same rating available at HCL for interchangeability.
- HV/LV cable termination box shall be design for unearth system (ph-ph and ph-E air distance shall remain same)

1.11 Bushings

- Conforming to IS 3347 Part 5 - 1979, Part 3 - 1988 and 2099 - 1986.
- Minimum rated current of line and bushings shall be 1.5 times rated current of the corresponding windings
- Clamps and fittings made of steel or malleable iron shall be hot dip galvanized.
- Bushings rated 400 Amps and above shall have non-magnetic clamps and fittings only.
- Neutral bushings shall be provided as required for earthing of neutral point.
- The creepage distance for bushings, insulators etc. shall be adequate for heavily polluted atmosphere, and shall not be less than 31 mm / kV corresponding to the highest system voltage.
- Clearances in air shall be as per CBIP manual (however shall be design for un earth system)

1.12 Bushing current Transformers (Where applicable)

- CTs for REF protection and back up earth fault shall be provided on the neutral end.
- For differential protection, CTs shall be provided on primary side
- Removable at site without opening transformer tank cover/active parts.
- Secondary leads shall be brought to a weatherproof terminal box and from there to the marshalling box.

1.13 Oil temperature Indicator

- Local 150 mm dial type thermometer with manual reset maximum reading pointer. There shall also be two potential free contacts for alarm and trip signals. The alarm and trip settings shall be independently adjustable. The temperature-sensing element mounted in a pocket of oil shall be connected to the indicator through capillary tubing. Contact rating at DC shall be minimum 0.5 amps.

1.14 Winding Temperature Indicator

- Local winding temperature indicator (WTI) shall have a 150 mm diameter dial type indicator with a manual reset maximum reading pointer. There shall be two potential free contacts for alarm and trip signals.

For transformers with forced cooling, another set of contacts shall be provided to start/stop the forced cooling system automatically. The settings for closing/opening of each contact shall be independently adjustable. Contact rating at DC11, 110V DC shall be minimum 0.5 amps. The device shall be complete with lamp, sensing element, image coil, calibration device, auxiliary CTs etc. as required.

1.15 Marshalling box

- a. All outgoing connections from the transformer i.e buchholz relay, temperature indicators, level indicators, CT secondary, fault contacts for annunciation, including forced cooling system and OLTC etc shall be wired to a marshalling box.
- b. Degree of protection of enclosure shall be IP 52 for indoor and IP 55 for outdoor type respectively.

1.16 Earthing

- a. All metal parts of the transformer with the exception of individual core laminations, core bolts, and clamping plates shall be maintained at fixed potential by earthing.
- b. Two tinned copper earthing terminals
- c. One end of bushing CTs shall be earthed.

1.17 List of fittings and Accessories

- a. Identification plate
- b. Rating and diagram plates.
- c. Valve diagram plate.
- d. First fill of oil as per IS-335, 1993 with 10% excess in drums
- e. Cooling system complete with accessories as specified
- f. Off-circuit tap switch as specified
- g. Conservator with oil level gauge and aircell.
- h. Dehydrating breather
- i. Buchholz relay with alarm and trip contacts
- j. Oil filter valves at top and bottom of tank
- k. Drain off valve at lowest location to allow complete draining
- l. Oil sampling device at top and bottom
- m. Suitable PRV with oil splash protection – 2 Nos.(1 for main tank+1 for OLTC)
- n. Pockets with thermometers for oil temperature and winding temperature indicators
- o. Magnetic oil level gauge with low level alarm contacts
- p. HV, LV and neutral bushings.
- q. Bushing CTs as specified
- r. Dial type winding temperature & oil temp. indicator with maximum reading pointer and alarm and trip contacts
- s. Lifting lugs and jacking pads
- t. Earthing terminals
- u. Inspection covers
- v. Cable/ busduct disconnecting chamber
- w. By-directional rollers with locking arrangement (For distribution transformers)
- x. By-directional flanged wheels with locking arrangement (For distribution transformers)
- y. Marshalling box.
- z. Flat base and foundation bolts.
- aa. Haulage holes
- bb. Attached Al ladders

1.18 Special features

- a. The Bidder should submit documents for prime CRGO, M3 type i.e. Bill of Landing, Packing List and Mills Test certificate.
- b. Manufacturers should have In-house Core cutting Plant to avoid mixing of prime CRGO with seconds or core material to be directly procured either from the manufacturer or from accredited marketing organization and not through any agent .
- c. Manufacturers should submit the Type Test Report whichever is available nearer or Similar rating

of the quoted Transformer.

d. Transformer should be designed with Bolt less Core construction method/type to maintain Hot Spot temperature rise to limit in –rush magnetizing current, flux density and current density.

e. Manufacturer should supply Past supplies Reference List.

f. The testing laboratory of the manufacturer shall be NABL accredited. The bidder shall furnish NABL accreditation certificate of his laboratory along with the Bid offer.

1.19 Technical Particulars

Particulars	8.0 MVA, 33/3.45 kV
Specification	IS 2026, Part I - 2011 Part II - 2010 Part III – 2009 Part IV - 2001 Part-V -2011 IEC-60076– 2000/2002
Type	Three phase, core type oil filled
Duty	Outdoor, installed in open yard.
Voltage HV/LV	33/3.45 kV
Frequency	50 Hz
No. of phase	3
Continuous rating	8.0 MVA
Insulation class	Class A
Cooling	ONAN
Winding connection	Star/Delta
Vector group	Ynd1
Neutral grounding	
System earthing	33kV- Solidly earthed 3.3kV- Resistance-earthed
Percentage impedance	7.5 %
Pri-Sec-1	
Pri-Sec-2	
Sec-1 to Sec-2	
Impedance tolerance	As per IS
Termination	33kV- Through ACSR conductor. 3.3kV- Aluminium circular
Temperature rise over : 50 deg C ambient temp	
a) In oil (measured by Thermometer)	35 deg. C
b) In winding (measured by Resistance method)	45 deg. C
c) Hot spot Temp.	55 deg. C
Tap changer on primary side	On load high speed resistor transition
a) Range	+12.5%, -10%
b) Total tap positions	13
c) Taps above nominal voltage	4
d) Taps below nominal voltage	4
e) Voltage per step variation	+/-2.5
f) Tap change controls	Local Manual, local electrical, remote electrical, fully automatic.
Impulse test with-stand voltage kVp	170/40

Particulars	8.0 MVA, 33/3.45 kV
One minute dry and wet power frequency withstand voltage kV rms	70/10
Induced over voltage withstand voltage	As per IS 2026, Part III – 2009
Withstand time without injury for 3 phase short circuit at secondary terminals	5 Seconds.
Auxiliary supply voltage	220 V DC/ 415 V AC
Parallel operation	Suitable for parallel operation with transformers of similar ratings
Overload capacity	As per IS 6600 –1972, IS-2026 Part-7
Radiators	Detachable type
Flux density (at rated voltage)	1.6 Tesla Max
Magnetizing current	0.3% of rated current
Current density	2.5A / sqmm at normal tap
Short circuit level on HV side	1500 MVA
Short circuit level on LV side	150 MVA

04.13.2.11 MICRO PROCESSOR BASED NITROGEN INJECTION FIRE PROTECTION AND EXTINGUISHING SYSTEM FOR TRANSFORMERS.

1.0 General Description

Nitrogen injection fire protection system designed for oil filled transformers, shall prevent tank explosion and the fire during internal faults resulting in an arc where tank explosion will normally take 3-4 seconds after arc generation and also extinguish the external oil fires on transformer top cover due to tank explosion and / or external failures like bushing fires, OLTC fires and fire from surrounding equipments. It should be fully automatic and shall require minimum maintenance and practically no running cost.

The system shall work on the principle of DRAIN AND STIR and on activation, shall drain a pre-determined quantity of oil from the tank tope through outlet valve to reduce the tank pressure and inject nitrogen gas at high pressure from the lower side of the tank through inlet valves to create stirring action and reduce the temperature of top oil surface below flash point to extinguish the fire. Conservator tank oil shall be isolated during tank explosion and oil fire to prevent aggravation of fire.

A] Codes and Standards

The design, manufacture, and performance of equipment shall comply with all currently applicable standards, regulations and safety codes, particularly to the following standards.

- IS: 2147-Degree of protection provided by enclosures for electrical equipment
- IS 5216 -Guide for safety procedures and practices in electrical works
- Tariff Advisory Committee (TAG) Regulations
- National Fire Prevention Association (NFPA) Regulations
- CEA REGULATION 2010
- CBIP MANUAL 2013 –SECTION -EE(publication 317)
- NIFPS equipments offered by the supplier-The operation philosophy, system components, tech. particulars(especially N2 cylinder capacity) and installation guide lines shall be strictly followed to CBIP MANUAL 2013 –SECTION -EE(publication 317) whether specifically mentioned in bellow TS or not.

1.1 System Requirements

All large oil filed transformer, as indicated in project scope of works are to be provided with microprocessor based Nitrogen Injection Fire Protection System (NIFPS). Accordingly, the Contactor shall co-ordinate with the transformer manufacturer for fittings the accessories without affecting the overall performance of transformer. Fittings of all the accessories of NIFPS shall be done in transformer manufacturer's work.

In the fire fighting system nitrogen shall used as fire quenching medium. The fire protective system shall prevent transformer oil tank explosion and possible fire in case of internal faults. In the event of fire by

external causes such as bushing fire. OLTC fires, fire from surrounding equipment etc, it shall act as a fast and effective fire fighter. It shall accomplish its role as fire preventer and extinguisher without employing water and / or carbon dioxide. Fire shall be extinguished within 3 minutes (Maximum) of system activation and within 30 seconds (maximum) of commencement of nitrogen injection.

1.1.1 Activation of the fire protective system (NIFPS)

The supplier of NIFPS shall ensure that the probabilities of chances of malfunctioning of the fire protective system are practically zero. To achieve this objective, the supplier shall plan out his scheme of activating signals which should not be too complicated to make the fire protective system inoperative in case of actual need. The system shall be provided with automatic control for fire prevention and fire extinction. Besides automatic control, provision for Remote Manual operation from substation control room, one at the Nitrogen storage room near the transformer bay and local manual control in the fire extinguishing cubicle shall also be provided. The following electrical-signals shall be required for activating the fire protective system under prevention mode / fire extinguishing mode.

Auto Mode

For Prevention of fire:

The activation signals are as following

- Differential relay operation
- Buchholz relay paralleled with pressure relief valve or RPRR (Rapid Pressure Rise Relay)
- Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer is the pre-requisite for activation of system.

For extinguishing fire

The activation signals are as following

- Fire detector
- Buchholz relay paralleled with pressure relief valve or RPRR (Rapid Pressure Rise Relay)
- Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer is the pre-requisite for activation of system.

Manual Mode (Remote)

- Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer is the pre-requisite for activation of system.

Manual Mode (Mechanical)

- Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer is the pre-requisite for activation of system.
- The system shall be designed to be operated manually in case of failure of power supply to fire protection system.

1.1.2 Constructional Features and System Components

Transformer isolation shall be an essential pre-condition for activating the system. The system shall consist of following equipments:

1. Fire extinguishing cubicle placed on a plinth at about 5-10 meters away from the transformer. Control box placed in the control room.
2. Pre-stressed Non return valve in the conservator pipe / high speed pneumatically operated ball valves. Backup valve of same type may be provided to the main valve, if necessary.
3. Required number of fire detectors on the tank top cover.
4. Signal box fitted on the tank top or tank sidewall Terminating signals from PRV, fire detectors differential relay, buchholz relay, and PNRV/Pneumatic valve and for cable connection to control box.
5. On line testing facility of the system without taking shutdown of the transformer
6. Required no. of Fire Detectors on top cover of the Transformer and Tap changer.
7. Special Isolation Valve between Buchholz relay and Transformer oil conservator (TCIV) with glass window for viewing position of flap and with padlocking facility.
8. Required quantity of Fire Retardant Low Smoke (FRLS) cables.
9. Required quantity of Fire Survival cables.

10. Pipes and Pipe Fittings.

11. Nitrogen injection fire protection system should be a dedicated system for each oil filled transformer / reactor. It should have a Fire Extinguishing Cubicle (FEC) placed on a plinth at a distance of 5-10 m away from transformer / reactor or placed next to the fire wall (if fire fighting wall exists). The FEC shall be connected to the top of transformer/reactor oil tank for depressurization of tank and to the oil pit (capacity is approximately equal to 10% of total volume of oil in transformer/reactor tank) from its bottom through oil pipes. The fire extinguishing cubicle should house a pressurized nitrogen cylinder(s) which is connected to the oil tank of transformer/reactor oil tank at bottom. The Transformer Conservator Isolation Valve (TCIV) is fitted between the conservator tank and Buchholz relay. Cable connections are to be provided from signal box to the control box in the control room, from control box to fire extinguishing cubicle and from TCIV to signal box. Fire detectors placed on the top of transformer/reactor tank are to be connected in parallel to the signal box by Fire survival cables. Control box is also to be connected to relay panel in control room for receiving system activation signals.

1.1.3 Operation

On receipt of all activating signals, the system shall drain pre-determined volume of hot oil from the top of tank (i.e. top oil layer), through outlet valve, to reduce tank pressure by removing top oil and simultaneously injecting nitrogen gas at high pressure for stirring the oil at pre-fixed rate and thus bringing the temperature of top oil layer down. Transformer conservator isolation valve blocks the flow of oil from conservator tank in case of tank rupture / explosion or bushing bursting. Nitrogen occupies the space created by oil drained out and acts as an insulating layer over oil in the tank and thus preventing aggravation of fire.

The system shall be provided with automatic controls for fire prevention and fire extinction and besides remote electrical push button control on control box and local manual control in the fire-extinguishing cubicle shall be provided.

1.1.4 System Activating Signals

a) To avoid transformer explosion two fast trip signals given by circuit breaker of transformer and Buchholz relay paralleled with pressure relief valve/ pressure and temperature sensors to initiate:

i. Explosion prevention by opening quick depressurization valve to release the internal pressure and to prevent the transformer explosion.

ii. Oil cooling – by injecting a large flow of nitrogen at the transformer base to limit the damages of overheated parts affected by short circuit and to evacuate the very explosive hydrogen gas by dielectric oil.

b) i. The fire protection back up system should be initiated by two signals from one of the high temperature sensors, located on the transformer cover and by the operation of Buchholz relay paralleled with pressure relief device/ pressure and temperature sensors. On receipt of the activation signals The drain valve should open out within 3 second. The nitrogen injection shall cause stirring of transformer oil and should immediately drop its surface temperature below flash point to extinguish fire with a minimum possible time. Nitrogen injection should continue for sufficient time, which will further cool the transformer and prevent any re-combustion.

ii. Fire protection back up system shall be provided to function in case if all transformer electrical protections leading to breaker trip or if all pressure sensors have failed during the incident, by the conventional nitrogen fire extinguishing method.

In case of fire, even if the circuit breaker has not tripped, the system shall inject nitrogen into the transformer tank even when the transformer is live but after giving warning signal to the operating personnel to manually isolate the circuit breaker.

c) The system shall be of automatic operation and in addition, remote push button control through control box and manual local control in fire extinguishing cubicle are to be provided.

d) During the initiation/activation of sensing devices mentioned above, for prevention of tank explosion or for fire protection, the oil from the conservator tank should be isolated, by action of PNRV/TCIV.

1.1.5 TECHNICAL PARTICULARS

Power supply, for control box/	:	220V. D.C /
Fire Extinguishing Cubicle (lightning)	:	230V A.C
Fire extinguishing cubicle	:	Suitable for 8 MVA Transformer

Dimensions/Weights/Capacity

Control box Dimensions/ Weights : Suitable for 8 MVA Transformer
Nitrogen cylinder capacity : Suitable for 8 MVA Transformer With
approximately 40 to 50 tonnes of transformer oil.
Fire detectors heat sensing temperature : 141°C

1.1.6 System components

Nitrogen injection fire protection system shall broadly consist of the following components. However, all other components which are necessary for fast reliable and effective working of the fire protective system shall deemed to be included in the scope of supply.

1.1.7 Fire Extinguishing Cubicle (FEC)

- The FEC shall be made of CRCA sheet of 3 mm (minimum) thick complete with the base frame, painted inside and outside with post office red colour (shade 538 of IS-5). It shall have hinged split doors fitted with high quality tamper proof lock. The degree of protection shall be IP55. The following items shall be provided in the FEC.
- Nitrogen gas cylinder with regulator and falling pressure electrical contact manometer.
- Oil drain pipe with mechanical quick drain valve.
- Electro mechanical control equipment for draining of oil of pre-determined volume and injecting regulated volume of nitrogen gas
- Pressure monitoring switch for back-up protection for nitrogen release
- Limit switches for monitoring of the system
- Butterfly valve with flanges on the top of panel for connecting oil drain pipe and nitrogen injection pipes for transformer/reactors
- Panel lighting (CFL Type)
- Oil drain pipe extension of suitable sizes for connecting pipes to oil pit.

1.1.8 Control cubicle

Control cubicle is to be placed in the control room for monitoring system operation, automatic control and remote operation. The following alarms, indications, switches, push buttons, audio signal etc. shall be provided.

- System on
- TCIV open
- Oil drain valve closed
- Gas inlet valve closed
- TCIV closed*
- Fire detector trip *
- Buchholz relay trip
- Oil drain valve open*
- Extinction in progress *
- Cylinder pressure low *
- Differential relay trip
- PRV / RPRR trip
- Transformer/reactor trip
- System out of service *
- Fault in cable connecting fault fire detector
- Fault in cable connecting differential relay
- Fault in cable connecting Buchholz relay
- Fault in cable connecting PRV / RPRR
- Fault in cable connecting transformer /reactor trip
- Fault in cable connecting TCIV
- Auto/ Manual / Off
- Extinction release on / off

- Lamp test
- Visual/ Audio alarm*
- Visual/ Audio alarm for DC supply fail *
- The doors, removable covers and panels shall be gasketed all round with neoprene gaskets

1.1.9 Transformer Conservator Isolation Valve

Transformer conservator isolation valve (TCIV) to be fitted in the conservator pipe line, between conservator and Buchholz relay which shall operate for isolating the conservator during abnormal flow of oil due to rupture / explosion of tank or bursting of bushing. The valve shall not isolate conservator during normal flow of oil during filtration or filling or refilling, locking plates to be provided with handle for pad locking. It shall have proximity switch for remote alarm, indication with visual position indicator. The TCIV should be of the best quality as malfunctioning of TCIV could lead to serious consequence. The closing of TCIV means stoppage of breathing of transformer/reactor.

Locking plates shall be provided for pad locking.

1.1.10 Arrangements Required on Transformer Tank

- Oil drain opening with pipe, flange and manual gate valve at about 120mm below the top cover.
 - Nitrogen injection openings with suitable size of pipe with flange and manual gate valve on tank sides at about 50-200mm from the bottom plate.
 - Flanges on the conservator pipe between Buchholz relay and conservator tank for fixing PNRV/POBV.
 - Provision for pressure and temperature sensors if required.
 - Supply and welding of the fire detector brackets on top cover of the transformer / reactor oil tank.
- The system shall be complete with adequate number of fire detectors (quartz bulb).

1.1.11 Fire detectors

The system shall be complete with adequate number of fire detectors (quartz bulb) fitted on the top cover of the transformer / reactor oil tank.

1.1.12 Signal box

It shall be mounted away from transformer main tank, preferably near the transformer marshalling box, for terminating cable connections from TCIV & fire detectors and for further connection to the control box. The degree of protection shall be IP55.

1.1.13 Cables

- Fire survival cables (capable to withstand 750° C.) of 4 core x 1.5 sq. mm size for connection of fire detectors in parallel shall be used. The fire survival cable shall conform to BS 7629-1, BS 8434-1, BS 7629-1 and BS 5839-1, BS EN 50267-2-1 or relevant Indian standards.
- Fire Retardant Low Smoke (FRLS) cable of 12 core x 2.5 sq. mm size shall be used for connection of signal box / marshalling box near transformer/reactor and FEC mounted near transformer/reactor with control box mounted in control room.
- Fire Retardant Low Smoke (FRLS) cable of 4 core x 2.5 sq. mm size shall be used for connection between control box to DC and AC supply source, fire extinguishing cubicle to AC supply source, signal box/ marshalling box to transformer conservator isolation valve connection on transformer/reactor.

1.1.14 Pipes

Pipes complete with connections, flanges, bends and tees etc. shall be supplied along with the system.

1.1.15 Other items

- Oil drain and nitrogen injection openings with gate valves on transformer / reactor tank at suitable locations.
- Flanges with dummy piece in conservator pipe between Buchholz relay and conservator tank for fixing TCIV.
- Fire detector brackets on transformer tank top cover.
- Spare potential free contacts for activating the system i.e. in differential relay, Buchholz relay,
- Pressure Relief Device / RPRR, Circuit Breaker of transformer
- Pipe connections between transformer / reactor and FEC and between FEC and oil pit required for collecting top oil.

- Cabling for fire detectors mounted on transformer top cover
- Inter cabling between signal box, control box and Fire Extinguishing Cubicle(FEC).
- Butterfly valves /Gate valves on oil drain pipe and nitrogen injection pipe which should be able to withstand full vacuum.
- Supports, signal box etc. which are to be painted with enameled paint.

04.13.2.12 CAST RESIN TRANSFORMER (CRT) DRY TYPE DISTRIBUTION TRANSFORMER

1.0 Standards:

Transformers shall comply with the following standards.

IS : 2026 (1977/1981) - Power Transformers (Part-I,II,III & IV)

IS : 11171 (1985) - Dry type transformers

IEC : 60726 - Dry type transformers

2.0 Mechanical Design:

a) Transformer enclosure shall be welded/bolted sheet steel construction, free standing with suitable size of louvers backed with wire mesh. Base shall be suitably reinforced to prevent any distortion during lifting. Base channels shall be provided with flat wheels with pulling eyes and lifting hooks to facilitate handling.

b) All fasteners and bolts etc shall be galvanized or zinc passivated. All surfaces to be painted shall be thoroughly cleaned, made free from the rust and given a primary coat of rust resisting paint followed by two finishing coats of approved shade. Paint shall be suitable to withstand specific climatic condition.

c) The transformer shall be provided with separate weather proof HV/LV terminal boxes and disconnecting links on the side of transformers so as to facilitate withdrawal of transformers without disturbing the HT & LT cables connected to transformers.

d) All tanks shall be suitably designed to withstand harmonics available in the system as well as generated by transformers.

2.1 Electrical Design:

i. The transformers shall be CRT dry type transformers, AN cooled suitable for indoor installation.

ii. Generally as per IS-2026-part-I, II & IV of 1977 and part-III of 1981.

iii. 3-phase core type CRT.

iv. Rated output, voltage ratio, vector group shall be specified in technical particulars of design.

v. Rated frequency shall be + 6%.

vi. Insulation level shall be designed according to the voltages specified below.

Sl. No.	Description	3.3kV system	415V system
1.	Nominal system voltage	3.3	415
2.	Maximum system voltage	3.6	433
3.	One min. power frequency withstand voltage (kV)	10	3
4.	Peak impulse test withstand voltage (kV)	40	--

vii. Transformer shall be capable of delivering rated current at an applied voltage up to 105% of rated voltage without exceeding the temperature limits.

viii. Overall capacity of the transformers shall be as per IS-6600-1972 unless otherwise specified.

ix. Shall be operable at its rated capacity at any voltage within + 10% of the rated voltage of the particular tap.

x. Permissible maximum temperature at rated output and principal tap at the ambient temperature of 50C.

Winding (By resistant methos)	130C
Core and other adjacent parts of winding	130C
Core and other part not adjacent of winding	Within safe limits of core and adjacent materials

xi. Transformers shall be designed to withstand the thermal and dynamic stresses due to short circuits at its terminals or symmetrical/asymmetrical fault on any winding. Short circuit withstand capacity for the bolted

- fault at the terminals shall not be less than 5 Sec duration with respect to fault level specified.
- xii. Transformers shall be designed for minimum no-load and load losses within the economic limit.
- xiii. Designed for suppression of harmonics, especially 3rd and 5th.
- xiv. "No load losses & Load losses" will be provided by bidder in their data sheet.

2.2 Magnetic Circuit:

- i. Low loss CRGO M3 silicon steel shall be used.
- ii. Laminations shall be annealed in a non-oxidizing atmosphere to relieve stresses and restore the original magnetic properties of CRGO M3 sheets after cutting and punching operations.
- iii. CRGO M3 sheets shall be coated with insulation varnish compatible with the sealing liquid.
- iv. Insulation to withstand annealing temperature as high as 850C and shall reduce eddy current to minimum.
- v. Ducts to be provided to ensure adequate cooling.
- vi. Core, framework and clamps arranged and tightened to securely hold laminations in order to prevent any settling or displacement in case of heavy shocks during transport, handling or short circuit.
- vii. Flux density under specified overvoltage or frequency condition shall be within the maximum permissible for the laminations. However it shall not exceed 1.6T.
- viii. Transformers shall be designed to withstand 110% overfluxing corresponding to rated voltage.
- ix. Magnetizing current within 1.5% of rated current or transformer upto 2.0MVA is acceptable.

2.3 Windings:

- i. Material shall be electrolytic grade copper.
- ii. Shall be subjected to shrinkage treatment.
- iii. Both The windings to be Casted Separately under full vacuum.
- iv. Shall be braced to withstand shocks due to rough handling and forces due to short circuit switching or other transients.
- v. Permanent current carrying joints in winding and leads shall be brazed.
- vi. Coils shall be supported using dried and high pressure compressed wedge type insulation spacers.
- vii. Insulating material shall be compatible with transformer liquid under all service conditions.
- viii. Leads to the terminal board and bushings shall be rigidly supported.
- ix. Both the windings should be copper material. LV winding should be of foil winding only.
- x. The windings shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and at site repair to the winding can be made readily without special equipment.
- xi. The windings shall not absorb any moisture and shall be suitable for tropical climate and 100% humidity. The coils shall be hardly inflammable and self-extinguishing.
- xii. The windings and connections of all transformers shall be braced to withstand shocks which may occur during transportation or due to switching and other transient conditions during service.

2.4 Insulation:

- i. Inter turned and inter coil insulation shall be designed such that dielectric stress is uniformly distributed through-out the winding under all operating conditions.
- ii. The winding shall be provided with class-F insulation With Temp rise 50+80 max = 130Deg insulation or better (As applicable to dry type transformers as per IS-2026, Part-II). However, temperature rise in winding and core shall be limited to class-B insulation.

2.5 Off circuit TAP switch / Link :

- i. Bolted link type within enclosure, with easy accessibility.
- ii. Designed for sustained over-current of at least 150% of the rated current of the windings.
- iii. Capable of repeated operation and withstanding short circuit forces.
- iv. Tap position configuration diagram shall be provided.
- v. Inspection/operation/or repair shall not require removal of transformers core from its enclosure.
- vi. Shall not occupy any intermediate position between clearly marked tap position.

2.6 Terminations:

It shall be possible to withdraw the transformer easily after disconnecting the connection without disturbing the cable terminations. Cable termination box shall be bolted type and supported from bottom so that after withdrawing the transformer, it remains at its same position.

- i. Cable termination
- a) Air insulated cable box suitable for the type and number of cable specified.
- b) Air insulated disconnecting chamber with inspection opening.
- c) Compression type brass cable glands with finned copper lugs of non soldering crimped type.
- d) Bolted type gland plated (non magnetic material wherever specified).
- e) Sealing kits with associated accessories like stress relieving, insulating type, bi-furcating boot, HT insulating tape.

2.7 Bushings:

- i. Conforming to IS-3347 part-1,2&3-1979, part-3&4-1988 and IS:2099-1986 for HT and IS-7421 for LT system.
- ii. Minimum rated current of line end bushings shall be 1.5 times rated current of corresponding winding.
- iii. Clamps and fittings made of steel or malleable iron shall be hot dip galvanized.
- iv. Bushing rated 400A and above shall have non magnetic clamps and fitting only.
- v. Bushing shall be solid porcelain type.
- vi. Neutral bushing shall be provided as required for earthing of neutral point. This shall be connected to brass/tinned copper bar and brought to outside the body through porcelain insulator.

2.8 Neutral Current Transformer:

- i. Removable at site without opening transformers enclosure cover/active part.
- ii. Secondary leads shall be brought to a weather proof terminal box and from there to the marshalling box with 4sqmm copper armoured cable.

2.9 Winding temperature indicator:

- i) Dial type thermometer winding temperature indicator (3 no indicator) operated by RTD (3 no probe per limb/phase in LV winding) shall be provided.

2.10 Marshalling box:

- i) All outgoing connections from the transformer viz temperature indicators, level indicators, CT secondary, fault contacts for annunciation, etc shall be wired to marshalling box.
- ii) Degree of protection of enclosure shall be IP-52 for indoor and IP-55 for outdoor type respectively. Manufacturer should have IP 55 protection Test report as per IEC 60259.

2.11 Rating Plate:

Each transformers shall be provided with a rating plate giving the details as per IS:2026 (Part-I). The making shall be indelible and the rating plate shall be located on the front side. Exact value of transformer % impedance, as determined by the tests shall be engraved on it and also on the final submission of name plate drawings.

2.12 Noise:

Noise level shall be low and shall be within limit depending on the rating of the transformers as per IEEE-141 or (NEMA TR1)

2.13 Earthing:

- i) All metal parts of transformers with the exception of individual core lamination core bolts and clamping plates shall be maintained of fixed by earthing.
- ii) Two numbers of tinned copper earthing terminals shall be provided.
- iii) One end of bushing Ct shall be earthed.

2.14 List of fitting and accessories:

- i) Off-circuit tap switch/link as specified.
- ii) Dial type winding temperature indicators operated by RTD elements.
- iii) Bushing CT as specified.
- iv) Bi-directional rollers/flanged wheels with loading arrangements.
- v) Lifting lugs and jacking pads.
- vi) Rating and diagram plates.
- vii) Earthing terminals.
- viii) Inspection covers.
- ix) Identification plates.
- x) Pockets of transformer for winding temperature indicator.

- xi) HV, LV & neutral bushings.
- xii) Marshalling box.

2.15 Tests:

The equipment shall be subjected to all the routine tests at the manufacturer's works in accordance with latest version of IS-2026, part-I & III or, the relevant IPSS (where specified), in presence of purchaser or his representatives.

Test of all equipments shall be conducted as per latest BIS. Test shall also confirm to international standard IEC/VDE/DIN/BS.

The bidder shall submit type test certificates for similar or higher equipment supplied by him elsewhere. In case type test certificates for similar equipment is not available the same shall be conducted in presence of purchaser/consultant or his representative if purchaser so desires, without any financial implication to purchaser.

2.16 Inspection

- i) Purchaser/consultant can inspect the manufacturing process and material Stages wise inspection.
- ii) Purchaser/consultant conduct all routine test as per relevant IS & IEC for all Transformer and Heat run test for single transformer of each rating at final inspection.

Acceptance tests to be conducted at site:

- i. Assembly inspection/painting check
- ii. Measurement of winding resistance
- iii. Measurement of voltage ratio & check of voltage vector relationship
- iv. Measurement of no load current
- v. Measurement of insulation resistance/polarization index
- vi. Certification for on-load/off load tap changer
- vii. Final documentation check

2.17 Drawing and documents:

The supplier shall supply the following drawings/documents and manuals.

- A. List of drawings:
 - a) Overall general arrangement drawings
 - b) Rating and diagram plate
 - c) GA of marshalling box
 - d) Wiring drawing of marshalling box
 - e) HV cable box assembly
 - f) LV busduct assembly
 - g) QAP, internal test certificate and inspection certificate
 - h) List of drawings:
 - i) Instruction manual shall give step by step procedure for:
 - Erection testing and commissioning
 - Operation
 - Maintenance & repair
 - a) Operation and maintenance manual:
 - Recommended procedure for routine maintenance
 - Tests for checking of proper functioning
 - Diagnostic trouble shooting/fault location charts
 - b) Storage, conservation and re-commissioning manual:
 - c) Safety manuals

Note:- Instruction manual shall contain

- a) Manufacturer's catalogues with ordering specification for all items.
- b) List of consumables with specifications, brand names and annual consumption figures.
- c) Procedure for ordering spares.
- d) Drawings relevant for erection, operation, maintenance and repair of the equipment.

2.18 Technical specification:

Sl. No.	Particulars	
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1.	Specification	IS: 2026 Part-I- 1977 Part-II-1977 Part-III-1981 Part-IV-1977 IS-11171-1985
2.	Type	Three phase, core type, CRT dry type
3.	Indoor	Indoor installation in room
4.	Degree of protection of enclosure	IP-42 for indoor IP-52 for outdoor
5.	Voltage HV/LV	3300/415V
6.	Frequency	50Hz
7.	No. of phase	3
8.	Continuous rating	500kVA/1250 kVA /or as per BOQ
9.	Conductor	Copper
10.	Insulation class	Class F
11.	Cooling	AN
12.	Winding connection	Delta/Star
13.	Vector group	DYn11
14.	Neutral grounding	Effectively earthed
15.	System earthing	HV : Unearthed LV : Effectively earthed
16.	Percentage impedance	4.5%
17.	Termination	HV : Cable and box suitable for termination of XLPE aluminium cables with air insulated disconnecting chamber LV : Suitable for termination of cable/busduct with disconnecting chamber
18.	Temperature rise over 50C ambient temp	
	a) In winding (measured by resistance method)	80C
	b) Core and other adjacent parts of winding	80C
	c) Core and other parts not adjacent of winding	Within safe limit of core and adjacent materials.
19.	Bushing mounted CT's	
	CT in LV neutral bushing for standby E/F protection	Ratio : 400/1A Class : 5P20
20.	Off circuit tap changer	Bolted link type
	a) Range	±5%
	b) Total tap positions	5
	c) Taps above nominal voltage	2
	d) Taps below nominal voltage	2
	e) Voltage per step variation	2.5%
	f) Tap change controls	Manual
21.	Impulse test withstand voltage	As mentioned above in table
22.	One minute power frequency withstand voltage	As mentioned above in table
23.	Short Ckt level on HV side	25kA for 3 Sec

24.	Time duration to withstand 3 phase short circuit at secondary terminals, without any injury	5 Sec
25.	Auxiliary supply voltage	240V AC
26.	Parallel operation	Suitable for parallel operation with transformers of similar rating
27.	Overload capacity	As per IS-6600-1972
28.	Paint and paint shade	Epoxy based (shade-632 as per IS-5)

2.19

General:

1. For dry type transformers overload capacity will be governed by IEC-905 instead of IS-6600.
2. Bidirectional rollers will be flat type wheels instead of flanged wheels:

04.13.2.13 STATION TRANSFORMER (ONAN TYPE)

1.0 Electrical Design

- Shall be as per IS 1180, (Part-I) 2014.
- The maximum allowable losses at rated voltage and rated frequency permitted at 75°C for distribution transformers shall be chosen as per **Table-9 as per Energy Efficiency Level-2 specified in IS 1180 (Part-1): 2014** for distribution transformers.
- 3 phase core type
- Rated output voltage ratio, vector group shall be as specified in Technical particulars for design.
- Rated frequency 50 Hz, + 3%, -6%.
- Insulation level shall be designed according to the voltages specified below:

Nominal system voltage	0.415 kV	33 kV
Max. system voltage	0.433 kV	36 kV
One minute power frequency withstand voltage	-	70 kV
Peak impulse test withstand voltage	-	170 kV

- Transformers shall be capable of delivering rated current at an applied voltage up to 105% rated voltage without exceeding the temperature limits.
- Overload capacity as per IS 6600 - 1972 unless otherwise specified.
- Shall be operable at its rated capacity at any voltage within + 10% of rated voltage of the particular tap.
- Permissible maximum temperature at rated output and principal tap ambient temperature of 45 deg. C
 - a) Top oil (by thermometer) : 85 deg C
 - b) Windings (by resistance method) : 95 deg. C
 - c) Maximum hot spot temp : 105 deg C
- Transformers shall be designed to withstand the thermal and dynamic stresses due to short circuits at its terminals. Unless otherwise specified the duration of short circuit shall be 2 seconds.
- The maximum temperature at the end of the specified duration shall not be more than 250deg. C with the temperature prior to short circuit corresponding to maximum permissible overload.
- Designed for suppression of harmonics especially 3rd and 5th.

2.0 Magnetic Circuit

- Core material CRGO, M3-0.23mm steel shall be used.
- CRGO sheets shall be coated with insulation varnish compatible with the sealing liquid.
- Ducts to be provided to ensure adequate cooling.
- Core, framework and clamps arranged and tightened to securely hold laminations in order to prevent any settling or displacement in case of heavy shocks during transport, handling or short circuits.
- Flux density under specified over voltage or frequency conditions shall be within the maximum permissible for the laminations.
- Transformers shall be designed to withstand 110% over fluxing corresponding to rated voltage.

3.0 Windings

- Material shall be electrolytic grade work hardened copper of high proof stress with more numbers of radial supports.
- Shall be pre-compressed, press board of coil.
- Completed core and winding to be vacuum dried in full vacuum and impregnated immediately.
- Shall be braced to withstand shocks due to rough handling, and forces due to short circuit, switching or other transients.
- Permanent current carrying conductors within winding shall be brazed.
- Coils shall be supported using blocks, spacers and cylinders.
- Insulating materials shall be compatible with transformer liquid under all service conditions.
- Leads to the terminal board and bushings shall be rigidly supported.

4.0 Insulation

Inter turn and inter coil insulation shall be designed such that dielectric stress is uniformly distributed throughout the windings under all operating conditions.

5.0 Off - Circuit Tap Switch

- Externally hand operated with easily accessible links.
- Designed for sustained over current of at least 150% of the rated current of the winding.
- Shall not occupy any intermediate position between clearly marked tap position.
- Capable of repeated operation and withstanding short circuit forces.
- Tap position indicator
- Inspection and/or repair shall not require removal of transformer core from tank.
- Integral handle with padlocking arrangement

6.0 Tank

- Welded thick gauge plates stiffened and reinforced to withstand without deformation all stresses applied during transport and operation or short circuit conditions.
- Oil tight welds and joints
- -Fully assembled transformer with its radiators, conservator and other fittings shall withstand for one hour a pressure corresponding to twice the normal head of liquid or to the normal pressure plus 35 kN/sq. m, whichever is higher, measured at the base of the tank.
- Plates shall be protected internally against corrosion due to insulating liquid.
- Provided with inspection opening and cover (with handling equipment) to provide access to bushing connections.
- Form of cover shall be such as to prevent any stagnant water deposit and to drain gas bubbles towards the buchholz relay
- Tank (with radiators when welded to tank) shall be capable of withstanding of full vacuum.
- The tank shall be capable of withstanding a pressure of 1 kg/cm² (g) and a vacuum of 760mm of Hg for 30 minutes without any permanent deflection (Air pressure test shall be conducted as per IS -1180(Part-I):2014).

7.0 Conservator and Breather

- Conservator mounted on frame, integral with tank in such a manner that under all conditions and the lowest oil level the bushings remain under the head of liquid.
- Conservator volume shall be sufficient to maintain oil seal from ambient to oil temperature of 90 deg. C
- Oil filling hole with cap, and a drain valve to drain the oil completely shall be provided. One end of the conservator shall be bolted into position so that it can be removed for cleaning purposes.
- Silica gel breather with inspection window.
- Prismatic type oil level gauge with maximum and minimum levels marked. One 150 mm diameter dial type magnetic level gauge with alarm and trip contacts shall also be provided.

8.0 Buchholz Relay (If applicable)

- Double float relay as per IS 3677 - 1966.
- Shut off valves on either sides of the buchholz relay.

- Pot cocks at the top and bottom of relay drain plug, inspection window, calibrated scale, terminal box with oil tight double compression type brass gland.
- Potential free, self reset independent alarm and trip contacts, rated to make, break and carry 2 amps at 110 V DC. No auxiliary relay shall be used to multiply the contacts. Contacts are to be wired to the marshalling box.

9.0 Cooling

The cooling system provided may be either of the following or a mixed system of these, as specified.

ONAN - Oil natural, air natural

The insulating oil shall comply with the requirements of IS 335. The specific resistance of the oil shall not be less than 2.5×10^{12} ohm-cm at 27°C when tested as per IS 6103.

Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling.

The design and all materials and processes used in the manufacture of the transformer, shall be such as to reduce to a minimum the risk of the development of acidity in the oil.

Radiators

Radiators shall be detachable type directly mounted or separately mounted flanged, gasketed and bolted connections shall be used for connecting the radiators to the tank.

The following accessories shall be provided for each radiator/radiator bank.

- a) Top and bottom shut off valves and blanking plates.
- b) Bottom drain plug and top filling plug, air release plug
- c) Lifting lugs
- d) Thermometer pockets with thermometers in the inlet and outlet pipes (for separately mounted radiator banks).
- e) Top and bottom filter valves for each separately mounted radiator bank.

Valves and connections

- Valves of sluice type with hand wheels (clear marking for open and close indication)
- Made of gun metal
- Clear indication of open and closed position
- Provided with blanking plates or screwed plugs
- Padlocking facility to lock in closed/open position.

10.0 Terminations

It shall be possible to withdraw the transformer easily after disconnecting the connections without disturbing the cable terminations.

For cable termination

- Air insulated cable box suitable for the type and number of cables specified.
- Air insulated disconnection chamber with inspection opening
- Compression type brass cable glands with tinned copper lugs
- Bolted type gland plates.
- Sealing kits with associated accessories like stress relieving cones, insulating tape, trifurcating boot, HT insulating tape, etc.

11.0 Bushings

- Conforming to IS 3347 Part 5 - 1979, Part 3 - 1988 and 2099 - 1986.
- Minimum rated current of line and bushings shall be 1.5 times rated current of the corresponding windings
- Clamps and fittings made of steel or malleable iron shall be hot dip galvanized.
- Bushings rated 400 Amps and above shall have non-magnetic clamps and fittings only.
- Neutral bushings shall be provided as required for earthing of neutral point.
- The creepage distance for bushings, insulators etc. shall be adequate for heavily polluted atmosphere, and shall not be less than 25.4 mm / kV corresponding to the highest system voltage.

12.0 Oil temperature Indicator

150 mm dial type thermometer with manual reset maximum reading pointer. There shall also be two potential free contacts for alarm and trip signals. The alarm and trip settings shall be independently adjustable. The temperature-sensing element mounted in a pocket of oil shall be connected to the indicator through capillary tubing. Contact rating at DC shall be minimum 0.5 amps.

13.0 Winding Temperature Indicator

Local winding temperature indicator (WTI) shall have a 150 mm diameter dial type indicator with a manual reset maximum reading pointer. There shall be two potential free contacts for alarm and trip signals. For transformers with forced cooling, another set of contacts shall be provided to start/stop the forced cooling system automatically. The settings for closing/opening of each contact shall be independently adjustable. Contact rating at DC11, 220V DC shall be minimum 0.5 amps. The device shall be complete with lamp, sensing element, image coil, calibration device, auxiliary CTs etc. as required.

Remote winding temperature indicator with resistance type temperature detector, shall be provided additionally.

14.0 Marshalling box

All outgoing connections from the transformer i.e buchholz relay, temperature indicators, level indicators, CT secondary, fault contacts for annunciation, including forced cooling system and OLTC etc shall be wired to a marshalling box.

Degree of protection of enclosure shall be IP 52 for indoor and IP 55 for outdoor type respectively.

15.0 Earthing

All metal parts of the transformer with the exception of individual core laminations, core bolts, and clamping plates shall be maintained at fixed potential by earthing.

Two tinned copper earthing terminals. One end of bushing CTs shall be earthed.

16.0 List of fittings and Accessories

- Identification plate
- Rating and diagram plates.
- First fill of oil as per IS-355, 1983 with 10% excess in drums
- Cooling system complete with accessories as specified
- Conservator with oil level gauge
- Dehydrating breather
- Buchholz relay with alarm and trip contacts
- Oil filter valves at top and bottom of tank
- Drain off valve at lowest location to allow complete draining
- Oil sampling device at top and bottom
- Suitable PRV
- Pockets with thermometers for oil temperature and winding temperature indicators
- Bar type level gauge with alarm contacts
- HV, LV and neutral bushings.
- Dial type winding temperature indicator with maximum reading pointer and alarm and trip contacts
- Lifting lugs and jacking pads
- Earthing terminals
- Inspection covers
- Cable disconnecting chamber
- By-directional rollers/flanged wheels as specified
- Marshalling box.
- Flat base and foundation bolts.

17.0 Technical Particulars

Particulars	200KVA 33/0.433 kV
Specification	IS 1180, Part-I, 2014
Type	Three phase, core type, oil filled
Duty	Indoor
Voltage HV/LV	33/ 0.433 kV
Frequency	50 Hz
No. of phase	3
Continuous rating	200 KVA
Insulation class	Class A
Cooling	ONAN
Winding connection	Delta / Star
Vector group	Dyn 11
Neutral grounding	Solidly earthed
System earthing	33kV – Solidly earthed 415 V - Solidly earthed
Percentage impedance	5%
Termination	Cable end box for termination of XLPE cables at both HV and LV side
Temperature rise over : 50 deg C ambient temp a) In oil (measured by Thermometer) b) In winding (measured by Resistance method) c) Hot spot Temp.	35 deg C 45 deg C 55 deg. C
Tap changer on primary side	Off load tap changer
a) Range	+5%-5%
b) Total tap positions	5
c) Taps above nominal voltage	2
d) Taps below nominal voltage	2
e) Voltage per step variation	±2.5%
f) Tap change controls	Local Manual
Impulse test withstand voltage	As per IS 2026, Part III – 1981
One minute dry and wet power frequency withstand voltage	- do -
Induced over voltage withstand voltage	- do -

Particulars	200KVA 33/0.433 kV
Withstand time without injury for 3 phase short circuit at terminals	2 Seconds
Auxiliary supply voltage	30 V DC/ 415 V AC
Parallel operation	Suitable for parallel operation with transformers of similar ratings
Overload capacity	As per IS 6600 –1972
Radiators	Detachable type
Short circuit level on HV side	25kA for 3 Sec
Short circuit level on LV side	50 kA for 1 Sec

04.13.2.14 3.3KV NEUTRAL GROUNDING RESISTORS (NGR)

1.0 General

Natural air cooled, suitable for indoor application, sheet steel enclosure, degree of protection IP-55 as per IS-13947, technical parameters as specified and conforming to IEEE-32 for 3.3KV system earthing. The NGR shall be provided with single pole, off load isolator in a segregated chamber.

Neutral side bushing suitable for overhead connection and earth side bushing suitable for grounding flat connection. The resistor shall be designed for the required system voltage and current as per the technical particulars.

The resistor grid elements shall be made from unbreakable formed nickel chromium stainless steel (AISI-304), punched construction. The insulation used for the elements shall be of non-deteriorating type and shall be unaffected dimensionally during heating and cooling.

Temperature rise shall not exceed 250°C over ambient temp. of 50°C during the passage of fault current for 30 seconds. Current transformer for neutral O/C protection shall be provided before the single pole isolator as per the technical particulars.

All interconnections between unit frames and between tiers shall be of solid copper. The entire assembly shall be designed to ensure ample strength to withstand the mechanical stresses imposed due to fault current. The enclosure shall be of CRCA sheet steel, totally enclosed without louvers. The min. thickness of sheet steel shall not be less than 2 mm.

Any deviations from the specifications shall be clearly indicated. All guaranteed technical particulars, along with GA drawing and constructional details shall be furnished along with the offer.

1.1 Single pole Isolator

A single pole isolator shall be provided along with each NGR panel on the neutral side for isolation of NGR in case of maintenance.

The isolator shall be single pole, off load, manually operated air break type, kiosk mounted along with NGR in a segregated chamber. Connection between the isolator and NGR shall be through bushing.

The isolator shall be provided with the following features.

- Mechanical & Electrical ON/OFF indicator.
- Position indicator to indicate open and close position of operating handle.
- Pad locking facility in ON and OFF condition.
- Door interlock so that the door can't be opened with the isolator ON with interlock defeat facility.
- 4NO + 4NC auxiliary contacts wired to terminal block.
- Separate LT chamber to house Auxiliary contacts, indication circuits, CT secondary connections etc.

1.2 Technical Particulars

1.2.1 Neutral Grounding Resistors

Sl. No.	Particulars	3.3 KV System

1.	Type	Kiosk Mounted, Punched Stainless Steel
2.	Resistance material	Stainless Steel (A1S1-304)
3.	Nominal system voltage	3.3KV
4.	Highest system voltage	3.6KV
5.	One minute power frequency withstand voltage	10KV
6.	Impulse withstand voltage	40kV
7.	Resistance	----
8.	Current rating	50A
9.	Duration	30 Sec
10.	Constructional features	
a)	Sheet steel thickness	Minimum 2.0 mm
b)	Installation	outdoor
c)	Degree of protection	IP-55
d)	Neutral side connection	AL tubular bus
e)	Earth side connection	Earth strip

1.2.2 Single Pole Isolator

Sl. No.	Particulars	3.3KV System
1.	Type	Manually operated, air breaker, off load
2.	Mounting	Kiosk Mounted
3.	No. of poles	One
4.	Nominal system voltage	3.3
5.	Highest system voltage	3.6
6.	Current rating	1250A
7.	One minute power frequency withstand voltage	10KV
8.	Impulse withstand voltage	40KV

Technical requirement of Continuous monitoring of NGR System:

- The monitor must be capable of detecting an NGR failure, whether or not there is a ground fault on the system.
- The monitor must work in tripping or alarm only.
- The monitor must not be exposed to neutral voltage during a ground fault.
- Monitoring the NGR should include monitoring the neutral and ground connection.
- The monitor should not be capacitively or inductively coupled to the NGR.
- If the ground fault protection is included, the monitor should be capable of detecting a ground fault, when the NGR is open.

A combination of overvoltage measurement by Overvoltage relay, over-current measurement by over-current relay and a resistance measurement shall be used for better online monitoring of NGR system.

04.13.2.15 3.3KV SWITCHBOARD

1.0 Codes and Standard

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC with specific conformity to the latest editions of the following standards, except where modified and/or supplemented by this specification.

IS:12729	General requirement for switchgear and control gear for voltage exceeding 1.1kV
IS:13118	General requirement for circuit breaker for voltage above 1000V
IS:3472	Metal enclosed switchgear and control gear for voltage above 1000V
IS:5082	Material for data for aluminium bus bar
IS:9920	Switches and switch isolator for valve above 1000V
IS:9921	AC dis-connectors (isolators) and earthing switches for voltage above

	1000V
IS:9046	AC contactors of voltage above 1000V upto and including 1100V
IS:12661	HV motor starter
IS:13703	Low voltage fuses
IS:2705	Current transformers
IS:3156	Voltage transformers
IS:1248	Electrical indicating instruments
IS:722	Integrating meters
IS:3231	Electrical relays for power system protection
IS:6875	Control switches and push buttons
IS:694	PVC insulated cables for working voltage up to including 1.1kV
IS:2544	Porcelain post insulators for system with nominal voltage greater than 1.1kV
IS:11353	Guide for uniform system of making an identification of conductor and apparatus terminal
IS:5578	Guide for marking insulated conductors
IS:5	Colors for ready mixed paints and enamel
IEC 62271-1	Common specification for HV Switchgear & Control gear.
IEC-62271-100	Specification for High Voltage Alternating Current Circuit Breaker
IEC-62271-102	Specification for HV Alternating Current Disconnectors and Earthing Switches.
IEC-62271-200	Specification for AC metal enclosed switchgear and control gear for rated voltage above 1KV and upto and including 52KV

1.3 General Requirement

- Manufacturer of switchgear panel shall be same as the manufacturer of circuit breaker. Circuit breaker and panel shall be supplied from the same unit/factory. Circuit Breaker manufacturer shall utilize their own make vacuum interrupters (bottles) if being manufactured by them and the type test certificate for the combination shall be submitted.
- In all locations (and also all circuit breakers in the one switchboard) shall be of same model & design, except for the continuous current rating.
- The switchgear shall be of metal clad, self-standing, dust proof construction, indoor cubicle type fitted with truck mounted Vacuum circuit breakers in fully draw out execution. Horizontal isolation and ground operated (not cassette type.) Fixed contacts on busbar and breaker side shall be flat/tulip type contacts with self aligning mechanism flat type and moving contacts on breaker side shall be jaw type or tulip type, with self aligning.
- The circuit breaker shall confirm to E2 & M2 duty class for 10000 operations as per IEC-62271-100.
- Circuit breaker shall confirm to C2 class for capacitive breaking current.
- The circuit breakers shall be suitable for following duties.
 - ⇒ To withstand inrush magnetizing currents of transformers.
 - ⇒ Transient surge produced by one CB due to severe chopping during rapid interruptions of inductive current e.g. motors, shall be within limits allowable for overhauled motors according to IEC60034 part-1.
 - ⇒ Suitable surge suppressor/arrestor (3kA) shall be provided for all the outgoing motor feeders which shall be mounted separately on the fixed compartment only (i.e. cable chamber/ breaker cubicle) but not on the draw-out movable VCB trucks. Calculation of rating & suitability of SA shall be furnished.
 - ⇒ To withstand switching off over voltages caused due to break of lightly loaded low capacity cage type induction motors. It shall also withstand DOL starting of motor with large starting time, and repeated starting like one hot start and two successive cold starts.
 - ⇒ All normal current rating of breaker shall be in-panel rating and not free air rating. Required normal current rating shall be achieved by single breaker principle inside the cubicle without fan.

- ⇒ Bidder to furnish calculation for de-rating factor at 50 deg ambient and type test certificate shall be submitted to substantiate the same. The temperature rise shall be as per IEC.
- ⇒ To withstand switching off over voltages caused due to break of lightly loaded low capacity cage type induction motors. It shall also withstand DOL starting of motor with large starting time, and repeated starting like one hot start and two successive cold starts.
- ⇒ Transient surge produced by one CB due to severe chopping during rapid interruptions of inductive current e.g motors, shall be within limits allowable for overhauled motors according to IEC-34 part-1 otherwise suitable surge absorber shall be provided.
- ⇒ To withstand inrush magnetizing currents of transformers & capacitor bank 'ON' and 'OFF' operation.
 - The controls, indicating lamps, relays and meters shall be mounted on breaker cubicle itself.
 - Operation counter, close/open mechanical indications spring charged/ discharged indication shall be provided.
 - All circuit breakers shall have motor operated spring charged independent closing and shunt tripping coil (220V DC.) Closing coil shall be suitable to operate between 85% to 110% of voltage and tripping coil between 70-110% of rated voltage. Spring charging motor shall operate between 85-110% and motor shall be of universal type and operate with 240V AC.
 - Heat shrinkable sleeving of all busbar, live parts shall be provided.
 - Raychem sleeve rated for the full voltage of the switchboard shall be provided for entire busbar in the switchboard. Reusable removal shroud of rated voltage shall be provided at all joints. The insulation shall be tested for the full voltage during inspection.
 - All power carrying Busbars, Jumpers, feeder connections as applicable in the cubicle also shall be of same current rating as that of the breaker and not according to CT primary rating. This includes any power carrying jumpers / busbars connected to CT.
 - Wherever conventional Jumpers in the cubicle is used the rating should be same as that of breaker otherwise seal off bushing type fixed isolating contacts in power circuit of panel shall be preferred for preventing any arc transfer from breaker compartment to bus bar and CT cum cable compartment in the event of internal arc in breaker compartment.. Only the jumpers connected to CT shall be rated according to CT rating. There should not be any air gap between CT primary and secondary to avoid failure on account of partial discharge.
 - A manually operated device to enable charging of closing springs.
 - Manual/ Mechanical tripping arrangement for emergency tripping of CBs.
 - All circuit breaker truck shall have service, test and draw out positions. Test position shall engage only the auxiliary (control) contacts to close the Circuit Breaker during testing. All the three interrupters of individual phases shall be mounted on a common phase segregated hydrophobic epoxy body mounted on a truck for better insulation and avoidance of non-simultaneity of poles and for 3.3kV. It shall have interrupters housed in totally individual encapsulated insulating poles to avoid any surface discharge. Individual interrupter housed in an enclosed pole design can also be provided.
 - Space heater shall be provided for each compartment of 3.3KV switchboard and same will be operated by differential thermostat to maintain temperature of 5deg higher than ambient. Suitable indication for healthiness of space heater shall be provided.
 - Bus riser panel shall have removable link with necessary interlocking arrangement adjacent to bus coupler panel.
 - Panel door switch shall be provided for illumination inside panel.
 - Mechanical as well electrical anti pumping feature for the breakers shall be provided.
 - All live parts shall be insulated by taping, supported by suitably designed insulators. Proper insulation of bus bars upper and lower contacts of breakers, vacuum bottles (for VCB) and sealing of opening of bushings shall be provided to eliminate accidental contacts. Switchboard busbars shall be taped by proper grade of insulating tape.
 - The cubicle shall be provided with a position changing gear arrangement in such a way that by engaging detachable device from outside the front door, it shall be possible to move the breaker truck and

change position without opening the cubicle door. Facilities for pad locking in each position shall be provided. The cubicle shall be provided with necessary arrangement for smooth rack in and rack out. Facility shall be provided for all operation with door closed. Shutters shall be earthed metallic insulated and shall have provision for padlocking. Breaker should also having facility for position padlocking facility by locking mechanical push to trip and push to close buttons to avoid any inadvertent movement of breaker from test to service position when operator is working on cable side.

- Safety shutters complying with IEC 62271-200 shall be provided to cover up the fixed high voltage contacts on bus bar and cable side when the truck is moved to ISOLATED position. The shutter shall move automatically, through linkage with the movement of the truck. Necessary tests shall be carried out in line with IEC 62271-200.
- Operation of all feeders shall be manually.
- Each cubicle shall have mimic diagram with metal strip on front & rear.
- Each cubicle shall be of compartmentalized construction as per "Loss of Service continuity" and "Partition Metallic" criteria of latest edition of IEC 62271-200 and shall have separate compartments for bus bars, CTs and outgoing cables, metering & protection devices.
- The switchgear construction shall be such that the operating personnel are not endangered by breaker operation and internal explosions. Front portion of the panels shall be specially designed to withstand the same.
- All circuit breaker trucks of same rating shall be identical in all respects (except metering and protective devices) and shall be interchangeable with similar breaker panel. However, it shall not be possible to insert circuit breakers of lower current rating into cubicles rated for higher current.
- Continuous copper earth bus shall be provided throughout the board.
- The position of various control switches, push buttons, levers etc. requiring manual operation shall be at a height not less than 450mm and shall not exceed 1850mm from the finished floor level.
- CT shall be positioned in such a way so that they are easily replaceable and their secondary terminal shall be easily accessible.
- The controls, indicating lamps, relays and meters shall be mounted on breaker cubicle itself.
- Operation counter, close/open mechanical indications spring charged/ discharged indication shall be provided.
- For indoor switchboards CB rating shall be considered for determining the Busbar Jumpers rating for the Incomers/ O/G Feeders instead of CT Ratio.
- A built-in/separate spring charging handle to enable charging of closing springs.
- Manual / Mechanical tripping arrangement for emergency tripping of CBs.
- All circuit breaker truck shall have service, test and draw out positions. Test position shall engage only the auxiliary (control) contacts to close the CB during testing. Circuit breaker shall be vacuum type for 3.3KV system.
- Individual segregated pole type construction shall be considered for indoor switchboard.
- Indoor switchboard busbar chambers shall not have any separation in between the adjacent panels through seal off bushings.
- Panel front should be closed with a pressure resistance door which should open to an angle of almost 130° and shall be provided with a switch for illumination inside panel. Panel illumination lamp with socket shall be provided in low voltage compartment.
- Both Electrical & Mechanical Anti pumping feature shall be provided.
- Pressure relief device shall be provided in each high voltage compartment of a panel, so that in case of fault in a compartment, the gases produced are safely vented out, thereby minimizing the possibility of its spreading to other compartments and panels. The pressure relief device shall not however reduce the degree of protection of panels under normal working conditions. To demonstrate that the pressure relief device operates satisfactorily the Bidder shall carryout test in line with IEC 62271-200 Annex – A, as a type test.
- Each cubicle shall have mimic diagram with metal strip. (preferably)
- All circuit breaker trucks of same rating shall be identical in all respects (except metering and protective devices) and shall be interchangeable with similar breaker panel.

- All breaking/making duties shall be at 3.3KV for 3KV system respectively as per IEC Standard.
- Breakers controlling motors must be tested for switching motor over voltage test as per Clause-3.6 of IEC 1233, 1994.
- Space heater with thermostat to be provided in each breaker and cable chamber, line Pt, bus PT and dummy panels.

• CBCT shall be provided in all outgoing feeders to limit earth leakage current.

In the design of the switchgear, the following positive interlocking shall be provided.

- It shall not be possible to move the truck from the isolated to the Service position unless low voltage plug and socket connections have been made.
- It shall not be possible to disconnect the low voltage plug and socket as long as the circuit breaker truck is in service position.
- It shall not be possible to withdraw the truck from the isolated position without disconnecting the low voltage plug and socket.
- It shall not be possible to move the truck from the service to the isolated position or vice-versa with the circuit breaker in the 'ON' position.
- It shall not be possible to switch on the circuit breaker when the truck is in between the isolated and the service positions (except in test position).
- CB in test position with auxiliary supply disconnected shall be indicated as isolated position
- Breaker compartment door can be padlocked in both test and service positions. In the test position-locking arrangement (by Double Bit Key) top revent rack in/out of the breaker shall be possible.
- It shall not be possible to open the circuit breaker enclosure when the breaker is ON or to have access to any part of the draw out assembly which is live when the circuit breaker is in the service position.
- Shutters shall be lockable in closed position and earthed metallic.
- Rack in/out of CB from test to service position and vice versa only with door closed.
- While opening the rear side cover (in all feeders) the breaker must be tripped through heavy duty high quality limit switch.
- Where local/remote selector switches are called for, it shall be ensured that the philosophy of operation of local / remote switch should be –
 - * For outgoing Transformer feeders: the breaker can be closed locally if the breaker truck is in the test or service position.
 - * For the motor feeders: the breaker can be operated from Remote panel (from hop) when the breaker truck is in service position and the local/remote selector switch is in Remote position. Breaker can be closed in local position when breaker is in TEST position only
 - * The breaker can be tripped locally from TNC regardless of the position of the Breaker truck either in test or service and either in local or remote mode.

1.4 Operating Mechanism

The operating mechanism parts shall be designed to give longer life, trouble free operation and require minimum maintenance. The Circuit Breaker mechanism shall satisfy the Mechanical Endurance class M2 for 10,000 operations as per latest edition of IEC 62271-100.

The material and components used shall have chopping current limited to minimum.

1.5 Insulation Levels

Nominal voltage (KV)	:	3.3
Highest system voltage (KV)	:	3.6
One minute power frequency withstand voltage (KV)	:	10
1.2/50 micro sec impulse withstand voltage (KVp)	:	40
Clearance in air (Phase-Phase & Phase-Ground) (mm) for upto 12 kV	:	As per IEC

1.6 Strength

- Rated short time withstand current shall not be less than the system short circuit level specified for the stipulated duration.
- Rated peak withstand current shall not be less than 2.5 times the system short circuit level.

1.7 Auxiliary Circuits for Control & Protection

- Control supply buses for AC and DC
- Signalling supply
- PT secondary voltage

All control & protection supply can be done through internal wiring instead of auxiliary bus.

1.8 Provision of Surge Suppressor

Breakers (VCB) that give rise to overvoltage surges due to current chopping phenomenon, surge suppressors to be provided at the load side terminals of the breakers to limit the switching surges to value limited for as per IEC. This shall be provided for all motor feeders after the breaker contacts before CT. Protection shall be interconnected with respective breaker. Surge suppressor shall be metal oxide gapless type, 10kA discharge current capacity.

1.9 Annunciation Schemes

- Flag indications for all faults for which individual protective relays have been specified.
- Warning signalling (as applicable) on individual panels:
 - a) All transformer warning/signaling conditions (group signal from corresponding transformer control panel / substation.
 - b) Loss of trip circuit supply.
 - c) Earth fault.
 - d) Control supply failure.
 - e) PT fuse failure/MCB tripping.
 - f) Internal failure relay.
- Emergency signalling for tripping of HT breakers on fault.
- One common signal for warning and one signal for emergency from each panel to be wired to a common annunciation panel of the switchboard, where specified.
- Annunciators for warning and emergency signalling condition on individual panels of solid state facia window type. Common audio signalling with Accept, Reset and Test push buttons for the switchboard where common annunciation panel is not specified. Audio signalling to have distinct tones for warning and emergency.

1.10 Bus Bar and Connections

- Power buses of high conductivity electrolytic grade copper as per IS: 613-1984. The bus bars shall be tinned coated/nickel coated/silver coated at joints as per IEC.
- The bus bars shall be insulated with Raychem make insulating sleeves of full potential. Even that part of isolating contacts which projects into the bus compartment shall be covered with an insulating sleeve.
- Control and Auxiliary buses of electrolytic grade copper.
- Anti-condensation measures by use of space heaters need not be provided in bus-bar chambers.
- The continuous rating of the main horizontal bus not less than the rating of the incomer specified, where not specified, the rating to be selected for at least 125% of the maximum demand of the switchboard taking into account spare feeders.

• The vertical bus rating

For incomer	:	Not less than that of horizontal bus
For outgoing	:	Not less than that of the outgoing breaker, irrespective of relay setting.

- Final operating temperature under continuous operation in enclosure limited as per permissible values stipulated in IEC 62271-1 considering maximum ambient of 50degree Centigrade.
- Both horizontal and vertical bus bars to be designed and supported to withstand the thermal and dynamic stress corresponding to rated short time and peak withstand current specified.
- Cross-section of main horizontal bus to be uniform throughout the switchboard and continuous in one transport unit.

- Bus bar arrangement as per IS:375.
- Phase identification by colour in each panel or colour coded labels on each phase.
- Bus bars (horizontal as well as vertical) shall be provided with heat shrinkable, non-tracking, low absorption type sleeving conforming to international standards to the full potential.
- Bus bar joints and tap off connections of bolted type with zinc dichromite high tensile steel bolts, nuts and spring washers, fishplates with accessories at the end of a transport unit for site connections.
- All the joints shall be provided with reusable & removable shrouds suitable for rated voltage of the switchboards.
- All busbar support insulators shall be of hydrophobic material having high impact and dielectric strength with an anti-tracking contour.
- Continuous path of Busbar chamber is acceptable. Seal-off bushings not required inside HT switchboard.
- Self-supporting busbars insulated to the full voltage level instead of support insulators can also be provided. In that case, each compartment will be sealed from the adjacent cubicle and busbars will pass through epoxy cast resin bushing.
- Bus bar joints and tap off connections shall be of bolted type with zinc dichromite high tensile stainless steel bolts (grade 8.8), nuts and spring washers, fishplates with accessories at the end of a transport unit for site connections.

1.11 Internal Control Wiring

- Control wiring shall be carried out by 1100V grade PVC insulated, FRLS, single core multi stranded copper wire of minimum cross section 1.5 sq. mm.
- Multi-stranded flexible copper wire of min. 2.5sq. mm shall be used from CT secondary to relay and shall have protection against heat & mechanical damage due to flash over. Use of heat proof sleeves and rigid conduit shall be made to run the control wires from back to front.
- All inter panel AC and DC control supply wiring shall be min. 4 sq mm flexible copper wire
- Wiring and terminal arrangement for all panels shall be carried out as per approved scheme.
- Flexible wires protected against mechanical damage for wiring to door mounted devices.
- Wires identified at each end in accordance with schematic diagrams by interlocked type ferrules. These shall be firmly located so that these do not move. Number of ferrules in place of interlocked type ferrules can also be provided.

- Color code for control wiring

AC – Black	Earth wire – Green
DC – Light gray	Trip circuit – Red

- All connections external to a feeder, all the auxiliary contacts of the HV breaker and at least 1 NO & 1 NC spare contacts of the relays shall be brought to terminal blocks.
- Interconnection between panels of adjacent shipping sections to be brought out to a separate terminal block.
- No bunch shall contain more than 12 wires.
- Wiring shall not be joined or tied between the terminal points.
- Control wires shall be run in earthed metallic flexible conduits when laid in HV bus chamber.
- Not more than two connections shall be provided on any one terminal.
- Heat proof arrangement for the passage of wiring in HT panel.
- All tele-metering signals shall be wired to terminal strips.

1.12 External Terminations

1.12.1 Control Terminations

- 1.1kV grade multi-way open type terminal blocks of non-tracking moulded plastic complete with insulated barriers, stud type terminals, washers, nuts and lock nuts and identification strips.

- All terminals going out of the switch board shall be brought to a separate terminal board marked "External Termination". These will be easily accessible.
- External terminal block shall be provided in the relay chamber with proper clamping facilities for cable dressing.
- Disconnecting type terminal block for CT/PT and for AC/DC supply.
- Control terminals shall be suitable to receive two numbers 2.5 sq. mm copper conductor.
- 20% spare terminals in each control terminal block. Terminal blocks in separate groups shall be provided for transformer marshalling boxes, local push button stations,
- Gland plate for control cables shall be of adequate size to accommodate and to facilitate glanding of all the control cables coming from external equipment.
- Terminal blocks shall be placed separately for internal looping and external looping.

1.12.2 Power Terminations

- Suitable for accepting cable/bus trunking as specified.
- Sufficient space and support arrangement inside each panel to accommodate HT cable termination kits and sealing kits suitable for the size and number of XLPE cables. If it is with cable pan, then type test reports shall be furnished. Gland plate in cable chamber shall have built in adjustable cable holding damp.
- Where more than one cable has to be terminated per unit, the arrangement shall permit connection and disconnection of cables separately without disturbing other cables.
- Where specified the following cable termination accessories, suitable for the type, size and number of cables to be terminated, to be supplied with switchboard.
 - ⇒ Cable sockets with all HT terminals (sockets set at such an angle that cable tails can be brought up for termination with minimum bending and setting).
 - ⇒ HT cable termination and sealing kits.
 - ⇒ Power cable termination facilities shall be designed to facilitate easy approach to CTs.
 - ⇒ Double compression type brass cable glands and crimping type tinned heavy duty copper lugs for HT, LT power and control cables.
 - ⇒ Polycarbonate sheet between ph-ph and ph-E to be provided in all cable chambers.
 - ⇒ All power cable terminations shall be covered with silicon rubber boot especially to be provided by cable jointing kit manufacturer.

1.13 Protection and Measurement

1.13.1 Electrical Protection and Metering

- Selection of protective scheme will be based mainly on reliability, sensitivity, selectivity. All main protections shall be fast acting type in order to clear the faulty system from the healthy system in earliest possible time to minimize damage to equipment and ensure continuity of power supply.

The details of major protections and metering for 3.3kV system are elaborated below. (Indicative only)

Sl. No.	Feeder Designation	Protection and Metering	
		Protection	Metering
1.	Bus Coupler	<ul style="list-style-type: none"> • Over-Current and Earth fault (50, 51, 51N, 50N) • Check Sync Relay (25). • High speed tripping relay, close & trip circuit supervision relay, aux relays, time delay as required. 	<ul style="list-style-type: none"> ▪ 1 no. Multifunction meter. ▪ 3 nos. Ammeter
2.	Incomer	<ul style="list-style-type: none"> • Over-Current and Earth fault (50, 51, 51N, 50N). • Fuse failure protection of line PT (97) (for alarm). • Check Sync Relay (25). 	<ul style="list-style-type: none"> ▪ 1 no. Multifunction meter. ▪ 3 nos. Ammeter. ▪ 3 nos. Voltmeter with voltmeter selector switch for LINE PT.

Sl. No.	Feeder Designation	Protection and Metering	
		Protection	Metering
		<ul style="list-style-type: none"> High speed tripping relay, close & trip circuit supervision relay, aux relays, time delay as required. 	<ul style="list-style-type: none"> 1 no P.F meter 1 no kWH meter
3.	Transformer Feeder	<ul style="list-style-type: none"> Over-Current and Earth fault (50, 51, 51N, 50N). High speed tripping relay, close & trip circuit supervision relay, aux relays, time delay as required. Provision of inter-trip from downstream switchboard. Earth leakage protection with CBCT and EOR relay. 	<ul style="list-style-type: none"> 1 no. Multifunction meter. 3 nos. Ammeter. 1 No. kWH Meter
4.	Motor feeder	<ul style="list-style-type: none"> Motor protection relay (99). Time delayed U/V relay. Over-Current and Earth fault (50, 51, 51N, 50N). High speed tripping relay, close & trip circuit supervision relay, aux relays, time delay as required. Provision for taking RTD/BTD input Earth leakage protection with CBCT and EOR relay. 	<ul style="list-style-type: none"> 1 no. Multifunction meter. 1 nos. Ammeter. 1 no. multifunction Transducer to Remote Ammeter. Interposing CT for remote ammeter connection. 1 no kWH meter.
5.	Bus PT	<ul style="list-style-type: none"> HT Fuse on primary MCB on secondary Link (Drawout) Under Voltage (27) with timer Fuse Failure (97) (for alarm) Neutral displacement relay (60) Over Voltage (59) with timer 	<ul style="list-style-type: none"> 1 no. frequency meter in BPT 3 nos. Voltmeter with voltmeter selector switch. 1 no. Frequency meter & PF meter
6.	Line PT	<ul style="list-style-type: none"> HT Fuse on primary MCB on secondary Link (Drawout) Neutral Displacement relay (60) 	

Note:-

Except MFM all the meters mentioned above shall be analogue type with 90 degree scale

1.13.2 Protective scheme requirements

- Synchronization check relay/feature shall be provided in all the incomers and buscoupler feeders.

- Synchronization check relay/ feature shall be provided in all the incomers and buscoupler feeders
- Auxiliary relays, timers switches etc. required to make the scheme complete shall be considered as part of the scope of work.
- All CT-PT shall be suitable for the relay-meter requirement - lead burden
- All CT-PT wires shall be brought to test terminal blocks before connecting to circuits. All protective relays shall be provided with test block with jack for testing of relays.
- The circuits of various protections (coming from other panels) shall be connected to master trip relays through aux. relays (flag indicated). The (MTR) Master Trip Relay shall be VAJH type or equivalent. For incomers & bus coupler feeders electrical reset facility shall be provided in addition to the hand reset feature in MTR.
- VAA type aux. relays shall be provided for each transformer fault. Connection of the relay shall be through links to facilitate maintenance. All external indication, alarm & trip contacts to a feeder shall be wired through flagged aux. relays.
- High end Relay ranges and scale of meters shall be finalized during drg. approval stage.
- Contact arrangement, number of poles/ways in control/selector switches shall be as per the requirement/approved scheme.
- For control supply distribution, panel to panel separate set of terminal blocks shall be provided at top of the panel. All items/accessories required for above in each panel and in incoming panels shall be provided by the supplier.
- All relays shall be hand/self-reset type with flag indication. NO/NC contacts for relays shall be as per the requirement of approved protection, annunciation & interlock schemes. Wherever required supplier shall provide aux. relays for contact multiplication.
- Trip Circuit supervision features can be a part of the numerical relay or if provided separately through a relay shall be self-reset type with flag (hand reset). Close Circuit supervision shall be through a separate relay which shall be self-reset type with flag (hand reset). Close circuit supervision can also be a part of the numerical relay (NR) if the features are available in NR.
- Annunciation facia shall be mounted on each panel / separate switchgear panel and details shall be finalized during drawing approval stage.
- Centre line of switches, lamps, meters shall be matched to give uniform
- Appearance and mounting height of switches shall be between 1.1 to 1.8 m.
- Intelligent Electronic Devices (IEDs) shall be installed in the 3.3KV switchgear panels for control, measurement and protection. The IED shall measure voltage, current, active power, reactive power, power factor, energy, etc having minimum accuracy of 1.0%. The energy readings shall be in non-volatile memory and IED shall not use any battery back-up. Four quadrant energy measurement shall be considered for all HT feeders.
- Each feeder shall have master trip relay and close/trip coil supervision relay.
- Aux. Relays to be considered as per scheme requirement.
- Relays shall be mounted on the HT switchboard itself unless otherwise specified.
- All protection trip from 415V switchboard to HT switchboard of various substations shall be hardware wired.
- Local /Remote selector switches, Trip selector switches, close permissive switches, TNC Switches, Synchro Switches, Auto/Manual selector switches, Emergency pushbuttons etc shall be provided in the panels as required to fulfill the control logics.
- Beside multifunction meter, Analog voltmeters, Analog frequency meters and Analog ammeters shall be provided in all the incomers and interconnector feeders.
- Analog Ammeters shall be provided in all the outgoing feeders.

1.13.3 Specification for MFM:

Provision of individual multi-functional metering system for all incoming and outgoing line

- Meters should be capable to measure the following parameters
- KWH, KVAh, KVAH ((import and export).
- Meter should be capable to display the instantaneous parameters like voltage, current, PF, Frequency, Inst. Load etc.
- Meter should record data in its memory with a retention time of at least 10 years for parameters like Active Energy, Apparent Energy, Av. Voltage, Av. Current, PF which can be viewed upon downloading through CMRI in tabular as well as graphical view for at least 35 days.
- Meter should be capable to record the Maximum demand on 15/30 mins integration period.
- Meter should have a Four Line seven-digit LCD display with quadrant identification and power level indication.
- Meter should be capable of reading the Total Harmonic Distortion for current, voltage and power.
- Meter should record the True RMS Value
- Meter should be of Accuracy Class 0.2S
- Compliance to IS 14697, IEC 62053-22
- Meter should be of site/field configurable 3P3W/4W and CTR and PTR type.
- Meter should record the Maximum demand for an IP of 15/30 mins
- Meter should be capable to provide whole day data / Midnight snapshots for energy parameters upon downloading
- Meter should have MODBUS communication via RS 485 for online application
- Meter should have a Calibration LED for periodic site accuracy testing
- Meter should have the setup page password protected so that it can be secured after installation.

1.14 Current Transformer (Panel Mounted)

- Separate cores shall be used for, over current protection and measurement purposes. CT's on incomer side shall be mounted in the bus before incomer breaker and CT's for outgoing feeder shall be put after the breaker.
- Short time thermal and dynamic ratings and insulation level of CT's shall be similar to rating of associated breaker.
- Short time ratings and insulation level of CT's shall preferably be similar to rating of associated breaker. However same may be different, based on various CT parameters for 3.3kV, SCR shall be 25KA for 1 sec for CT ratio of 250A & below and above 250A, SCR shall be 25KA for 3Sec. (preferably)
- CT ratios specified are provisional. Where outputs and accuracy are not specified, these shall be such as may be required by the circuits in which they are used. Generally the protection CTs and metering CTs shall have 5P20 and 1 class respectively.
- All CTs depending upon primary current rating shall be non-hygroscopic epoxy cast resin insulated & bar primary type. CT may be wound primary up to 250A. There should not be any air gap between primary and secondary of CT to avoid failure due to partial discharge between primary and secondary.
- CT's shall have shorting link on secondary side to facilitate insertion of meters on secondary side without opening CT circuits.
- Indicative CT ratios for incomer shall be 1200/1 and Outgoing feeders shall be 100/1A.
- All CTs shall have class F insulation.
- ICT for 5VA burden shall be provided for all motor feeders for 3.3KV system for the purpose of remote metering.

1.15 Potential Transformers

- Shall be cast resin insulated type mounted on withdrawable truck and accessible from front end and shall be withdrawable without affecting power circuit.
- PTs shall have fuses on high voltage side and MCBs on low voltage sides.

- Low voltage star winding shall have all three phase and neutral connections brought out to terminals and one phase shall be earthed.
- Insulation levels shall be similar to rating of associated board.
- Accuracy class shall be 0.5/3P.
- VA burden shall be selected based on meters and relays connected with the PT from the following standard values: 100VA, 200VA
- The PT earth fault factor shall be as per table 2 of IS-3156, Part-I, 1992.
- All PTs shall have class F insulation.
- For CTs and PTs: switch gear manufacturer's own make can be acceptable however they must have the in house manufacturing facility (casting and winding), testing facility and should have type tested design.

1.16 Relays

- All protection relays shall be microprocessor based numerical & communicable type (IEC-61850 compliant) for connection to the proposed SAS system.
- All relays shall be flush mounted in dust proof cases and shall be mounted on front side of cubicle.
- The numerical relays provided for HT feeders and shall have facility to filter out inrush currents so that lower setting for short circuit protection could be utilised.
- All protective relays shall be draw-out type.
- Major relays are as indicated in the specification.
- Master trip relay shall be hand reset and shall have 6NO and 6NC contacts in addition to those required by the protection/control scheme.
- All timers and Aux. relays shall have flag indicators & protection relays shall have LED indication to indicate operation of the relay.
- Relay ranges, exact type, number of aux. relays, timers shall be finalized during drawing approval stage.
- All instantaneous / IDMT current protection relays shall be of 3 pole type.
- In HT switchboard two nos. bus PT's, with U/V relays neutral displacement relays, timer etc. to be provided.
- No plug-in type relays shall be used.
- Feeder Management Relay (FMR)
- Each feeder shall be provided with FMR which shall perform complete control, protection and monitoring of that particular feeder.
- Following digital signals shall be provided in FMR:
 - 1) CB ON
 - 2) CB OFF
 - 3) Master Trip Operated
 - 4) TC Healthy
 - 5) Closing ckt healthy
 - 6) CB Service
 - 7) CB Test
 - 8) Spring Charged
 - 9) Local/Remote
 - 10) DC Fail
 - 11) All Transformer Alarm & Trip Signals (as applicable)
 - 12) Cable side earthed (As applicable to a feeder)
 - 13) Bus earthed (as applicable to a feeder)
 - 14) Any other signal as listed in the Automation writeup.
- The FM Relay shall be so selected that all protective functions configured on the relays shall be displayed on the SAS through IEC-61850 communication protocol.

- All the necessary control & Interlock logic for that particular feeder shall be built within the relay through graphic means with CFC.
- Shall have inbuilt O/P contacts rated for direct connection to trip & close coil.
- Shall have self diagnostic features with watchdog output.
- Shall have I,V, P,Q, Cos ϕ and energy measurement capabilities
- Shall have graphical display unit.
- 20% spare I/O shall be available after complete engineering for future use.

1.17 Salient Specification points for Numerical relays:

- Relay shall have Large Graphical display with dynamic mimic
- Relay shall have minimum 8 freely configurable LEDs apart from fixed LEDS for relay ready/IRF, protection start & protection trip.
- Relay shall have Front port for local one to one communication and Rear RJ45 Port for remote communication on native IEC61850 protocol.
- Relay shall have 1000 + event records and 25 fault records with date and time.
- Relay shall have WEB HMI feature to facilitate relay parameterization and fault record even in the absence of dedicate relay software
- Relay shall have minimum 12 Digital inputs (apart from those used for trip circuit supervision) and 10 output contacts + Dedicated contact for IRF.
- Relay shall have dedicated Disturbance record facility apart from event & fault recording.

1.18 Indicating Instruments

- All indicating instruments shall conform to IS: 1248-1983 and IS - 2419-1979.
- Shall be capable of withstanding system fault current taking account CT saturation.
- Shall be back connected.
- Shall be located in the upper part of the panel.
- Shall have 144 sq. mm square flush case, non-reflecting type, clearly divided and indelibly marked scales, sharply out lined pointers and zero adjusting device.
- The minimum scale reading shall not be more than 10%. Maximum reading shall be 15% full load for transformers panels.
- Each voltmeter shall be calibrated with coil hot. The scale shall be open between 60% to 125% of normal volts and shall be suppressed below 60% of normal volts.
- Class of accuracy shall be 0.5 or better.
- The full load reading of each ammeter shall occur at the most pen part of the scale the minimum scale reading shall not be more than 10%. Maximum reading shall be 15% full load for transformer panels and 600% full load for motor panels.

1.19 Annunciation

- The annunciator shall be microprocessor based, fascia window type.
- Hooter and bell for trip and alarm indication respectively.
- Shall be suitable to work on DC supply as specified.
- Test, accept and reset facilities (with push button) shall be provided on each panel.
- Suitable audio - visual indication shall be provided on DC failure. Audio alarm with reset facility shall be provided. Visual indication shall be panel- wise.
- Spare annunciation points shall be wired upto terminal blocks. 20% spare fascias shall be provided.
- Each point shall have two bunch LEDs in parallel.
- All trip points fascia shall have red color and non trip points white color.
- The cover plate of fascia shall be flush with panel.
- Shall be capable to receive simultaneous signals.
- Shall be capable to receive signal during testing mode.
- Bidder shall ensure the non-presence of spurious signals due to influence of external electromagnetic / electrostatic interference on the annunciation wiring and switching disturbances from neighboring circuits within panels.

- All interconnections, bell hooter, buzzer, alarm facility, push button etc. required to achieve complete function of above scheme.

- Sequence shall be as follows:

	<u>VISUAL</u>	<u>AUDIO</u>
ON OCCURRING OF FAULT	LAMP FLASHING	ON
ON ACCEPTING	LAMP STEADY ON	OFF
ON RESET (Fault Cleared)	OFF	OFF
ON TEST	LAMP FLASHING	ON

- Annunciation fascia (minimum 12 windows) shall be mounted on each outgoing switchgear panel. A common alarm & annunciation facilities for control AC and control DC system with necessary flashers, hooters, bells as required shall be provided in the switchboard. However, details shall be finalized during drawing approval stage.

- Bus coupler, Incomer and tie shall have minimum 16-window fascia.
- 20% spare window shall be available in each annunciator for future use.
- Warning and emergency points shall be as per the list approved during detail engineering stage. In general, all tripping points and alarm points shall be annunciated.

1.20 Control Supply

- Control supply buses shall run throughout the switchgear.
- Two DC feeders shall be taken in each board controlled by MCB's.
- In each panel for controlling of its DC supply MCB (DC duty) shall be used. DC auto changeover and manual changeover facility shall be provided. Failure of each DC supply shall be monitored in the switchboard as well as at remote.
- 240V AC supply shall be taken from a station aux. board.
- Each section shall have separate feed with automatic changeover scheme.
- Each panel shall have one MCB for controlling its AC supply.
- Sub circuits shall be protected with HRC fuses in each panel for indication lamps, closing and tripping circuits.

1.21 Earthing Devices

- Separate earthing truck shall be provided to facilitate earthing of busbars and any feeder circuit.
- Earthing truck shall have PT and alarm provision. (Separate trucks shall be provided for feeder and bus earthing through bus PT panel in each switchboard). 1 no. earthing truck for feeder earthing and 1 no. for busbar earthing shall be provided for each board. It shall not be possible to use bus earthing truck for feeder earthing and vice-versa.
- Rating of earthing device shall be in line with associated board.
- Interlock provision shall be there so that incomer cannot be closed if bus earthing device is connected.

1.22 Indicating Lamps

- LED cluster type with OVGP (over voltage glow protection).
- LEDs used shall be of the colour of the lamp.

Color shall be as follows;

TYPE OF LAMP	:	LED COLOUR
ON	:	RED
OFF	:	GREEN
AUTOTRIP	:	AMBER
TRIP CKT. HEALTHY	:	WHITE
SPRING CHARGED	:	BLUE

1.23 Control and Selector Switches

- Control switches for circuit breaker ON/OFF control-3 position spring return to neutral with lost motion device and pistol grip handle.

- Other control and selector switches - stay put type with wing type knobs.
- Voltmeter selector switches – 7 positions as required.
- Colour : Black
- Contact Rating :

Continuous	10 amps
AC 11	4 amps, 240V
DC 11	0.5A, 30V, L/R - 40 ms

1.24 Push Buttons

- Contact Rating :

Continuous	10 amps
AC 11	4 amps, 240V
DC 11	0.5A, 30V, L/R - 40 ms

- Colour :

ACCEPT	BLUE
RESET	BLACK
TEST	YELLOW

1.25 Protective Earthing

- Continuous earth bus of minimum size as per IEC 62271-200, Cl 5.3.2 made of copper, designed to carry the peak short circuit and short time fault current as specified.
- Provided at the bottom extending throughout the length of the board, bolted/brazed to the frame work of each panel with an earthing terminal at each end for terminal at each end for terminating external earth conductor.
- All non-current carrying metal work (including metallic cases of instruments and other panel mounted components effectively) bonded to the earth bus.
- Hinged doors earthed through flexible earthing braid.
- Looping of earth connection resulting in loss of earth connection to other devices when the loop is broken not permitted.
- Withdrawable units provided with self aligning, spring loaded copper scrapping earth contacts of make before/break after type, ensuring earth continuity from service to the test position.
- For cable earthing or bus bar earthing, earthing truck shall be provided. The earthing truck shall be of specified making capacity with annunciation, indication & interlock scheme. Alternatively front operated mechanically interlocked earthing switch with specified making capacity shall be provided. Earthing truck shall be provided with single phase PT.

1.26 Test and Maintenance Equipment

Each board shall be supplied with following items;

- 2 set of test plugs.
- 2 common transport trolley for interchanging withdrawable units, height of the trolley lifting arm adjustable for raising / lowering the units. (In case of cassette mounted breakers)
- Any other special purpose tools for maintenance.
- 2 Movable step ladder.
-

1.27 Constructional Features

001 Mechanical Design

- Sheet steel clad, compartmentalized, floor mounted, free standing design. The panel shall uniform depth.

- Minimum CRCA sheet steel thickness shall be 2mm Gland plate shall be min 3mm thick.
- Doors shall be provided with lock and key arrangement Degree of protection shall be IP4X or better.
- Assembled on base channel of structural steel of minimum 40 mm height painted black.
- Operating height shall be between 450 to 1800 mm. Switchboard height not to exceed 2500 mm.
- Earthed metallic barriers between compartments and between vertical sections.
- Zinc bichromated and passivated hardwares.
- All supporting insulators in the bus chamber and bus duct shall be easily accessible with detachable covers for easy replacements.
- HT panel gland-plate shall be split type.
- The shutter plate of HT cubicle shall be of insulated material/earthed metallic.
- Removable lifting arrangement for each transport unit. The lifting arrangement can be through sling from the bottom of the panel.
- Lockable front doors with concealed hinges with the door not forming part of the draw-out truck.
- Panel door shall have provision of additional knock-out suitable for addition of relay at a later date.
- Panels shall be extendable on both sides.
- Removable sheet steel covers shall be provided at rear. Alternatively, rear covers shall be of bolted construction and made up of Alu-Zinc sheet.
- Separate back covers with handles shall be provided for bus chamber & cable chamber.
- Independent explosion vent for each HT compartment.
- Explosion vent of resettable type may or may not be provided for each compartment e.g. the CB chamber, cable chamber & bus chamber.
- Control cables entry shall be from front side.
- CTs shall be located in such a way that they are easily accessible.
- Panel door switch shall be provided for illumination inside the panel.
- All live parts shall be insulated by Raychem HT sleeves, supported by suitably designed insulators. Proper insulation of bus bars, upper and lower contacts of breakers and sealing of opening of bushings shall be provided to eliminate accidental contacts.
- Fire proof sealing shall be provided below the HT panels.
- Screw wire mesh in the power cable chamber of all the feeder is to be provided. Wire mesh will be provided in the CT compartment.
- Separate slotted channel shall be provided in the cable chamber for clamping the cable.
- The manufacturer must have inhouse CNC fabrication facility. However, CNC bending and electrostatic powder coating with paint thickness minimum 50 microns can be done at vender's premises under close supervision of the manufacturer only. Fabrication of cubicle and assembly outsourcing is not acceptable.
- Transparent window need not be provided both front and back to inspect earthing switch contact since earthing truck is to be used for earthing of panels.
- Panels will be made of CRCA sheet steel/Alluzinc material, which is corrosion proof. The sheet steel is coated with unique silvery spangle composed of Al (55%) Zinc (43%) and silicon (1.6%) for perfect harmony with steel. Alluzinc sheet thickness shall be 2.0 mm. However front doors and end covers are made of CRCA sheet thickness 2 mm with special reinforcement.

- Switchgear panels will be made up of CRCA sheet steel/Aluzinc materials which do not require painting. However, front doors shall be of CRCA sheet. Hence we shall provide painting on front doors only. Surface treatment & painting shall be done at our vendors premises.

002 Labels

- Switchboard designation nameplate at the center of the board with letters not less than 25 mm high.
- Panel designation number on each panel, both in front and rear
- Inscription plate for each feeder on the door
- Door front mounted devices to have labels directly below them
- Labels made on non-rusting metal or 3 ply lamicoid with engraved inscription of white letters (minimum 3 mm high) on black background.
- Label designation and size of lettering subject to approval.
- Bus side and cable side shutters labeled for identification.

003 Surface Treatment

All metal parts of the panel to undergo surface treatment that includes de-rusting, cleaning, chemically degreasing, pickling in acid, cold rinsing, phosphating and passivating followed by spraying with two coats of zinc oxide primer and baking in oven.

Panel interior base plate	Off white shade
Exterior & interior	Epoxy based RAL-7032

1.28 Technical particulars and design parameters

Sl. No.	PARTICULARS	3.3KV Switchboard
1.	Type	VCB with stored spring mechanism
2.	Service	Indoor
3.	Enclosure	IP4X or better
4.	Nominal System Voltage (KV)	3.3
5.	Highest System Voltage	3.6
6.	No. of phases and frequency	3ph. 50 Hz
7.	Busbar material	Electrolytic grade copper as per IS:613:1984
8.	Bus Colour code	RYB
9.	System Earthing	Non-Effectively Earthed
10.	Circuit Breaker Rating	
	A) Continuous Current Rating at 45-50°C	1250A
	B) Short Circuit Rating	25KA for 3 Sec.
11.	Busbar Rating	1250A
12.	Power Frequency Withstand voltage	10KV for 1 minute
13	Impulse withstand voltage (1.2/50 microsecond)	40 KV
14	Control Voltage	30 VDC
15	Spring charge motor voltage	240 V AC
16	CT Ratio	Secondary Current 5A
17.	BPT ratio - STAR / STAR/ STAR	Primary :(3.3/√3) KV
18.	LPT ratio - STAR / STAR/ STAR Open Delta	Primary :(3.3/√3) KV Secondary : (0.11/√3) KV

19	Aux. Contacts	6 NO + 6 NC Any additional contacts, If required shall be obtained through contact multiplication by contactors / relays.
20.	Termination	
21	Incomers	XLPE FRLS Al Cables
22	Outgoings	XLPE FRLS Al Cables
23	Joints And Isolating contacts	Silver Plated
24	End Temperature of all current carrying parts including breaker	Shall be governed by IEC 694. Temperatures rise will be calculated with ambient temperature of 50°C and considering an in-panel rating.

1.29 Type Test certificates:

a) Following Type test certificates relevant to HT switchgear as per IEC: 62271-100 will be furnished during DE:-

1. Test Duties 9T10 to T100a, t100s).
2. Single Earth Fault (SEF).
3. Double earth Fault (DEF).
4. Capacitor Duty.
5. Cable Charging Duty.
6. Impulse Test.
7. Temperature Rise Test

Short Time Rating for 3 sec equivalent to full Fault Current.

1.30 Interlocking Scheme(between incomer and buscoupler)

A) Momentary Paralleling

Manual changeover from one incomer to another with momentary paralleling of the two supplies after checking through synchro check relay (located at Bus Coupler panel).

Manual live changeover facility shall be provided for the switchgear. When planned outage of one of the normal incoming supplies is required, the respective incomers shall be tripped automatically after the bus coupler breaker is closed manually. For this purpose, a selection shall be provided through a selector switch. Depending on the selection made, incomer to bus coupler– I or to bus section–II shall be tripped once bus coupler breaker is closed manually, thus maintaining continuity of supply.

A timer (with a time delay on pick up of 0.5. - 5 sec.) shall be provided for annunciation if the running breaker fail to trip within a preset time, (i.e. if the two sources remain paralleled for more than a preset time). When the normal supply is to be brought back into operation, the incomer breaker shall be closed manually whereupon the bus coupler shall trip automatically.

B) Manual dead bus closing of either bus-coupler or Incomer1 or 2 shall be possible after an intentional manual trip/outage (due to under voltage) of any one incomer. However, restoration to normal shall be manual only.

Latest breaker tripping provision shall be included in the change over scheme in addition to annunciation.

1.31 COMMISSIONING ASSISTANCE

Bidder shall provide testing & commissioning assistance at HCL Chapri, Sidheswar for four (4) working days of one (1) person during testing & commissioning. Bidder shall also arrange his own transport, local transport, accommodation etc during assistance at HCL Chapri.

04.13.2.16 AC DISTRIBUTION BOARD (ACDB and DCDB)

- Board shall be single front, metal clad, front matched, dust and vermin proof, fully compartmentalised and extensible on both sides, IP51 type enclosure.
- Board shall have base channel of size ISMC75.

- Board shall have isolated busbar chamber for main busbar at the top, running through out the length of the board. Chamber shall have removable cover.
- Cable alley shall have sufficient space for aluminum power cables and bottom cable chamber shall be left free completely isolated from the vertical busbars.
- Busbars shall have same cross section through out the length. Rating of the neutral bus bar shall be 50% of the main bus bar. Earth bus bar shall run in bottom chamber through out the length of the panel.
- Board shall have Moulded Case Circuit Breaker (MCCB) triple pole, air break type with independent manual quick make and break type. MCCB shall be capable of breaking rated current at 0.3 pf at the rated voltage. MCCB shall withstand the fault current envisaged for 415V system.
- Earth leakage protection with CBCT and separate EOR relay in all outgoing feeders.
- ACDB shall be painted as per shade 221 of IS-5 or RAL equivalent
- All feeders shall have ON/OFF lamps and 96 sq mm size ammeter.
- Incomer & Bus-coupler shall have manual operated MCCBs with Microprocessor based o/c, short circuit, earth fault & shunt trip releases and outgoing shall be MCCB/MCBs.
- Mechanical interlock shall be provided in ACDB.
- Constructional features of ACDB shall be in line with DCDB.

Construction Features

- The battery chargers and the DC distribution board (including alarm annunciation) may be integrated into one switchboard or separate boards may be provided.
- Switchboard shall be floor mounting type sheet steel enclosed with degree of protection IP 52 or better.
- Sheet steel used shall be CRCA of minimum 2 mm thickness except for doors and covers for which 1.6 mm thick shall be used.
- Cable entry shall be from bottom, removable gland plates shall be provided.
- All components shall be mounted above 450 mm and below 1850 mm from the floor level.

Wiring and Terminations

- All power wiring shall be done through single core PVC insulated copper wires/buses.
- All control wiring shall be done through single core, PVC insulated copper wire of 2.5 sq. mm
- All connections external to the panel/switch board shall be terminated in suitable terminal blocks. Inter panel wiring shall be only between terminal blocks.
- Each wire shall be identified by ferrules corresponding to the schematic diagram.

Testing Of Equipment

- Tests of all equipment shall be conducted as per latest ISS/IPSS. Tests shall also confirm to International Standards IEC/VDE/DIN/BS (in case corresponding test are not mentioned in ISS/IPSS).
- Manufacture test certificate for major bought out components shall be submitted during inspection.

04.13.2.17 BATTERY, BATTERY CHARGER AND DC DISTRIBUTION BOARD

1.0 Scope and Mode of Operation

The system shall include:

One Battery system comprising with

- DC battery set.
- Identical (Dual) automatic float-cum-boost chargers and one no. double bus DC distribution switchgear.

Normally one of the chargers shall supply the DC load and also keep the battery under float charge. On failure of supply from charger, the battery shall take over without any interruption. The other charger shall be 'off'.

When the battery requires boost charging, one charger will operate on boost charge mode, while the second charger will supply the DC load on float mode. The battery's +ve shall be connected to the boost charger

while an intermediate tap shall be connected to the float charger (through a blocking diode) to take over the load in the event of supply failure from charger.

The DC distribution board shall feed the power from the charger/battery to the various consumers as required.

1.1 BATTERY , BATTERY CHARGER & DCDB

1.1.1 TECHNICAL SPECIFICATION

1.1.1.1 Scope and Mode of Operation

i)The scope includes :

- Battery set (Sealed Plante cell valve regulated lead acid).
- Identical dual automatic float-cum-boost charger for the above battery set.
- DCDB

ii)Normally the chargers connected to the battery shall supply the DC load and also keep the battery under float charge. On failure of supply from charger, the battery shall be taken over without any interruption.

iii)When the battery requires boost charging, the charger will operate on boost charge mode while the second charger will supply the DC load on float mode through changeover arrangement.

iv)Battery sizing shall be based on the 6 hours backup time.

1.1.1.2 Battery and Accessories

i)Nominal voltage shall be as indicated in technical specification for design. The no. of cells shall be chosen accordingly. Battery cell shall be maintenance free. The type of battery shall be as per technical specification.

ii)Each cell shall be rated as :

Parameters / Type	Plante
Nominal Voltage (V)	2
Float charging voltage (V)	2-2.3
Boost charging voltage (V)	2-2.75
Voltage at the end of 10 hours discharge (V)	1.85

iii)200 Ampere hour capacity shall be provided for Design of 10 hours discharge rate with final voltage per cell of 1.85 V for Plante type.

iv)Bidder shall select number of cells based on following:

System Voltage	30V
Maximum voltage during float operation	33V

v)For Lead Acid Battery (Plante type) :

For faster discharge rate, the permissible continuous load with final discharge voltage 1.85 V per cell shall be:

Discharge Time	Ampere Hour capacity in percentage of rated 10 hour capacity
10 hours	100%
5 hours	67%
3 hours	60%
1 hour	33%

vi)Standards to be followed: Plante Battery confirming to IS:1652

vii)Accessories to be supplied along with each battery set are :

- Cell testing voltmeter 3-0-3 volts with least count of 0.01V, complete with leads.
- Copper cell connectors
- Spanner for cells, Torque wrench, Acid resistant, gloves and Protective apron.
- Bridging clamps for cutting out individual cells in the event of defect.
- First aid box.
- Cell Booster for each set
- For Plante type only:

- Teak wood stand finished with 3 coats of black anti sulphuric acid paint complete with cell number plates and fixing nails. Suitable for double row single tier arrangement/as per layout.
- Acid for first fill and 10% spare capacity
- Mercury in glass clinical thermometer for 0-1000C temperature measurement range
- Syringe type hydrometer
- Float type level indicator
- 2 liter jug and acid resistant funnel

viii) Container :

Shall be high quality transparent plastic boxes with top lids, vent plugs and suitable electrolyte level indicator.

ix) Cell cover / lids:

Shall be sealed type of glass, plastic or ebonite material and provided with vent plugs.

x) Separator:

Separators shall be of synthetic material as per IS 6071

xi) Connectors, nuts & bolts:

Connectors shall be lead to withstand corrosion due to H₂SO₄ at very high rate of charge/discharge. Intercell connectors should be protected with heat shrinkable silicon sleeves.

Nuts / bolts for connecting cells shall be of Copper, Brass or Stainless steel. Copper & Brass nuts/bolts should be lead coated.

xii) Battery stand:

All batteries shall be mounted in galvanised steel structural rack for Lead acid Plante type. It shall be painted with acid resistant paint. Suitable insulation shall be provided between stand & ground to avoid grounding of stand.

xiii) Venting device

This shall be antisplash type with more than one exit holes and shall allow gases to escape freely but shall effectively prevent acid particles/spray from coming out. For 120AH and above, two vent holes shall be provided

xiv) Electrolyte

Sulphuric Acid and water used for preparation and maintenance of electrolyte shall confirm to IS 266 and IS 1069 respectively.

xv) Electrolyte level indicator

Suitable indicator showing lower and upper limits shall be fitted to facilitate checking of electrolyte level in opaque containers. Material shall be acid proof and shall not deteriorate during service.

1.2 Battery Chargers

1.2.1 General Requirement

i) Identical dual automatic float cum boost chargers for battery comprising of :

- MCCB, line contactor and overload relay on the ac side for each charger.
- 3 phase full wave full controlled thyristorised rectifier bridge complete with free wheeling diode and blocking diode. The thyristors and diodes shall have high speed fuses for protection against short circuits. Necessary snubbers for hole storage effect shall also be provided.
- Rectifier transformer shall be dry type double wound with copper conductor and class 'B' insulation
- Filter circuit at the output
- MCCB on DC side
- Control and protection circuits as per requirement

ii) In float mode, the charger operates with a constant voltage controller and the output voltage of the charger shall be maintained within + 1% of the set voltage for + full range variation in input AC voltage (as per General specification)

or

0 – 100% load variation

or

both occurring simultaneously

The output voltage required can be set externally through potentiometers in the range 90-120% steplessly.

- iii) In boost mode, the charger shall be suitable to operate in a constant current as well as constant voltage mode with manual selector arrangement, controller suitable for two-rate charging. The charging current shall be externally adjustable from 20 to 100% steplessly.
- iv) Provision of charging with manual control of output voltage shall also be provided.
- v) Electronic current limiter, adjustable between 85-105% of rated current shall be provided.
- vi) During boost charging, the charger shall be cut-off as soon as over voltage occurs.
- vii) Ripple content in the charger's output voltage shall not exceed 0.5% in float mode and 3% in boost mode.
- viii) The charger efficiency shall be minimum 80% under all operating conditions.
- ix) The supply to the charger will be at Three phase LT voltage and frequency with their variations, as mentioned in General specification
- x) The charger shall have voltage rating corresponding to the battery. However, the charger rating shall be chosen to charge the battery from 1.85 volts per cell (For Lead Acid & Plante Only) to fully charged condition in 10 hours.
- xi) The changeover of battery from float to boost condition and vice versa shall be automatic. However, provision for manual changeover shall also be provided.
- xii) PCBs used shall be made up of glass epoxy material. PCBs shall include LED indication and test connection in front to facilitate fault diagnostic.

1.2.2 Relays

- i) The following relays shall be provided :
 - AC input supply to charger failure
 - Earth fault
 - Float bus over and under voltage
 - Boost bus over voltage
 - Boost over current for each charger circuit
- ii) All relays shall be in draw-out cases and with mechanical hand reset operation indicator.

1.2.3 Indicating lamps

- i) The following LED indications shall be provided.
 - AC supply ON (for 3 phases separately) for each charger
 - DC supply ON for charger
 - Boost/float mode ON for charger

1.2.4 Metering

- i) The following measurement shall be provided
 - AC input voltage and current of each charger (through voltmeter & ammeter with selector switches)
- ii) DC output voltage and current of each charger
 - Battery charging/drain current of each charger with necessary shunt
 - Battery trickle charging current (through amplifier)
 - DC bus voltage (through selector switch) to measure between Positive to Earth, Negative to Earth & positive to negative.

1.2.5 Alarm Annunciation

- i) 16 window static type annunciation shall be provided on charger panel for the following :
 - AC supply failure to charger
 - Battery earth fault (+ve & -ve 12 separately)
 - Float bus over/under voltage
 - Boost bus over voltage
 - Boost over current for each charger
 - Failure of thyristor/diodes for each charger
 - Failure of blocking diode
 - Input MCCB open for each charger
 - Battery MCCB open
 - Battery room exhaust fan OFF
 - D.C. Voltage Low

- D.C. Voltage High
- A.C. Input Under Voltage

- ii)The annunciation system shall incorporate solid state facia window type annunciators. The sequence shall be :
- iii)On incident of fault, a hooter will become ON and the corresponding window's lamp will start flashing
- iv)On pressing "Accept" button, hooter shall stop and lamp shall become steady
- v)On pressing "Reset" button, the lamp will stay ON if the fault still persists or will go OFF if the fault has been cleared.
- vi)One repeat alarm point for all above annunciations shall be provided to facilitate annunciation of "Fault in Charger" in control room.
- vii)The power supply for the above annunciations shall be taken from the DC float bus.
- viii)A separate annunciation scheme with an AC hooter shall be provided for DC supply failure. This annunciation shall be fed from the AC supply. Reset shall be by a stay put push button.

1.2.6 Constructional Features of Charger

- i)Charger shall be free standing, floor mounting type, sheet steel enclosed with degree of protection IP 42 or better.
- ii)Sheet steel used shall be of minimum 2 mm thickness except for doors and covers for which 1.6 mm thick cold rolled sheets shall be used.
- iii)Cable entry shall be from bottom, removable gland plates shall be provided.
- iv)All components shall be mounted above 400 mm or below 1800 mm from the floor level.
- v)Panels shall be painted in epoxy light grey colour as per shade 631 of IS: 5.

1.2.7 Wiring and Terminations

- i)All power wiring shall be done through single core 1100V PVC insulated stranded copper wires / copper buses.
- ii)All control wiring shall be done through single core, PVC insulated stranded copper wire of 2.5 sq. Mm
- iii)All connections external to the panel/switch board shall be terminated in suitable terminal blocks. Inter panel wiring shall be only between terminal blocks.
- iv)Each wire shall be identified by ferrules corresponding to the schematic diagram.

1.3 Technical Particulars And Design Parameters

1.3.1 Battery Set

Sl. No.	Particulars	Design Parameters
1.	Voltage	110 V
2.	Rating	Bidder to specify as per the substation load and with MINIMUM 6 HR BACK-UP TIME
3.	Type	PLANTE
4.	Nominal cell voltage	2.00 V
5.	End cell voltage	1.85 V for Lead Acid & Plante type
6.	Discharge rate	C ₁₀
7.	Ampere Hour Capacity	150AH

1.3.2 Dual float-cum-boost charger

Sl. No.	Particulars	Design Parameters
1.	Input voltage and frequency	Three phase LT AC supply as per General specification
2.	Voltage variation	As per General specification
3.	Frequency variation	As per General specification
4.	Charging voltage	As per Technical specification
5.	Incomer to charger	MCCB
6.	Incomer to Battery	MCCB
7.	Protection to thyristors	Through high speed fuse
8.	Ripple content	
	Float mode	0.5%
	Boost mode	3.0%

Sl. No.	Particulars	Design Parameters
9.	Charger efficiency	80% (Min)
10.	Mode of operation	As per Technical specification
11.	Charger rating	As per Technical specification

1.4 Testing Of Equipment

1.4.1 Testing

- Tests of all equipment shall be conducted as per latest ISS/IPSS. Tests shall also confirm to International Standards IEC/VDE/DIN/BS (in case corresponding test are not mentioned in ISS/IPSS).
- Manufacture test certificate for major bought out components shall be submitted during inspection.

1.5 DC Distribution Board

- The DC distribution board shall have double busbar arrangement, viz. one set of the +ve and -ve connected to charger-1 and another set of +ve and -ve bus connected to charger-2. It shall be possible to connect the bus bars with either charger through selector switches.
- DCDB shall be considered as independent floor mounted panel, not integrated with Battery Charger Panel.
- Indicating instruments shall be as per IS 1248, accuracy class 1.5, 96 x 96 mm size.
- AC meters shall be taut band type, DC meters moving coil type.
- DC meters shall be zero centre type where applicable.

1.6 Feeder Arrangement

- Each outgoing circuit shall be connected to both the sets of bus bars through selector switch. It shall be possible to connect each outgoing circuit to either set of bus bars. Each outgoing circuit shall have MCCB. Incomer shall have AC/DC voltmeter and all outgoing shall have indicating lamps. The quantities and rating of outgoing feeders are indicative only and shall be finalized during detailed engineering.

1.7 Construction Features

- The battery chargers and the DC distribution board (including alarm annunciation) may be integrated into one switchboard or separate boards may be provided.
- Switchboard shall be floor mounting type sheet steel enclosed with degree of protection IP 52 or better.
- Sheet steel used shall be CRCA of minimum 2 mm thickness except for doors and covers for which 1.6 mm thick shall be used.
- Cable entry shall be from bottom, removable gland plates shall be provided.
- All components shall be mounted above 450 mm and below 1850 mm from the floor level.

1.8 Wiring and Terminations

- All power wiring shall be done through single core PVC insulated copper wires/buses.
- All control wiring shall be done through single core, PVC insulated copper wire of 2.5 sq. mm
- All connections external to the panel/switch board shall be terminated in suitable terminal blocks. Inter panel wiring shall be only between terminal blocks.
- Each wire shall be identified by ferrules corresponding to the schematic diagram.

1.9 COMMISSIONING ASSISTANCE

Bidder shall provide testing & commissioning assistance at HCL Chapri, Sidheswar for four (4) working days of one (1) person during testing & commissioning. Bidder shall also arrange his own transport, local transport, accommodation etc during assistance at HCL Chapri.

04.13.2.18 HT POWER, LT POWER & CONTROL CABLES (FRLS TYPE).

i) 33kV(E) & 6.6kV (UE) HT XLPE POWER CABLE

Sl. No.	Parameter	Description
1.0	Voltage Grade	33 kV(E) & 6.6kV (UE)
2.0	Duty type	Heavy duty
3.0	No. of cores	3 Cores

4.0	Reference standard	IS:8130 – 1984 IS:5831 – 1984 IS:3975 - 1999 IS:1554 (Part-2) - 1988 IS: 3961 (Part-2) - 1967 IS:7098 (Part-2) - 1985I IEC-60502
5.0	Conductor type	Compact circular stranded (rm/V) copper conductor, with extruded conductor shielding of semi conducting material. Conductor construction as per IS 8130-1984.
6.0	Insulation type	XLPE insulated, with insulation shielding over individual cores, consisting of extruded semi conducting compound, followed by lapped semi conducting material and copper tape (non-magnetic) metallic screen, cores stranded together with a holding tape provided with a common covering of extruded inner sheath of type ST2 compound . Manufacturing process shall be continuous vulcanized triple extrusion process simultaneously applying a thermosetting semiconductor screen, a thermosetting XLPE insulation & thermosetting semiconducting core screen in one operation with dry cured and dry cooling process.
7.0	Armour	Galvanised round steel wire double armouring.
8.0	Outer sheath	FRLS Type ST-2 compound as per IS 7098 Part-II, 1985, as amended upto date. Black in colour for 3core. Red , yellow & Blue for single core Suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.
9.0	Miscellaneous	Copper screen shall be suitable to carry 1kA E/F current for one second.
10.0	Temp. rise on continuous load	90 deg.C
11.0	Oxygen index of outer sheath material for XLPE Cable	Shall not be less than 29 at 27 ± 2 deg. C.
12.0	Temperature index	Not below 250°C.
13.0	Maximum conductor withstand temperature during short circuit.	250°C
13.0	Smoke Density Rating	Minimum average light transmission of 40 %
14.0	ACID Gas Generation	Max. 20% by weight
15.0	Flammability Test	As per IEC-332/IEEE-383
16.0	Fire Resistance Test	As per IS 5831

ii)

1.1kV PVC LT POWER CABLE

Sl. No.	Parameter	Description
1.0	Voltage Grade	1.1 kV grade
2.0	Duty type	Heavy duty
3.0	No. of cores	For power supply to other panel 4 core (upto conductor size of 50 sq.mm) or 3.5 core (for conductor size beyond 50

		sq.mm) cables shall be used.
4.0	Reference standard	IS:8130 – 1984 IS:5831 – 1984 IS:3975 – 1999 IS:1554 (Part-1) - 1988 IS: 3961 (Part-2) - 1967 IS:7098 (Part-1) - 1988 IEC-60502
5.0	Conductor type	- Copper conductor. - All power cables of size 10 sq.mm and above shall have standard sector shaped (sm) or compact circular stranded (rm/V) or circular stranded (rm) aluminium conductors as applicable. - The conductors shall be H2 or H4 grade. - The solid conductor shall be class - 1 and the stranded conductor shall be class - 2. - The conductors shall be solid for conductor of nominal area upto and including 6 sq. mm. and stranded beyond 6 sq. mm. Conductors of nominal area less than 25 sq. mm. shall be circular or shaped. Cables with reduced neutral conductor shall have sizes as per Table 1 of IS 1554 (Part-1) -1988.
6.0	Insulation type	- PVC insulation. - The insulation compound shall be conforming to IS: 7098 (Part-1) - 1988.
7.0	Inner sheath	- For armoured / unarmoured cables a tough inner sheath of heat resisting PVC compound (wrapped / extruded as per size), Type ST2 as per IS 5831. - Black in colour.
8.0	Armour	Galvanised round steel wire double armouring.
9.0	Outer sheath	- For armoured/unarmoured cables a tough outer sheath of heat resisting PVC compound (Type ST2 as per IS 5831). - Black in colour.
10.0	Temp. rise	Shall be limited to 90 deg. C.
11.0	Core identification	- Cable identification shall be provided by embossing on the outer sheath the following: • Manufacturer's name & trade mark • Voltage grade • Year of manufacture • Type of insulation - R, Y, B for phases. - Black for neutral (fourth core)

iii)

1.1kV PVC CONTROL CABLE

Sl. No.	Parameter	Description
1.0	Voltage Grade	1.1 kV grade
2.0	Duty type	Heavy duty
3.0	No. of cores	As per BOQ.
4.0	Reference standard	IS:8130 – 1984 IS:5831 – 1984 IS:3975 - 1999

		IS:1554 (Part-1) - 1988 IS: 3961(Part-2) - 1967 IEC-60502
5.0	Cross sectional area	2.5 sq.mm
6.0	Conductor type	Annealed circular stranded copper conductor.
7.0	Insulation type	PVC Type- C insulated
8.0	Inner and outer sheath	- Type ST-2 PVC shall be used for inner sheath. - Type ST-2 PVC shall be used for outer sheath. - Both inner and outer sheath shall be extruded type upto 7 core and after 7 core inner sheath shall be wrapped.
9.0	Armour	Galvanised round steel wire double armouring.
10.0	Core identification	- Cable identification shall be provided by embossing on the outer sheath the following: • Manufacturer's name & trade mark • Voltage grade • Year of manufacture • Type of insulation - Cores of the cables upto 5 cores shall be identified by colouring of insulation. - For cables having more than 5 cores, core identification shall be done by numbering insulation of core sequentially. - All the numbers shall be of same colour, which shall contrast with the colour of insulation. - Numbers shall be written in figures and words both - The numerals shall be legible and indelible. - The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. - When number is a single numeral a dash shall be blacked underneath. - If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. - The spacing between consecutive numbers shall not exceed 100 mm.

04.13.2.19 415 V POWER CONTROL CENTRES

LT Switchboard	
Nominal system voltage	415 V
System earthing	Neutral solidly earthed
Short time rating	50 KA for 1 Sec.
Making capacity	105 kA
Control supply	110V AC
Configuration	As per IS
Colour code	R Y B
Busbar rating	As indicated in Schedule of quantities
Enclosure	IP-4X or better
Circuit Breakers	
Symmetrical breaking current	50 kA

Making capacity	105 kA
Short time rating (for 1 second)	50 kA
Rating for Incomers and Buscouplers	1250 A / 2000 A
Rating for outgoings (ACBs)	As indicated in Schedule of quantities
Closing mechanism	
Incomers & bus couplers	Motor operated spring charged stored energy type
Outgoing feeders	Manual operated
Tripping mechanism	Shunt trip
Control supply	240 AC
No. of auxiliary contacts	6 NO + 6 NC for future use
Termination	
Incomer	Armoured cable
Outgoing	Armoured cable
Feeder Arrangement	
Incomer (Mounted in single tier arrangement)	Air circuit breakers
Outgoings (Mounted in two/three tier arrangement for ACB / MCCB respectively)	Air circuit breakers / MCCBs

Schedule of Components

Sl. No.	Schedule of components equipment specification	Type of Feeder		
		B/C	Incomer	Out going ACB Feeder
1.a	415V, 50 kA air circuit breaker with: - independent manual spring charged closing mechanism. - shunt trip - Mechanical ON/OFF indicator	1	1	1
2.	Microprocessor based direct acting O/C, S/C & EF release with timer	-	-	1
3.	Control switch ON/OFF with spring return to neutral	1	1	1
4.	Voltmeter with selector switch	1	1	-
5.	Ammeter	1	1	1
6.	Selector Switch for Ammeter	1	1	1
7.	kWh meter	-	1	1
8.	PF meter	-	1	-
9.	Twin core current transformer class 1.0 for metering and 10P15 for protection cores	3	3	3
10.	Core balance current transformer	1	1	1
11.	Triple pole inverse time over current relay with 2 O/C element with 50-200% setting range, and 1 E/F element 20-80% setting range type SPAJ140C or equivalent.	1	1	-

Sl. No.	Schedule of components equipment specification	Type of Feeder		
		B/C	Incomer	Out going ACB Feeder
12.	Inverse time over current relay type SPAJ140C or equivalent, setting 20-80% for back up earth fault protection.	-	1	-
13.	ON/OFF/Trip on fault/Trip circuit healthy lamps	3	4	4
14.	Auxiliary relays flag indication for winding temp. alarm and trip signals	-	6	-
15.	Auto changeover scheme with under voltage relay, PT etc.	As per Requirement		
16.	Set of CTs as per requirement	1	1	1
17.	Set of relays, contactors, timers, etc. for annunciation scheme	As per Requirement		
18.	Set of relays, contactors, timers for auto changeover scheme	As per Requirement		
19.	Impulse switch for tripping upstream breaker	-	1	-
20.	Two position, two contacts stay put switch with pistol grip handle for closing permission of upstream kV breaker	-	1	-
21.	ON/OFF lamp indication of upstream breaker	-	2	-
22.	Inter tripping push button to trip the upstream breaker	-	1	-

04.13.2.20 LIGHTING TRANSFORMER

Sl.No.	Parameter	Description
1.0	Type	Dry Type
2.0	Power Rating	20 KVA or as described in schedule of quantities
3.0	Primary Voltage	415 V
4.0	Secondary Voltage	120 V with mid point earthed
5.0	Connection	Star – Delta
6.0	Tapping	+/- 10% in steps of 2.5%

04.13.2.21 FLOOR MOUNTED MAIN LIGHTING DISTRIBUTION BOARD

A. General		
1.0	Type	- Metal clad . - Non drawout type.
2.0	Construction	- Modular construction . - Fully compartmentalized with metal / insulating

		material partition.
3.0	Enclosure class	IP52
4.0	Type of execution	Single front.
5.0	Mounting	- Floor mounting. - Free standing with ISMC 75.
6.0	Installation	Indoor.
B. Constructional Features :-		
1.0	Sheet steel	
	Thickness	- 2 mm for load bearing members. - 1.6 mm for non load bearing members.
	Material	CRCA
2.0	Cable entry	- Incomer :- Bottom cable entry. - Outgoing :- Bottom cable entry.
3.0	Design	- Separate bus alley and cable alley on opposite side of the outgoing modules . - All the components shall be accessible from front . - Each module to have covering at the bottom.
4.0	Interlocking & protection	- Module door interlocked with main power isolating devices. - Power circuit isolation device to have pad locking in the OFF position with door closed.
5.0	Operating height	- Minimum :- 300mm - Maximum :- 1800 mm.
6.0	Gland plate	Undrilled removable bottom gland plates (3 mm thick)
7.0	Miscellaneous	- Neoprene rubber gasket shall be provided for all the doors , removable covers & between adjacent covers . - Lifting hooks for the panel . - Doors shall have concealed hinges .
9.0	Earthing	- Two separate earthing terminals will be provided. - Bolted joints with tooth spring washers for good earth continuity. - Earth bus to run in all cable alley of the panel .
C. Busbars		
(i) Main horizontal & vertical busbars		
1.0	Arrangement	Three phase & neutral.
2.0	Material	High conductivity electrolytic aluminium alloy confirming to grade E91E as per IS-5082 –1981.
3.0	Phase Busbar Rating	- Shall be able to carry continuously the connected load (considering all derating factors) plus a 25% margin . - Max. current density shall be - 1.0 A/sq.mm for Aluminium - 1.5 A/sq.mm for Copper .
4.0	Neutral Busbar Rating	50 % of phase busbar rating
5.0	Short circuit rating	50 KA for 1 sec.

6.0	Busbar configuration	Red-yellow-blue from front to back or top to bottom or left to right as viewed from front.
7.0	Max. temp. rise of bus	Not to exceed 35 deg. C. above ambient of 50 deg.C.
8.0	Air clearance for bare busbar	Phase to phase :- 25.4 mm (minimum) Phase to earth :- 19.0 mm (minimum)
9.0	Vertical busbar	Rear side
(ii) Earth bus		
1.0	Material	GI.
2.0	Size	Minimum 50 x 6 mm with extension at both ends .
(iii) Control bus		
1.0	Material	Copper.
2.0	Size	Minimum 25 x 3 mm .
3.0	Emergency operation	Availability of control supply in case of failure of normal power shall also be provided so that Bus-coupler & Incomer operation for emergency can be done.
D. Insulation level		
1.0	Rated insulation voltage	1100 V
2.0	Impulse withstand voltage	4 KV as per IS-13947 (Part I) 1993
3.0	One minute power frequency withstand voltage	2.5 KV for power circuit & 500 V for control circuit
F. Feeder arrangement		
Incomers		
1.0	Isolating Equipment	3 pole MCCB (for rating upto 630 A) (with E/F protection).
2.0	Quantity	Two incomers
4.0	Indication Lamps	LED type indicating lamps for :- - MCCB ON/OFF/TRIP. - Power ON R / Y / B .
Outgoing feeder arrangements		
1.0	Circuit breaker	Three pole MCCB .
2.0	Indications	ON/OFF/TRIP indication lamp.
3.0	Protection	All the equipment inside the boards shall be covered in front with a 3 mm thick bakelite sheet. Only the operating knobs of the equipment shall be projected outside the bakelite sheet for safe operation.

04.13.2.22 SUB LIGHTING DISTRIBUTION BOARD (SLDB)

A. General :-		
1.0	Type	- Metal clad - Shall be suitable for 415/110V, 3 phase and neutral.
2.0	Construction	- Totally enclosed.

		<ul style="list-style-type: none"> - Dust & vermin proof. - Welded back and sides .
3.0	Enclosure class	IP54 . IP 55 (with canopy) for outdoor installation .
4.0	Type of execution	Single front.
5.0	Mounting	Wall mounting .
6.0	Installation	Indoor / Outdoor (with canopy).
B. Constructional Features :-		
1.0	Sheet steel CRCA	
	Thickness	2 mm .
2.0	Cable entry	<ul style="list-style-type: none"> - Incomer :- Bottom cable entry. - Outgoing :- Top / Bottom cable entry.
3.0	Design	<ul style="list-style-type: none"> - One Incomer and outgoings . - All the components shall be accessible from front . - Access to the operating handle of the incoming isolating switch shall be from the front of the cubicle without opening the front door. - Operating knobs of outgoing MCBs shall be accessible only after opening the front door of the cubicle. - Protective insulated cover plate (3 mm thick bakelite sheet) shall be provided inside the cubicle to shroud all the live parts .
4.0	Gland plate	Undrilled detachable gland plates (3 mm thick) shall be provided at the top and bottom with suitable gaskets for cable entry.
5.0	Miscellaneous	<ul style="list-style-type: none"> - Neoprene rubber gasket shall be provided for all the doors , removable covers & between adjacent covers . - Suitable locking devices. - Doors shall have concealed hinges .
6.0	Labelling	<p>Clear legible identification labels (anodized aluminium with white letters engraved on black background) with letter sizes of :-</p> <ul style="list-style-type: none"> - 5 mm for components and module name plates. - Danger board on front and rear sides in English , Hindi and local language .
7.0	Earthing	Two separate earthing terminals will be provided.
C. Busbars		
1.0	Arrangement	Three phase & neutral.
2.0	Material	High conductivity electrolytic aluminium alloy confirming to grade E91E as per IS-5082 –1981.
3.0	Phase Busbar Rating	<ul style="list-style-type: none"> - Shall be able to carry continuously the connected load (considering all derating factors) plus a 25% margin . - Max. current density shall be - 1.0 A/sq.mm for Aluminium - 1.5 A/sq.mm for Copper .
4.0	Neutral Busbar Rating	50 % of phase busbar rating
5.0	Short circuit rating	25 kA for 1 sec (or higher as per system requirement).
6.0	Busbar configuration	Red-yellow-blue , black for neutral .

D. Feeder arrangement		
Incomers		
1.0	Isolating Equipment	3 pole ELCB ELCB shall be of AC 23 duty category conforming to IS: 13947-1993 having fully shrouded contacts.
2.0	Quantity	One
3.0	Indication Lamps	LED type indicating lamps for :- - Power ON R / Y / B .
Outgoing feeder arrangements		
1.0	Circuit breaker	DP MCB

04.13.2.23 FLOOR MOUNTED / TRANSPORTABLE STARTER PANEL

A. General :-		
1.0	Type	- Metal clad . - Non drawout type.
2.0	Construction	- Modular construction . - Fully compartmentalized with metal / insulating material partition.
3.0	Enclosure class	IP52.
4.0	Type of execution	Single front.
5.0	Mounting	- Floor mounting. - Free standing with ISMC 75.
6.0	Installation	Indoor.
B. Constructional Features :-		
1.0	Sheet steel	
	Thickness	- 2 mm for load bearing members. - 1.6 mm for non load bearing members.
	Material	CRCA
2.0	Cable entry	- Incomer :- Bottom cable entry. - Outgoing :- Bottom cable entry.
3.0	Design	- Rear access through removable rear hinged cover door. - All the components shall be accessible from front .
4.0	Interlocking & protection	- Module door interlocked with main power isolating devices. - Power circuit isolation device to have pad locking in the OFF position with door closed.
5.0	Operating height	- Minimum :- 300mm - Maximum :- 2000 mm.
6.0	Gland plate	Undrilled removable bottom gland plates (3 mm thick)
7.0	Miscellaneous	- Neoprene rubber gasket shall be provided for all the doors , removable covers & between adjacent covers . - Lifting hooks for the panel . - Doors shall have concealed hinges .
8.0	Labelling	Clear legible identification labels (anodized aluminium with white letters engraved on black background) with letter sizes of :-

		<ul style="list-style-type: none"> - 25-50 mm for panel . - 5 mm for components and module name plates. - Danger board on front and rear sides in English , Hindi and local language .
9.0	Earthing	<ul style="list-style-type: none"> - Two separate earthing terminals will be provided. - Bolted joints with tooth spring washers for good earth continuity.
10.0	Panel space heater	In each panel with thermostat , fuse , switch.
C. Busbars		
1.0	Arrangement	Three phase & neutral.
2.0	Material	High conductivity electrolytic aluminium alloy confirming to grade E91E as per IS-5082 –1981.
3.0	Phase Busbar Rating	<ul style="list-style-type: none"> - Shall be able to carry continuously the connected load (considering all derating factors) plus a 25% margin . - Max. current density shall be - 1.0 A/sq.mm for Aluminium - 1.5 A/sq.mm for Copper .
4.0	Neutral Busbar Rating	50 % of phase busbar rating
5.0	Short circuit rating	50 KA for 1 sec.
6.0	Busbar configuration	Red-yellow-blue from front to back or top to bottom or left to right as viewed from front.
7.0	Busbar insulation	Heat shrinkable PVC <ul style="list-style-type: none"> - R,Y,B coloured sleeves for phases - Black for neutral.
8.0	Busbar supporting insulators	<ul style="list-style-type: none"> - Non-hygroscopic - Flame retarded - Track resistant - High strength - Sheet moulded compound or equivalent polyster fibre glass moulded type .
9.0	Max. temp. rise of bus	Not to exceed 35 deg. C. above ambient of 50 deg.C.
13.0	Busbar access	Rear side
(ii) Earth bus		
1.0	Material	GI/Al.
2.0	Size	Minimum 50 x 6 mm with extension at both ends .
(iii) Control bus		
1.0	Material	Copper.
2.0	Size	Minimum 25 x 3 mm .
D. Insulation level		
1.0	Rated insulation voltage	1100 V
2.0	Impulse withstand voltage	4 KV as per IS-13947 (Part I) 1993
3.0	One minute power frequency withstand voltage	2.5 KV for power circuit & 500 V for control circuit

F . Components		
1.0	Isolating Equipment	3 pole manual MCCB
2.0	Indication Lamps	LED type indicating lamps for :- - ON/OFF/TRIP. - Power ON R / Y / B .
3.0	Meters and selector switches	- 96 sq.mm size voltmeter with 4 position selector switches - 96 sq.mm size ammeter with 4 position selector switches
4.0	Power contactor	- AC3 duty of rated capacity .
5.0	Motor protection relay	- Microprocessor based. - Suitable for 5A & 1A - Protections <ul style="list-style-type: none"> • Short circuit • Overload • Earth fault • Stalling protection • Undervoltage • Overspeed • No.of starts per hour (cold & hot) - Communication facility with PLC. - Memory for <ul style="list-style-type: none"> • Storing fault history & trending
6.0	Auxiliary contactors	- Shall be provided for logic operation and operating sequence . - Shall have minimum 2NO+2NC auxiliary contacts.
G. Panel Wiring		
1.0	Power / current transformer circuit	1.1Kv grade single core , black colour PVC insulated , stranded copper conductor of minimum size 2.5 sq.mm.
1.0	Power / current transformer circuit	1.1Kv grade single core , black colour PVC insulated , stranded copper conductor of minimum size 2.5 sq.mm.
H. Control Supply		
1.0	Control transformer	1 nos. of 415V/240V control transformer of minimum 2.5 KVA in each section. Secondary unearthed.
2.0	Input and output side isolation device	Input side :- MCCB Output side :- MCB

SCHEDULE OF QUANTITIES FOR SUPPLY ITEM

The scope of supply shall necessarily include (but not limited to) the major items listed under this schedule.

Sl. No.	Item Description	Unit	Qty.
	Electrical Facilities		
	MRS-Power Distribution Equipment		
1.	33kV Outdoor Lightning Arrestor	Nos.	3
2.	33kV outdoor Isolator	Set	2
3.	33kV outdoor Current Transformer	Nos.	3
4.	33kV outdoor Voltage Transformer	Nos.	3
5.	33kV outdoor Vacuum Circuit Breaker	Set	2
6.	33kV ACSR DOG conductor	Lot	1
7.	33kV Clamp and Connectors	Lot	1
8.	Structure and angle and channels	Lot	1
9.	33kV control relay panel with Relays, metering devices and indication lamp, Hooter , Buzzer etc	Set	1
10.	33/3.3kV, 8MVA, ONAN, OLTC Power Transformer equipped with nitrogen injection system for fire protection	No	1
11.	3.3kV, 50A, Neutral Grounding Resistor with NGR monitoring relay	No	1
12.	3.3kV VCB Switchboard		
12.1	3.3kV , 1250A, VCB Incomer with Line PT	Nos.	3
12.2	3.3kV , 1250A, VCB Buscoupler (with castle lock arrangement for interlock)	Nos.	2
12.3	3.3kV , 1250A, VCB Outgoing with CBCT and separate EOR relay	Nos.	15
12.4	3.3kV Bus PT	Nos.	2
13.	33/0.415kV, 200kVA, Oil filled ONAN transformer	Nos.	1
14.	13Mtr 34.6kg/Mtr RSJ pole (Double pole arrangement with all accessories, Like, AB Switch, DO fuse, Insulator, Clamp and connectors)	1	Set
15.	AC distribution board with castle lock arrangement for interlock Incomer – 300A MCCB Buscoupler – 300A MCCB (with castle lock arrangement for interlock) Outgoing feeder- 100A, MCCB with CBCT and separate EOR relay Outgoing feeders – 63 A, MCCB with CBCT and separate EOR relay Outgoing feeders – 32 A, MCCB with CBCT and separate EOR relay	Nos.	2 1 6 6 6
16.	Main Lighting distribution board Incomer – 100A MCCB with castle lock arrangement for interlock Buscoupler – 100A MCCB (with castle lock arrangement for interlock) Outgoing feeders – 32 A, MCCB CBCT and separate EOR relay	Nos.	2 1 6
17.	DC distribution board Incomer – 100A MCCB Buscoupler – 100A MCCB Outgoing feeders – 32 A, MCCB	Nos.	2 1 10
18.	30V, 100AH battery with Charger	Set	1
19.	33kV (E) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
20.	3.3kV (UE) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
21.	1.1kV grade, 3.5Cx300 sq. mm Stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
22.	1.1kV grade, 3.5Cx150 sq. mm Stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000

Sl. No.	Item Description	Unit	Qty.
23.	1.1kV LT control cable 10 Core x 2.5sq.mm, GI round double armoured Copper	Mtr.	1000
24.	Earthing material (As required) a) Outdoor switchyard b) HT substation c) LT substation d) Compresses air station building e) Canteen f) Office g) Pole earthing of 3Mtr pipe arrangement	Lot	1
25.	Lightning protection material (As required) a) Outdoor switchyard b) HT substation c) LT substation d) Compresses air station building e) Canteen f) Office	Lot	1
26.	Illumination material (Light fitting, Junction Boxes, Distribution boxes, Wires and cables etc) (As required) a) Outdoor switchyard b) HT substation c) LT substation d) Compresses air station building e) Canteen f) Office	Lot	1
27.	Miscellaneous Safety items ,Rubber mat, Danger board (33kV, 3.3kV & 415V), Sand Fire bucket, Hand gloves, Shock treatment chart etc	Lot	1
28.	GI conduit Pipe 150 Dia (As required)	Mtr	100
29.	Erection accessories, like Polymer Disc insulator, clamp and connectors etc.	Lot	1
30.	All Structural items for Gantry, equipment structure, Lighting cum lightning protection tower. (As required)	Lot	1
31.	VOID		
32.	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for surface)	Nos	2
33.	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for underground level-4 & 6)	Nos	4
34.	3.3 kV, 1250 A VCB switchboard (suitable for fault level of 25 kA) with 1 incomer & three outgoing ((for underground level-4 & 6)	Nos	2
35.	3.3 kV / 0.433 kV Dry type, 1250 kVA Distribution transformers. (for surface)	Nos	2
36.	3.3 kV / 0.433 kV Dry type, 500 kVA Distribution transformers. (for underground level - 4 & 6)	Nos	6
37.	Floor mounted, 415 V, 400 Amps Main Lighting distribution board with two incomers of 400 Amps & 4 numbers Outgoing of 100 Amps.	Nos	2
38.	Additional outgoing of 100 Amps in MLDB	Nos	2
39.	415V / 120V, Dry type, 20 kVA, Mid point earthed Lighting transformer with taps upto +/- 10 % at both sides in steps of 2.5%.	Nos	8
40.	Wall/Structure mounted MCB distribution board for lighting with one number 20 Amps TPN MCB & 12 number 6 Amps SPN MCBs	Nos	25
41.	415 V, 200 Amps Isolator for Lighting transformers	Nos	8

Sl. No.	Item Description	Unit	Qty.
42.	415 V, 1250 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with three incomers & two bus-coupler, each of 1250 Amps. (Each feeder shall have CBCT operated earth leakage relay) for underground substations at Level-4 & Level-6 (Electrically and Mechanically interlocked)	Set	2
43.	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs inclusive of CBCT operated earth leakage relay. (Exact feeders to be provided as per approved SLD of each PCC, Feeder addition deletion as per rate below)		
	a) Outgoing feeders of PCC – 800 Amps ACB	Nos.	1
	b) Outgoing feeders of PCC – 630 Amps ACB	Nos.	1
	c) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	6
	d) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	12
	e) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	1
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	1
44.	415 V, 2500 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with two incomers & one bus-coupler, each of 2500 Amps. (Each feeder shall have CBCT operated earth leakage relay) for LT substation at surface area. (Electrically and Mechanically interlocked)	Set	1
45.	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs incl. CBCT operated earth leakage relay.		
	a) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	3
	b) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	4
	c) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	2
	d) Outgoing feeders of PCC – 200 Amps MCCB	Nos.	2
	e) Outgoing feeders of PCC – 160 Amps MCCB	Nos.	2
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	4
46.	Independent Floor mounted / transportable Starter panel having mining type door interlock for following required in underground area.		
	a) Star-Delta Starter panel for 160 kW jumbo drill with MCCB, Overload relay & 630 Amps contactor (gate & box arrangement)	Nos.	4
	b) Star-Delta Starter panel for 132 kW pump motor with MCCB, Overload relay & 400 Amps contactor	Nos.	2
	c) Star-Delta Starter panel for 90 kW pump motor with MCCB, Overload relay & 250 Amps contactor	Nos.	1
	d) Star-Delta Starter panel for 55 kW pump motor with MCCB, Overload relay & 170 Amps contactor	Nos.	3
	e) Star-Delta Starter panel for 80 kW Electric LHD with MCCB, Overload relay & 250 Amps contactor (gate end box arrangement)	Nos.	6
	f) DOL Starter panel for Auxiliary Fan motor of 7.5 kW with MCCB, Overload relay & 25 Amps contactor	Nos.	20
47.	Mining type LED tube light fitting complete with 2 x 10W lamp, suitable for 90-130V AC.	Nos.	2500

Sl. No.	Item Description	Unit	Qty.
	Fitting should include metallic stand for rotary holder & clear plastic cover and wiremess grill 4-way 16 Amps PVC terminal block and double compression glands.		
48.	3.3kV(UE), aluminium conductor, aerial bunched cable of 150 sq mm + 120 sq mm including required numbers of suspension clamps/connectors.	Mtrs	1000
49.	1.1 kV, aluminium conductor, aerial bunched cable of 185 sq mm + 150 sq mm including required numbers of suspension clamps/connectors	Mtrs	500
50.	1.1 kV grade, HR PVC power cable of copper conductors, XLPE insulated and provided with a common covering of PVC inner sheath, and PVC outer sheathed of type ST2 PVC compound, double armored conforming to IS:1554 (Part-I) – 1988, as amended up to date.		
	a) 3.5 x 240 sq.mm	Mtr	500
	b) 3.5 x 185 sq.mm	Mtr	500
	c) 3.5 x 150 sq.mm	Mtr	500
	d) 3.5 x 120 sq.mm	Mtr	500
	e) 3.5 x 95 sq.mm	Mtr	500
	f) 3.5 x 70 sq.mm	Mtr	500
	g) 3.5 x 50 sq.mm	Mtr	500
	h) 3.5 x 35 sq.mm	Mtr	500
	i) 4 x 25 sq.mm	Mtr	500
	j) 4 x 16 sq.mm	Mtr	500
	k) 4 x 10 sq.mm	Mtr	500
	l) 4 x 6 sq mm	Mtr	500
	m) 4 x 2.5 sq mm (Copper conductor)	Mtr	500
51.	1.1 kV grade, HR PVC, circular stranded (rm) annealed multi strand copper conductor, PVC insulated and provided with a common covering of PVC inner sheath, and overall PVC outer sheathed of type ST2 PVC compound and multi-core, armored to IS : 1554 (Part-I) – 1988, Type YRY/YFY		
	a) 10 x 1.5 sq.mm	Mtr	1000
	b) 7 x 1.5 sq.mm	Mtr	100
	c) 5 x 1.5 sq.mm	Mtr	500
	d) 3 x 1.5 sq.mm	Mtr	1000
52.	LED Luminaries with lamp(s) suitable for 40W LED, 220 V, Suspended /surface mounted for Battery room in substations similar to Bajaj type BI PC 40W LED	Nos.	4
53.	LED Luminaries with lamp(s) suitable for 36W LED 220 V , Recess type for Control Room similar to Bajaj type BZRSQ 36W GZ WH	Nos.	4
54.	LED Street Light Luminaries with lamp(s) suitable for 120W LED 220 V ,	Nos.	10
55.	Lighting Junction boxes		2600
56.	56 inch sweep, ceiling fans complete with control gear, fan hook, down rods electronic regulators conforming to this specification.	No	10
57.	9 M Long Pole for street light with JB (300 X 300 X100 mm) confirming to specification.	No	10

Sl. No.	Item Description	Unit	Qty.
58.	Prefabricated, GI Ladder type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes		
	a) 600mm wide	Mtr.	500
	b) 450mm wide	Mtr.	500
	c) 300mm wide	Mtr.	1000
59.	Prefabricated, 6mm thick, GI Perforated type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes	Nos.	
	a) 600mm wide	Mtr.	100
	b) 300mm wide	Mtr.	100
	c) 100mm wide	Mtr.	100
	d) 50mm wide	Mtr.	100
60.	Wooden / Metallic clamps required for supporting of cable in shaft / wall	Lot	1
61.	Chemical earthing	Lot	1
62.	Steel structures consisting of MS Angle, MS Channel, MS plate of various sizes required for fabrication of brackets/supporting structures for, installation of cable trays, local control panels, light fittings, control panels etc.	Tonne	10
63.	Medium duty, GI pipes of following sizes		
	100mm	Mtr.	10
	50mm	Mtr.	10
	40mm	Mtr.	10
64.	1 inch MS Black conduits for lighting of PMCC, MCC rooms & other Civil buildings/rooms	Mtr	200
65.	2.5 sq. mm multistrand PVC insulated cu. Wire colour RBG for illumination of Electrical buildings (Cable laid in Conduit either in surface or in concealed manner as directive of site in – charge)	Mtr	500
66.	Pedestal fans	Nos.	6
67.	16 Amp plug & socket with MCB control with metallic enclosure Make: Indo Asian – For window type AC in office rooms/miscellaneous rooms	Nos.	10
68.	Switch boards with metallic enclosure with acrylic cover on the top having 10 no. piano switch of 5A rating, 2 no. 15/5 A socket (3pin cum 2pin) & suitable for mounting 2 no. electronic fan regulator. For lighting of Control rooms, office rooms, work shop.	Nos	8
69.	Multi strand single core copper cable (green colour) of 10 sq.mm for earthing of electronic equipment	Mtr	100
70.	Copper strip of size 25 mm x 3 mm for electronic earthing	Mtr	10
71.	Bakelite insulator as supports with female threads for supports for copper strip	Nos.	10
72.	Earthing pits with chemical earthing conforming to relevant is	Nos.	10
73.	GI earthing flats of following sizes		
	a) 75x10mm	Mtr.	200
	b) 50x6mm	Mtr.	200
	c) 25x3mm	Mtr.	500
74.	GI stranded wire for earthing of equipment of following sizes		
	a) 16 sq.mm	Mtr.	100
	b) 6 sq.mm	Mtr.	200
75.	Underground cable installation including excavation of soil, provision	Cub.M.	5

Sl. No.	Item Description	Unit	Qty.
	of sand, bricks, RCC protective slab cover, back filling of soil, removal of debris.		
76.	Miscellaneous erection & installation materials, all consumable materials required during, testing & commissioning like insulating tapes, terminals, ferrules, lugs, cable tags, connectors, GI cable markers, cable dressing materials, wires, brazing and soldering materials, fluxes, welding electrodes, gases, paints, oil, kerosene, solvent, clamps, anchor fasteners, inserts, nuts, bolts, washers, sands, bricks, hard ware such as bends, threads, elbows, reducers, caps, saddles, spacers, wooden grips, screws Inter panel wiring/termination (if any) etc required to complete the installation work. For erection of Panels & electrical equipment if cranes & hydra are required same shall be in the scope of tenderer	Lot	1

04.13.1 ERECTION SPECIFICATION

This specification is intended for the erection of 33kV outdoor switchyard incomer/transformer bay having equipment, LA, Isolator, CT, PT, Circuit breaker, overhead conductor clamp& connector, 8MVA transformer, Station transformer on RSJ double pole structure, HT switchboard, Battery, DCDB, Charger, ACDB, MLDB, laying of HT and LT power cable and control cable. Bidder shall do the design, engineering, erection, testing and commissioning of above mention items in an integrated way and handing over to employer.

1.1 Scope Of Work : The bidder's major scope of work are as following:-

- Taking connection from JSEB metering station through 33kV cable and termination to outdoor isolator. Laying and termination at both end of 33kV cable is in the scope of bidder.
- Erection, Testing and commissioning of outdoor 33kV LA, Isolator, CT, PT , VCB with stringing of conductor from Isolator to VCB.
- Erection, Testing and commissioning of outdoor 33/3.3kV, 8MVA, ONAN transformer.
- Erection, Testing and commissioning of outdoor 33/0.415kV, 200kVA, Dry type transformer on double pole with AB switch and DO fuse arrangement.
- Erection, Testing and commissioning Clamp connector, disc insulator.
- Erection, Testing and commissioning of 3.3kV indoor AIS HT switchboard, LT switchboard, AC distribution board, Main lighting distribution board, DC distribution board inside substation building.
- Laying, termination at both ends, erection, testing and commissioning of HT cable from transformer to HT switchboard, LT cable from station transformer to LT AC distribution board and from MLDB and ACDB to required equipment under scope of supply mentioned above.
- Erection, testing and commissioning of Battery at Battery room.
- Erection, testing and commissioning of Battery charger.
- Earthing of outdoor equipment and substation building and its equipment using chemical earth pits.
- Illumination of outdoor switchyard, substation building and its peripheral road.
- Lightning protection of outdoor equipment and substation building.
- Connectivity of flat GI Earth strip of each equipment with main earth grid for proper earthing.
- Erection accessories and consumables, angles, channels, mounting frames, flexible hoses etc.
- Safety items like hand gloves, shock treatment charts, rubber mats, danger/caution boards etc.
- Getting approval of the various statutory authorities for the electrical installations to be carried out by the bidder.
- The bidder shall provide all spares required during commissioning under his supply and left out commissioning spares shall be handed over to the Employer after commissioning of the system.

The scope of work mainly includes, but not limited to, the following:

- 1.2 All type of cable testing and measuring equipment e.g. Murray loop, Partial discharge (route tracer), cable detection and HV test kit etc. along with all kind of tools and tackles to be hired by the bidder (if required) for carrying out the entire job.
- 1.3 Where ever cable crosses Roads/Rail line/Pipeline etc. cable has to pass through the conduit blocks of GI pipe with high grade PCC encasing (if required).
- 1.4 Supply and Execution of civil / structural works for electrical installation.
 - Substation building, transformer foundation, pole foundation, RCC cable trench with supporting structures and covers (e.g, brackets, tray works and earth strips) covered under supply items mentioned above.-
 - Supporting structures, pipes as required.
 - -Erection accessories and materials including GI pipes, conduits, pull boxes, junction boxes with required number of terminals, cable lugs, double compression cable glands and termination accessories etc.
- 1.5 All necessary measures for safety and protection of existing structures and other underground/ over ground services lines.

1.6 QUANTUM OF WORK

Considering the nature of work, the Employer reserves the right to increase or decrease the quantities of work mentioned in the Schedule of Quantities depending on the requirement.

2.0 INSTRUCTIONS TO THE BIDDERS

2.1 General

Any exclusion/deviation from specification shall be clearly spelt out and listed at one place only and bidder shall substantiate the same with appropriate reasons. In the absence of clearly spelt out and mutually agreed deviations, it shall be considered that the bidder has undertaken to comply with the technical specification totally, in letter and spirit.

2.2 Codes, Standards & Regulations

The Indian Electricity Rules, Statutory requirements of Central Govt. and State Government of Jharkhand, shall also be complied within the absence of the IS, IEC Publication shall be followed.

The bidder must have HT electrical license from the concerned electrical authority with supervisory competency certificate.

2.3 Drawings, Data and Documents

The bidder shall furnish following documents/ information along with the offer.

- Outdoor switchyard layout
- Substation building layout
- Pole foundation layout
- Typical general arrangement and foundation details.
- Cable route layout.
- RCC cable trench design and drawings.

2.4 Installation

For installation work at site, the bidder shall be fully responsible for arranging the supply of required tools and tackles, welding sets, pipe bending machine, cable crimping tools, gauges, scaffoldings, ladders, temporary water and power connections and mobile cranes.

On completion of the installation work but before energisation of the system, all installation shall be physically checked and properly tested. All checks and tests shall be conducted by the bidder under the supervision of Employer. The bidder shall furnish the final status and test results. Any defect observed during such check and tests shall be rectified by the bidder free of cost within contract completion period.

All clamps brackets, bolts, nuts, screws, markers, ferrules, lugs, glands and other hardware necessary for erection work, shall be included in the scope of work and shall be supplied by the bidder. Equipment shall be painted to withstand the heavily polluted and saline environment prevailing in at site.

2.5 Painting

All equipment / components / accessories which are intended to be painted shall be thoroughly cleaned of rust, scales, grease, etc. and be painted with two coats of proper undercoat. This shall be followed by two coats of finishing paint of the colour specified/approved by the employer. Damage to the painting suffered during transit / erection shall be made good by the bidder free of cost before the equipment is finally accepted by the employer.

2.6 DRAWINGS & DOCUMENTATION

All drawings/documents shall be submitted in minimum 4 sets in hard copy and final approved drawing in soft copy (both editable & pdf format).

2.7 SITE TESTS AND CHECKS

2.7.1 GENERAL

Test of all equipment shall be conducted as per latest IS applicable. Tests shall also confirm to International Standards IEC/VDE/DIN/BS (in case corresponding test are not mentioned in ISS/ IPSS).

All routine test shall be carried out at manufacturer's works in the presence of purchaser or his representative.

The tenderer shall submit type test certificates for similar equipment supplied by him elsewhere. In case type test certificates for similar equipment are not available, the same shall be conducted in the presence of purchaser or his representative if purchaser so desires, without any financial implications to the purchaser.

All the equipment shall be tested at site to know its condition and to prove suitability for required performance. The site tests and acceptance tests to be performed by Contractor are detailed below.

The Contractor shall be responsible for satisfactory working of the complete system in an integrated manner and its guaranteed performance.

All the equipment shall be tested at site to know their condition and to prove suitability for required performance.

The list of tests indicated to be conducted, and all required equipment/ instrument shall have to be arranged by the bidder. Any other test which is considered necessary by the manufacturer of the equipment, bidder or mentioned in commissioning manual shall have to be conducted at site.

In addition to the tests on individual equipment, some tests / checks are to be conducted / observed from overall system point of view to develop confidence for charging of the system / equipment. Such checks are highlighted under miscellaneous tests but these shall not be limited to as indicated, and shall be finalized with consultation of Employer before charging of the system.

All checks and tests shall be conducted in the presence of Employer's representative and test results shall be submitted in three copies to Employer and one copy to Electrical Inspector. Test results shall be filled in proper proforma of Employer.

After clearance from Electrical Inspector system / equipment shall be charged as per charging protocol.

Based on the test results clear cut observation shall be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging are to be brought out by the bidder.

2.7.2 HT Equipment

1. IR test
2. HV one minute Power Frequency test
3. Functional test of all circuit components for each panel/feeder.

2.7.3 Cables

1. Continuity check for all cables.
2. Checking tightness of all connections at the terminating points.
3. Insulation resistance test as per clause no. 14.1 of IS 1255-1983.
4. DC high voltage tests on all power cables rated above 1.1 kV grade as per clause no. 14.2.4.1 of IS 1255-1983.

2.7.4 Transformers

A. Routine Tests

- i) Assembly inspection/ Painting check
- ii) Measurement of winding resistance
- iii) Measurement of voltage ratio and check of voltage vector relationship
- iv) Measurement of impedance voltage (Principal tapping), short circuit impedance and load loss.
- v) Measurement of no-load and current.
- vi) Measurement of insulation resistance/ polarizatation index.
- vi) Dielectric test:
 - a) Induced over voltage withstand test
 - b) Applied voltage withstand test
(H.V. power frequency test)
- vii) Certification for off-load tap changer
- viii) Final documentation check

B. Type Tests

- i) Temperature rise test
- ii) Measurement of acoustic sound level
- iii) Lightning impulse withstand test (if test certificates are not available)
- iv) Short circuit test
- v) Measurement of commutating reactance and determination of inductive voltage drops (for thyristor converter transformer only).

2.7.5 Busduct

A. Routine Tests

- i) One min. power freq. withstand voltage
- ii) Measurement of insulation resistance

- iii) Measurement of resistance and reactance of busbars
- B. Type Tests**
 - i) Heat run test
 - ii) Short time rating test (thermal & dynamic)
 - iii) Impulse withstand test
 - iv) Tests for degree of protection for enclosures

2.7.6 Power Control Centre and LT switchgear

- A. Routine Tests**
 - i) Assembly inspection/ Painting check
 - ii) Measurement of insulation resistance
 - iii) Dielectric test for assembled unit
 - iv) Functional test including automatic bus transfer scheme
 - v) Tests of ACBs including operation test, calibration of releases, measurements of contact resistances.
 - vi) Polarity tests for CTs.
 - vii) Final documentation check
- B. Type Tests**
 - i) Temperature rise test for main and vertical bus-bars.
 - ii) Short-circuit test for main and vertical bus-bars.
 - iii) Enclosure class, degree of protection
 - iv) Dielectric test including protective circuit.

2.7.7 Current Transformer and voltage transformer

- A. Routine Tests**
 - i) Assembly inspection
 - ii) Power-frequency tests on primary windings
 - iii) Power-frequency tests on secondary windings
 - iv) Over-voltage inter-turn tests
 - v) Dielectric test
 - vi) Ratio & polarity test
 - vii) Measurement of ratio error & phase angle error
 - viii) VI characteristics
 - ix) PT winding resistance
 - x) Final documentation check
- B. Type Tests**
 - i) Short-time current test
 - ii) Temperature rise test

2.7.8 Final Test of Materials of Grounding and lightning system

- i) Visual check
- ii) Dimensional check

- iii) Accessories fitting check
- iv) Mechanical and electrical test (where applicable)
- v) Final documentation check

2.7.9 Cables

1. Shop Tests

- a) The cables shall be subject to shop tests in accordance with relevant standards to prove the design and general qualities of the cables as below:-
- b) Routine test on each drum of cables

2. Acceptance tests on drum chosen at random for acceptance of the lot

- a) High Voltage withstand test for HT cable (Hi Pot test)
- b) Type tests certificates on each type of cable, inclusive of measurement of armour D.C. resistance of power cables will be furnished by Contractor

B. PACKING

- 1. Cables will suit barrel diameter and securely clamped/fixed. The barrels must be sufficiently strong to withstand mechanical shocks and shall effectively protect against transit.
- 2. Both ends of cable will be metal capped to prevent moisture ingress. Ends shall be kept inside the cable drum in a manner so that these are accessible for testing.
- 3. Cable drum identification/marking will be as follows:
 - a) Makers name
 - b) Consignee's full address
 - c) Type size and length of cables
 - d) Net and gross weights
 - e) Any other marking for shipping
 - f) Drum Markings

C. Drum Lengths

- 1. LT Cables will be delivered at site preferably on standard drums each containing 500 m or 1000 m cables, Where total quantity of a particular cable is less than 500 m, the entire length will be supplied in one drum.
- 2. For 90% cable drum of each item of cable permissible tolerance is in length + 5% For 10% balance cable drums, Contractor shall ensure that each 500 m capacity drum contains at least 250m and each 1000m capacity drum contains at least 500m cable lengths. Overall tolerance for each item of cable is + 1% of total length.

2.7.10 Motors :-

A. Routine Tests

The following are the routine tests carried out on each and every motor :

- 1.0 Measurement of resistance.
- 2.0 Insulation resistance test .
- 3.0 Motors are tested at 1/3 times the rated voltage for checking the ability of the motor to run upto full speed , when switched in either direction .
- 4.0 No load test .
- 5.0 High voltage test .

B. Type Tests

- 1 Measurement of rotor resistance .
- 2 No load test
- 3 Locked rotor test .
- 4 Full load reading of voltage, current , power input and slip.
- 5 Temperature rise test.
- 6 Momentary overload test .
- 7 Insulation resistance test .
- 8 High voltage test .
- 9 Polarisation index test (for HT motors)

2.7.11 SITE TESTS AND CHECKS

001 General

All the equipment will be tested at site to know their condition and to prove suitability for required performance.

The test indicated in following pages will be conducted after installation. All tools, accessories and required instruments will have to be arranged by contractor. Any other test that is considered necessary by the manufacturer of the equipment, Contractor or mentioned in commissioning manual has to be conducted at site.

In addition to tests on individual equipment some tests / checks are to be conducted / observed from overall system point of view. Such checks are highlighted under miscellaneous tests but these will not be limited to as indicated and will be finalised with consultation of client before charging of the system.

The Contractor will be responsible for satisfactory working of complete integrated system and guaranteed performance.

All checks and tests will be conducted in the presence of Client's representative and test results will be submitted in six copies to Client and one copy to Electrical Inspector. Test results will be filled in proper proforma.

After clearance from Electrical Inspector, system / equipment will be charged in step by step method.

Based on the test results clear cut observation will be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging are to be brought by the Contractor.

002 Trial Run Test

After the successful test of each equipment as per standard test procedure, the entire control system will be put on trial run test on actual site conditions and operation of the system.

003 Acceptance Test

The acceptance test on the system will be carried out by the contractor as per mutually agreed test procedures to establish satisfactorily functioning of the system as a whole and each equipment as part of the system.

004 Site Tests

The tests to be carried out on the equipment at pre-commissioning stage will include following but not limited to the following:

Transformer

- 1) IR test on each winding to ground and between winding and check for polarization index.
- 2) Turns ratio test on each tap
- 3) Polarity and vector group test
- 4) Measurement of winding resistance for windings by Kelvin bridge.
- 5) Heating and drying and checking with heating and cooling curve.
- 6) Checking of earthing wrt transformer tank (flexible from top cover to tank) other parts, neutrals and tank to electrodes of LAs (for LAs located near transformer)..
- 7) Testing of Buchholtz relay for alarm and trip conditions
- 8) For bushing CTs, tests applicable will be as for current transformers.
- 9) Calibration and setting of oil/winding temperature indicators, level gauge
- 10) Check insulators for cracks.
- 11) Checking for oil leakage and arresting of leakages (if required)
- 12) Checking of operation of all valves.
- 13) Checking of open operation of all valves (except drain and filter set)
- 14) Filtration of oil by using line filter and heater set
- 15) BDV test on Oil samples from top & bottom
- 16) Checking of Oil for acidity, water content and tan delta as per IS 335.
- 17) Measurement of magnetising current and no load loss.
- 18) Checking of silica gel breather.
- 19) Checking of noise level at no load and at full load.
- 20) Checking of air circulation conditions for indoor transformers.

- 21) Conducting magnetic balance test.
- 22) Checking of other points given in manufacturer's commissioning manuals.
- 23) IR, wiring and operational tests on all control devices in control cabinet, oil level indicator winding and oil temp. indicators, oil pump, cooling fan etc.

HT ISOLATOR

- 1) IR test before & after HV test
- 2) HV test
- 3) Operational test
- 4) Checking of interlocking with earth switch
- 5) Checking of operation of earth switch
- 6) Checking of tightness of earth connection
- 7) Check for continuity of aux contacts
- 8) Check working of shunt trip (if applicable)
- 9) Checking of CTs, PTs (if applicable) as per the details given in HT board.
- 10) Contact resistance/ millivolt drop test

LT SWITCHBOARD

IR test

HV test with 2.5 kV megger

Functional test for all feeders

Testing and calibration of all meters

Checking and calibration of overload relays and protective relays by primary injection method.

Check operation of contactors from local and remote points.

Checking of interlocking between incomers/ bus couplers and other feeders

Test of prove interchangeability of similar parts.

Test to prove correct operation of breakers at minimum and maximum specified control voltages.

Checking operation of RC circuit (if there) for tripping of circuit breaker after disappearance of control voltage.

Checking of earthing connection for neutral-earth bus, cable armour, location of E/F CT etc. as per the scheme.

Checking of tests, service and drawout position of all the breakers and operations of mechanical flag indicator and electrical indication lamps.

Checking the functioning of various electrical schemes like auto change over, signaling etc.

Contact pressure test

BUS DUCTS

- 1) IR measurement before and after HV test.
- 2) HV test.
- 3) Checking tightness of bolts with torque wrench.
- 4) Checking for phase sequence marking.
- 5) Check for clearances between phase to phase and phase to earth.
- 6) Check for minor damages and cracks in supporting insulators and bushings after cleaning.
- 7) Checking of busbar cracks and rectification of same.
- 8) Checking for inspection openings and accessibility for replacement of insulator etc.
- 9) Check tightness of earthing connections on enclosure.
- 10) Checking of silicagel breather (if there).
- 11) Checking of working of space heater.
- 12) Hot air blowing to remove moisture if required.

CABLES

- 1) Visual check
- 2) Checking of continuity and IR values for all the cables before and after HV test.
- 3) HV test and measurement of leakage current after termination of cable kits (for HT cables).
- 4) Checking of earth continuity for armour and fourth core (if applicable)
- 5) Check for mechanical protection of cables.
- 6) Check for identification (tag number system) distance placement of cable marker, cable joint etc. as per the cable layout drawing.
- 7) Check earthing of cable structures.
- 8) Check safe head room in tunnel and basement area.
- 9) Check clearance from ventilation duct and light fittings for cable structures.
- 10) Check proper fixing of cable structures.
- 11) Check for proper drainage and removal of water (if any).
- 12) Lightning Protection
- 13) Check continuity of all the earth strips / shield wire.
- 14) Check tightness of all connections.

- 15) Measure earth resistance of each electrode and combined system.

Earthing

- 1) Check tightness of all earth connections.
- 2) Check earthing of all metallic equipments, cable trays, busbar supporting structures, building column (if steel) all elect equipments, pipe lines etc. as per the drawing / specification
- 3) Measurement of earth resistance for each electrode.
- 4) Measurement of total earth resistance.
- 5) Measurement of earth loop resistance for E/F path of biggest LT drive.

Miscellaneous

- 1) Checking of continuity of the system.
- 2) Checking of phase sequence from overhead line consumer end.
- 3) Checking safe accessibility of all operating points
- 4) Check availability of emergency lighting
- 5) Check availability of control aux. supply.
- 6) Ensure availability of first aid box, fire fighting equipments, earth discharge rods, rubber mats, rubber glove.
- 7) Check oil drainage system for transformer oil
- 8) Check filling of gravels in transformer pits.
- 9) Check for safe movement of operators control room / switchgear etc., wrt proper illumination, escape light uncovered openings provision of hand railings in stairs etc.
- 10) Check proper covering of cable channels.
- 11) Placement of shock treatment chart, danger boards provision of boards indicating 'Man on work' 'Do not switch ON' 'Do not switch OFF'. 'EARTHED' etc.
- 12) Provision of route map at gallery entry points for indication of escape.
- 13) Check proper dressing of cables, mechanical protection of cables, placement of cable markers.
- 14) Check sealing of all cable openings including conduits opening with fire resistance material.
- 15) Check sealing of all openings at bottom of electrical panels.

2.7.12 Earthing System

1. Checking continuity of all earth connection.

2. Checking tightness of all earth connection in the main earthing network.
3. Measurement of earth electrode resistance and earth loop impedance as per Clause Nos. 37 & 38 of IS 3043-1993.

2.7.13 MISCELLANEOUS

1. Checking of continuity of the system
2. Checking for safe accessibility of all operating points
3. Check for availability of control/aux. supply
4. Ensure availability of first aid box, fire fighting equipments, earth discharge rods, rubber mats, rubber glove
5. Check for filling of gravels in yard and in transformer pits
6. Check for proper covering of cable channels.
7. Placement of shock treatment chart, danger boards, provision of boards indicating 'Man on Work, Do not switch ON', 'Do not switch OFF', 'EARTHED' etc.
8. Provision of route map.
9. Check for sealing of all openings at bottom of electrical panels.
10. Phase sequence, continuity, I.R and H.V. tests of power cables (HT<) and control cables as applicable after installation at plant site.

Note: The tests specified above are indicative and minimum only. Any test found necessary for proper commission of the equipment shall be performed by the bidder.

2.8 APPROVAL OF STATUARY AUTHORITIES

It shall be the responsibility of bidder to obtain necessary approval of statutory authority as per rules of State government, **DGMS and Central Electricity Authority** for the work under his scope, before energizing/charging the equipment. However, bidder shall be extended all assistance by the employer in this regard such as submission of application, relevant documents and payment of statutory fees.

2.9 SCHEDULE OF QUANTITIES FOR ERECTION, TESTING & COMMISSIONING

The scope of installation shall be on the item rate basis for the items listed under this schedule and as per drawings. All equipments, protection/control gear, accessories, components shall be as required for proper functioning of the system and to achieve the system satisfactorily working including civil/structural works. Civil foundation and structural works required for the below mentioned items shall also be in the scope of work of bidder.

The work shall be carried on the satisfaction of employer/consultant.

The scope of supply shall necessarily include (but not limited to) the major items listed under this schedule.

Sl. No.	Item Description	Unit	Qty.
	Electrical Facilities		
	MRS-Power Distribution Equipment		
1.	33kV Outdoor Lightning Arrestor	Nos.	3
2.	33kV outdoor Isolator	Set	2
3.	33kV outdoor Current Transformer	Nos.	3
4.	33kV outdoor Voltage Transformer	Nos.	3
5.	33kV outdoor Vacuum Circuit Breaker	Set	2
6.	33kV ACSR DOG conductor	Lot	1
7.	33kV Clamp and Connectors	Lot	1
8.	Structure and angle and channels	Lot	1

Sl. No.	Item Description	Unit	Qty.
9.	33kV control relay panel with Relays, metering devices and indication lamp, Hooter , Buzzer etc	Set	1
10.	33/3.3kV, 8MVA, ONAN, OLTC Power Transformer equipped with nitrogen injection system for fire protection	No	1
11.	3.3kV, 50A, Neutral Grounding Resistor with NGR monitoring relay	No	1
12.	3.3kV VCB Switchboard		
12.1	3.3kV , 1250A, VCB Incomer with Line PT		3
12.2	3.3kV , 1250A, VCB Buscoupler (with castle lock arrangement for interlock)	Nos.	2
12.3	3.3kV , 1250A, VCB Outgoing with CBCT and separate EOR relay	Nos.	15
12.4	3.3kV Bus PT	Nos.	2
13.	33/0.415kV, 200kVA, Oil Filled ONAN Distribution transformer	Nos.	1
14.	13Mtr 34.6kg/Mtr RSJ pole (Double pole arrangement with all accessories, Like, AB Switch, DO fuse, Insulator, Clamp and connectors)	1	Set
15.	AC distribution board Incomer – 300A MCCB (with castle lock arrangement) Buscoupler – 300A MCCB (with castle lock arrangement for interlock) Outgoing feeder- 100A, MCCB with CBCT and separate EOR relay Outgoing feeders – 63 A, MCCB with CBCT and separate EOR relay Outgoing feeders – 32 A, MCCB with CBCT and separate EOR relay	Nos.	2 1 6 6 6
16.	Main Lighting distribution board Incomer – 100A MCCB with castle lock arrangement for interlock Buscoupler – 100A MCCB (with castle lock arrangement for interlock) Outgoing feeders – 32 A, MCCB CBCT and separate EOR relay	Nos.	2 1 6
17.	DC distribution board Incomer – 100A MCCB with castle lock Buscoupler – 100A MCCB (with castle lock arrangement for interlock) Outgoing feeders – 32 A, MCCB	Nos.	2 1 10
18.	30V, 100AH battery with Charger	Set	1
19.	33kV (E) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
20.	3.3kV (UE) grade, 3Cx240 sq.mm stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
21.	1.1kV grade, 3.5Cx300 sq. mm Stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
22.	1.1kV grade, 3.5Cx150 sq. mm Stranded copper conductor, XLPE insulated, GI round double armoured cable.	Mtr.	1000
23.	1.1kV LT control cable 10 Core x 2.5sq.mm, GI round double armoured Copper	Mtr.	1000
24.	Earthing material (As required) h) Outdoor switchyard i) HT substation j) LT substation k) Compresses air station building	Lot	1

Sl. No.	Item Description	Unit	Qty.
	l) Canteen m) Office n) Pole earthing of 3Mtr pipe arrangement		
25.	Lightning protection material (As required) g) Outdoor switchyard h) HT substation i) LT substation j) Compresses air station building k) Canteen l) Office	Lot	1
26.	Illumination material (Light fitting, Junction Boxes, Distribution boxes, Wires and cables etc) (As required) g) Outdoor switchyard h) HT substation i) LT substation j) Compresses air station building k) Canteen l) Office	Lot	1
27.	Miscellaneous Safety items ,Rubber mat, Danger board (33kV, 3.3kV & 415V), Sand Fire bucket, Hand gloves, Shock treatment chart etc	Lot	1
28.	GI conduit Pipe 150 Dia (As required)	Mtr	100
29.	Erection accessories, like Polymer disc insulator, clamp and connectors etc.	Lot	1
30.	All Structural items for Gantry, equipment structure, Lighting cum lightning protection tower. (As required)	Lot	1
31.	Approval of Statuary clearances (DGMS / Electrical) from concerned departments	Lot	1
32.	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for surface)	Nos	2
33.	3.3 kV, 630 A, 25kA Load break Isolator with earth switch (for underground level-4 & 6)	Nos	4
34.	3.3 kV, 630 A VCB switchboard (suitable for fault level of 25 kA) with 1 incomer & three outgoing ((for underground level-4 & 6)	Nos	2
35.	3.3 kV / 0.433 kV Dry type, 1250 kVA Distribution transformers. (for surface)	Nos	2
36.	3.3 kV / 0.433 kV Dry type, 500 kVA Distribution transformers. (for underground level - 4 & 6)	Nos	6
37.	Floor mounted, 415 V, 400 Amps Main Lighting distribution board with two incomers of 400 Amps & 4 numbers Outgoing of 100 Amps.	Nos	2
38.	Additional outgoing of 100 Amps in MLDB	Nos	2
39.	415V / 120V, Dry type, 20 kVA, Mid point earthed Lighting transformer with taps upto +/- 10 % at both sides in steps of 2.5%.	Nos	8
40.	Wall/Structure mounted MCB distribution board for lighting with one number 20 Amps TPN MCB & 12 number 6 Amps SPN MCBs	Nos	25
41.	415 V, 200 Amps Isolator for Lighting transformers	Nos	8
42.	415 V, 1250 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with three incomers & two bus-coupler, each of 1250 Amps. (Each feeder shall have CBCT operated earth leakage relay) for underground substations at Level-4 & Level-6 (Mechanically and electrically interlocked)	Set	2

Sl. No.	Item Description	Unit	Qty.
43.	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs inclusive of CBCT operated earth leakage relay. (Exact feeders to be provided as per approved SLD of each PCC, Feeder addition deletion as per rate below)		
	a) Outgoing feeders of PCC – 800 Amps ACB	Nos.	1
	b) Outgoing feeders of PCC – 630 Amps ACB	Nos.	1
	c) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	6
	d) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	12
	e) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	1
	f) Outgoing feeders of PCC – 100 Amps MCCB	Nos.	1
44.	415 V, 2500 Amps, (suitable for fault level of 25 kA), free standing, floor mounted, fully compartmentalized, Power Control Centre (PCC) with two incomers & one bus-coupler, each of 2500 Amps. (Each feeder shall have CBCT operated earth leakage relay) for LT substation at surface area. (Mechanically and electrically interlocked)	Set	1
45.	Outgoing feeders of above PCC in maximum two tiers for ACB & three tiers for MCCBs incl. CBCT operated earth leakage relay.		
	a) Outgoing feeders of PCC – 630 Amps MCCB	Nos.	3
	b) Outgoing feeders of PCC – 400 Amps MCCB	Nos.	4
	c) Outgoing feeders of PCC – 250 Amps MCCB	Nos.	2
	d) Outgoing feeders of PCC – 200 Amps MCCB	Nos.	2
	e) Outgoing feeders of PCC – 160 Amps MCCB	Nos.	2
46.	Independent Floor mounted / transportable Starter panel having mining type door interlock for following required in underground area.		
	g) Star-Delta Starter panel for 160 kW jumbo drill with MCCB, Overload relay & 630 Amps contactor (gate & box arrangement)	Nos.	4
	h) Star-Delta Starter panel for 132 kW pump motor with MCCB, Overload relay & 400 Amps contactor	Nos.	2
	i) Star-Delta Starter panel for 90 kW pump motor with MCCB, Overload relay & 250 Amps contactor	Nos.	1
	j) Star-Delta Starter panel for 55 kW pump motor with MCCB, Overload relay & 170 Amps contactor	Nos.	3
	k) Star-Delta Starter panel for 80 kW Electric LHD with MCCB, Overload relay & 250 Amps contactor (gate & box arrangement)	Nos.	6
	l) DOL Starter panel for Auxiliary Fan motor of 7.5 kW with MCCB, Overload relay & 25 Amps contactor	Nos.	20
47.	Mining type LED tube light fitting complete with 2 x 10W lamp, suitable for 90-130V AC. Fitting should include metallic stand for rotary holder & clear plastic cover and wiremess grill 4-way 16 Amps PVC terminal block and double compression glands.	Nos.	2500
48.	3.3kV(UE), aluminium conductor, aerial bunched cable of 150 sq mm + 120 sq mm including required numbers of suspension clamps/connectors.	Mtrs	1000

Sl. No.	Item Description	Unit	Qty.
49.	1.1 kV, aluminium conductor, aerial bunched cable of 185 sq mm + 150 sq mm including required numbers of suspension clamps/connectors	Mtrs	500
50.	1.1 kV grade, HR PVC power cable of copper conductors, XLPE insulated and provided with a common covering of PVC inner sheath, and PVC outer sheathed of type ST2 PVC compound, double armored conforming to IS:1554 (Part-I) – 1988, as amended up to date.		
	n) 3.5 x 240 sq.mm	Mtr	500
	o) 3.5 x 185 sq.mm	Mtr	500
	p) 3.5 x 150 sq.mm	Mtr	500
	q) 3.5 x 120 sq.mm	Mtr	500
	r) 3.5 x 95 sq.mm	Mtr	500
	s) 3.5 x 70 sq.mm	Mtr	500
	t) 3.5 x 50 sq.mm	Mtr	500
	u) 3.5 x 35 sq.mm	Mtr	500
	v) 4 x 25 sq.mm	Mtr	500
	w) 4 x 16 sq.mm	Mtr	500
	x) 4 x 10 sq.mm	Mtr	500
	y) 4 x 6 sq mm	Mtr	500
	z) 4 x 2.5 sq mm (Copper conductor)	Mtr	500
51.	1.1 kV grade, HR PVC, circular stranded (rm) annealed multi strand copper conductor, PVC insulated and provided with a common covering of PVC inner sheath, and overall PVC outer sheathed of type ST2 PVC compound and multi-core, armored to IS : 1554 (Part-I) – 1988, Type YRY/YFY		
	e) 10 x 1.5 sq.mm	Mtr	1000
	f) 7 x 1.5 sq.mm	Mtr	100
	g) 5 x 1.5 sq.mm	Mtr	500
	h) 3 x 1.5 sq.mm	Mtr	1000
52.	LED Luminaries with lamp(s) suitable for 40W LED, 220 V, Suspended /surface mounted for Battery room in substations similar to Bajaj type BI PC 40W LED	Nos.	4
53.	LED Luminaries with lamp(s) suitable for 36W LED 220 V , Recess type for Control Room similar to Bajaj type BZRSQL 36W GZ WH	Nos.	4
54.	LED Street Light Luminaries with lamp(s) suitable for 120W LED 220 V	Nos.	10
55.	Lighting Junction boxes		2600
56.	56 inch sweep, ceiling fans complete with control gear, fan hook, down rods electronic regulators conforming to this specification.	No	10
57.	9 M Long Pole for street light with JB (300 X 300 X100 mm) confirming to specification.	No	10
58.	Prefabricated, GI Ladder type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes		
	a) 600mm wide	Mtr.	500
	b) 450mm wide	Mtr.	500
	c) 300mm wide	Mtr.	1000
59.	Prefabricated, 6mm thick, GI Perforated type cable tray (each piece of 3 meter standard length) conforming to TS of following sizes	Nos.	

Sl. No.	Item Description	Unit	Qty.
	a) 600mm wide	Mtr.	100
	b) 300mm wide	Mtr.	100
	c) 100mm wide	Mtr.	100
	d) 50mm wide	Mtr.	100
60.	Wooden / Metallic clamps required for supporting of cable in shaft / wall	Lot	1
61.	1 inch MS Black conduits for lighting of PMCC, MCC rooms & other Civil buildings/rooms	Mtr	200
62.	2.5 sq. mm multistrand PVC insulated cu. Wire colour RBG for illumination of Electrical buildings (Cable laid in Conduit either in surface or in concealed manner as directive of site in – charge)	Mtr	500
63.	Pedestal fans	Nos.	6
64.	16 Amp plug & socket with MCB control with metallic enclosure Make: Indo Asian – For window type AC in office rooms/miscellaneous rooms	Nos.	10
65.	Switch boards with metallic enclosure with acrylic cover on the top having 10 no. piano switch of 5A rating, 2 no. 15/5 A socket (3pin cum 2pin) & suitable for mounting 2 no. electronic fan regulator. For lighting of Control rooms, office rooms, work shop.	Nos	8
66.	Multi strand single core copper cable (green colour) of 10 sq.mm for earthing of electronic equipment	Mtr	100
67.	Copper strip of size 25 mm x 3 mm for electronic earthing	Mtr	10
68.	Bakelite insulator as supports with female threads for supports for copper strip	Nos.	10
69.	Earthing pits with chemical earthing conforming to relevant IS	Nos.	10
70.	GI earthing flats of following sizes		
	a) 75x10mm	Mtr.	200
	b) 50x6mm	Mtr.	200
	c) 25x3mm	Mtr.	500
71.	GI stranded wire for earthing of equipment of following sizes		
	a) 16 sq.mm	Mtr.	100
	b) 6 sq.mm	Mtr.	200

06. ERECTION, TESTING, COMMISSIONING, PERFORMANCE GUARANTEE & FINAL ACCEPTANCE.

06.01 GENERAL

06.01.01 The commercial document shall be read along with this Technical Specification for Erection/ Installation, Pre-commissioning test, Preliminary Acceptance test (PAT), commissioning, Performance Guarantee (PG) and Final Acceptance certificate (FAC).

06.01.02 Individual equipment and systems shall be tested as per the procedures elaborated in relevant clauses of this TS which shall be mutually agreed & approved by the Purchaser to achieve the performance requirement of the total system.

06.01.03 Performance guarantee tests shall be carried out by the Successful Bidder to demonstrate the performance guarantee parameters for the individual equipment under his scope and total system.

06.01.04 The successful Bidder shall supply specialists and skilled/unskilled manpower for PAT, commissioning, PG during development & operation.

06.02 PROJECT INTENT/ GUARANTEED VALUES.

HCL intends to get developed & operated their Chapri mines and accordingly underground mines development covering decline development and production of ore are crucial for successful operation of this project.

06.03 COMMISSIONING PLAN

06.03.01 The contractor submits the commissioning plan with the completed design and construction package, and the buyer/ consultant reviews for compliance with project intent. The final commissioning plan specifies activities to verify that the plant & equipments meet the project intent.

06.03.02 The Commissioning Plan will define how the proposed equipments / system should operate, guide the design and installation review and resulting requirements, and identify how the installed equipment/systems will be functionally tested. Tests include measurement of plant & equipment performance to document Project compliance with the specified performance guarantees and demonstrate the ability of the Project and Units to achieve the specified Generation Operating Characteristics or discover operating deficiencies to be corrected in the plant & equipment or other equipment with which it interfaces.

06.03.03 The final commissioning plan should have the following contents:

Overview

- Abbreviations and definitions
- Purpose of the commissioning plan
- Commissioning scope / objectives
- Commissioned systems

Commissioning Team: Roles & Responsibilities

- List commissioning team members & contact information
- Description of roles

Commissioning Process

- Final commissioning plan

- Commissioning kick-off meeting, other meetings
- Management protocols
- Submittals, documentation, and written work products
- Pre-functional checklists, tests, and start-up
- Functional tests and verification procedures
- O& M manuals.
- Training
- Schedule

06.04 PLANT & EQUIPMENT'S ERECTION/ INSTALLATION AND COMMISSIONING

06.04.01 ERECTION/ INSTALLATION

- 06.04.01.01 The contractor installs the equipments as per buyer-approved design and installation plans, and uses commissioning-related logs, checklists, and records required to document installation.
- 06.04.01.02 The erection of all plant and equipment shall be carried out according to the latest engineering practices and according to the working drawings, erection specification instructions etc. The Bidder shall carry out the work in the presence and/or as per the instructions of site engineer/supervisory personnel deputed by the Employer. The erection shall be carried out by highly skilled workmen.
- 06.04.01.03 The Bidder shall be responsible for paying strict attention to statutory regulations for prevention of accidents and to other safety rules. The regulations for prevention of accidents shall be deployed at appropriate places and should be distinctly visible to all personnel working in the area.
- 06.04.01.04 The Bidder shall supply all required consumables, construction and erection materials, petrol oil, kerosene, solvents, sealing compound, tapes, brazing and soldering materials, welding and brazing gases, erection bolts, nuts and packing sheets/compounds, temporary supports, wooden blocks, spacers, templates, jute and cotton wastes, sand and emery paper etc. as required for the satisfactory completion of work.
- 06.04.01.05 The Bidder shall make his own arrangement for handling the equipment and pipelines at the stores and transporting it to the site of installation. In addition to the above, the Bidder shall follow all the relevant erection clauses/conditions stated under various chapters and relevant chapters of this tendering specification.
- 06.04.01.06 The Bidder shall provide all tools, labour including necessary subsistence, erection supervision, equipment, materials, and accessories, to erection/installation and make ready for operation.
- 06.04.01.07 Erection details given in technical chapters for different facilities shall be followed while erecting the specific items as described in that respective chapter.
- 06.04.01.08 General Erection & Commissioning Guidelines
- (i) Fabrication of the structure wherever required shall be made only as per the Drawings supplied by the Contractor duly approved by Engineer-in-Charge.
 - (ii) Any component or part received separately from the main body of the equipment shall be assembled to the equipment as per the drawings, specifications of the manufacturers and as per the instruction of the Engineer-in-charge.

- (iii) The Contractor's responsibility shall consist of lifting of the equipment to the proper level by means of the Contractor's own erection tools.
- (iv) Before putting the equipment on foundation it shall be the responsibility of the Contractor to check the orientation of foundation, placing of anchor bolts and diameter of holes in the support/saddles etc. If any minor adjustments are required, the same shall be done by the Contractor after obtaining the prior approval of the Engineer-in-Charge.
- (v) The Contractor shall be entirely responsible for the perfect alignment and adjustment of machinery and equipment, installed by the Contractor or supplied by HCL and installed by the Contractor.
- (vi) After the placement of equipment, it shall be properly fixed on to the structure or grouted on the foundation.
- (vii) Grouting of back holes with foundation bolts shall be carried out after placing of equipment on foundation. Grouting below base plate shall be done after finally checking of level and alignment and with the approval of Engineer in-charge. Before final grouting machinery/equipment shall be levelled on the steel shims. The foundation bolts shall be fully tightened keeping proper grouting gap as per normal practice and/or specified by the manufacturers
- (viii)

06.04.02 OPERATIONAL ACCEPTANCE TESTS/ PRE-COMMISSIONING TESTS

- 06.04.02.01 After installation, functional and operational performance tests are conducted to demonstrate the plant & equipment's performance in compliance with the design intent and measures how the plant & equipments interfaces with other facility and achieves required plant operating conditions. Any operating deficiencies are documented and resolved.
- 06.04.02.02 Operational acceptance tests/ Pre-commissioning comprise the validation of components of equipment, systems, and controls for readiness at equipment start. Test documents for mechanical, electrical, instrumentation and controls, safety, and other facility are included. Pre Functional inspections as outlined below:

i.Pre –final inspection.

The buyer/consultant and contractor shall submit a list of deficiencies that were identified during the pre-final inspection. These items are to be corrected before the final inspection by contractor.

ii.Dry run inspection.

The contractor shall conduct dry-run inspections on installed equipment and system. During the inspection, the contractor shall check the equipment for proper mounting, direction of rotation or travel, proper lubrication with type of lubrication recorded and properly filled clearance, alignment, undue noise and vibration, safety devices, and general operation. The contractor shall remove all rags and other debris, check for obstructions in piping, check all valves for proper operation and seating and ensure all safety chains and guards are in place. Malfunctions shall be scheduled for corrective action and the wet-run testing of the facilities.

iii.Wet run inspection

The contractor shall conduct wet-run tests after the dry-run inspection and before the final inspections. The same form used in the dry-run inspections shall be used in the wet-run tests. Fresh water shall be used for the test.

iv.Final inspection/ Preliminary acceptance tests (PAT)

Each unit/ sub-unit shall be subjected to Preliminary acceptance before putting into commissioning/ operation. Requirement of manpower for PAT shall be provided by the Bidder.

All deficiencies found during the inspection and testing should be corrected before start-up. The contractor must demonstrate that all equipment is properly broken in, all equipment not to be used immediately is properly protected, and all measuring equipment is inspected for proper calibration & operation. The contractor is responsible for providing the completed pre-start-up inspections record to the buyer at the final inspections.

The final inspection verifies that corrections have been made and that has been completed in accordance with the approved plans, specification, and change order. The final inspection is accomplished after the wet-run test.

06.04.02.03 The list of defects observed and recorded during PAT shall be liquidated by the successful Bidder to the satisfaction of Purchaser / Consultant, the employer may test run and operate it without relieving the Bidder of his responsibility or guarantee.

06.04.02.04 On successful completion of Preliminary Acceptance Test, Preliminary Acceptance Certificates shall be issued by the Purchaser.

06.04.03 FUNCTIONAL ACCEPTANCE TESTS/ COLD COMMISSIONING TESTS

06.04.03.01 Functional acceptance tests/ cold commissioning comprise testing and evaluation of plant & equipments performance under operating conditions for compliance with project intent.

06.04.03.02 A detailed programme of cold test shall be drawn up by the successful Bidder in advance and shall be discussed and mutually agreed upon and will be reviewed during the cold test.

06.04.03.03 Cold test shall be performed on the individual equipment/ sub-assemblies of the unit/ plant as a whole in consultation with the Purchaser/ Consultant. Cold tests shall be designed to conduct systematic check of the components and of the functional operation thereof.

06.0403.04 Defects shall be listed and shall be rectified by the contractor in accordance with the agreement in all respects.

06.04.04 TRIAL RUN TESTING & COMMISSIONING

06.04.04.01 Trial run testing & commissioning addresses inter-system dependencies and intra-system components to verify safety, standby start and other performance functions that require multi-system interaction in loaded condition.

06.04.04.02 After the issue of Preliminary Acceptance Certificates, the successful bidders shall start-up and commission the facilities after getting clearance from Purchaser.

- 06.04.04.03 The Purchaser shall supply all raw materials, operating personnel, utilities & services required for commissioning. However, the Bidder shall supply commissioning spares and oil, grease, lubricants & chemicals required for commissioning.
- 06.04.04.04 The Bidder shall conduct commissioning test and establish minimum 95 % of the specified equipment / system capacity
- 06.04.04.05 The commissioning certificate shall be issued by the Purchaser subject to the Quality at the termination point of individual system units as mentioned under design basis are also to be shown on individual specifications, successfully achieved during uninterrupted seven days commissioning test run.
- 06.04.04.06 The contractor should complete tests and ensure that all documentation has been submitted as described in the commissioning plan and that all punch list items are complete.
- 06.04.04.07 The system/ equipments deemed to be commissioned on successful completion of the above trial operation. Upon successful completion of trial operation, a protocol shall be signed by the both parties.

06.04.04.08 **Commissioning Report**

After commissioning is complete but before issuing commissioning certificate, the contractor submits the commissioning report.

The commissioning report summarizes for each plant & equipments the intended operational performance, equipment installation, testing equipment and specifications, results of functional performance tests, any operational deficiencies and course of action for their remediation, and compliance with project intent. After buyer's review and written comments and any required revisions, the final report is submitted for approval.

An "interim" Commissioning Report along with corrective action report & schedule for undertaking corrective action is submitted if there are commissioning activities that must occur after acceptance to cover functional and operations testing.

Commissioning Report & Record Book Outline

The Commissioning Report contains two major documents: The Commissioning Record Book and the Commissioning Summary Report. Commissioning Record Book is documentation of the executed Commissioning plan.

The Commissioning Record Book includes:

- Completed pre-functional checklists
- Completed functional tests
- Monitoring reports
- Additional information and documentation added as required (such as completed manufacturer's checklists and documentation of manufacturer start-up).
- Commissioning test run results.

Commissioning Summary Report

Project overview:

- Executive summary
- List of participants & roles
- Brief project description

- Overview of commissioning scope
- General description of testing & verification methods

For each piece of equipment or system, report on:

- Equipment meeting specifications
- Equipment installation
- Functional performance and efficiency
- Brief description of verification & testing methods used and observation & conclusions from the tests
- Equipment documentation & design intent
- Operator training

Appendix materials:

- Detailed list of all outstanding or non-compliance issues, including reference to the specific test, inspection, and trend log, etc., where the deficiency is documented.
- Unresolved issues
- Summary of any design changes and location of additional information
- Commissioning meeting minutes
- Commissioning progress reports
- Site visit reports
- Findings
- Communications
- Etc.

06.04.04.09 **The contractor** to (among other things) submit the following before issue of commissioning certificate:

- Punch list items
- Operation & Maintenance manuals (system operating manuals and maintenance & repair manual) and assurance that O& M training is complete.
 - **System operating manual:** the system operating manual shall provide full and detailed information regarding the design criteria and sizing of facilities, standard operating procedure(SOPs), description and operation of unit processes, process troubleshooting , including report and records, testing procedure, plant staffing, emergency operation and safety and other procedure.
 - **Maintenance & Repair Manual:** the maintenance & repair manual shall provide the construction specification including performance sheets and graphs for installed equipments, catalogue & cuts showing application information, installation information showing minimum acceptable requirement, repair information and part lists, as built equipment list by adding manufacture's name, m/c sl. no, model no. part no.
- As-built drawings
- Post-Installation Measurement & Verification report confirming Plant & equipments' performance.
- Interim or final Commissioning report

06.04.04.10 The Bidder to the satisfaction of the Purchaser has liquidated all the defects/ observations, if any, during commissioning test run.

06.04.04.11 On satisfactory completion of commissioning & purchaser approval, the Bidder will apply to the Purchaser for issue of Commissioning certificate.

06.04.04.12 After issue of commissioning certificate, the successful Bidder shall hand over the plant and equipment after completion of all other obligations stipulated in tender document. The Purchaser shall then be responsible for the care & custody of the facilities together with the risk of loss or damage thereto, and shall thereafter take over the facilities.

06.04.04.13 The Purchaser shall have the right to take possession or use any completed or partially completed work. Such possession or use shall not be deemed to be in acceptance of any work not done in accordance with the Contract with successful Bidder.

06.06 PERFORMANCE GUARANTEE REQUIREMENTS

06.06.01. The Contractor shall undertake trial runs and Performance guarantee tests only after he receives statutory permission for all components, sub components, apparatus, etc, from the concerned authorities.

Performance testing shall be carried out under the direction of Contractor for a period of three weeks after completion of trial runs for the equipments.

The Contractor shall also provide additional performance guarantee for the following;

- i. Shaft lining
- ii. Shaft furnishing
- iii. Head gear
- iv. All permanent fittings
- v. All items under tendered scope of supply.

During this period all the performance parameters shall be continuously recorded in the presence of both parties and shall be proven.

The performance testing shall be carried out in accordance with the standards and principles normally prevalent for similar system in the industry or as directed by the Engineer-In-Charge.

The Performance Guarantee parameters for underground decline, mine development & Ore production with corresponding Acceptable Limit for each PG parameter and related applicable liquidated damages for non-fulfillment of Performance Guarantee parameters shall be as stated in Clause 8.6 (Liquidated damage) in Volume-I of the tender document

06.07 FINAL ACCEPTANCE

06.07.01 Final acceptance shall occur in respect of the facilities when:

- i. The performance guarantee tests have been successfully completed and the guaranteed output and other parameters are met by the successful Bidder, or the amount of liquidated damages specified in the specification, if recoverable, has been recovered by the Purchaser.
- ii. The successful Bidder has fulfilled all the obligations under the specification.
- iii. Submission of final documentation, if any, incorporating latest modification in "As built drawings" to Purchaser.
- iv. The plant has operated successfully for a period of 12 (twelve) months from date of commissioning.

- v. The successful Bidder has liquidated to the satisfaction of purchaser and as per requirement all objections/ observations mentioned during PAT, commissioning and PG Tests.
- vi. The successful Bidder has demonstrated smooth operation of uranium Filtration Plant with complete automation.

06.07.02 At any time after the events set out in the tender document hereof, have occurred, the Successful Bidder may give a notice to the Purchaser requesting for the issue of Final Acceptance Certificate (FAC).

PROJECT SCHEDULE & PROGRESS MONITORING

07.01 The project envisages development of mines and related auxiliary facilities for Chapri Block of HCL. The project is envisaged to be completed within 5 years from Zero Date which shall be reckoned as effective date of contract. However, production of ore from Stopes shall start from 3rd year. Construction of mines and operation of mines will be done parallelly. Zero date and commissioning as mentioned above and shown in the schedule shall be same as defined in the technical and commercial part of the specification.

An indicative Implementation Schedule, in line with the total time period and indicating the major activities, is shown in Drawing for reference.

07.02 Project Schedule

07.02.01 The Tenderer shall submit the following along with the offer.

i) Overall bar-chart schedule

The overall bar-chart schedule should be planned in weeks. The heads to be covered in the schedules shall broadly be as follows:

- Civil work
- Structural work
- Erection of equipment, piping, cables, etc.
- Testing and commissioning

The major milestones for the project are to be highlighted in the schedule.

ii) The overall erection plan –

- Bidder shall make their own arrangement for construction and drinking water.
- Bidder shall make their own arrangement for construction power. However, after commissioning of sub-station, construction power can be given on chargeable basis.
- Area within Battery limit should be utilized for construction and storage area. However, if additional area outside the battery limit is available, the client may permit the bidder to utilize the same.

07.02.02 The tenderer shall submit the following before finalization of contract.

i) Off-site/ on-site organization chart for execution of the project

- ii) Deployment of construction man power
- iii) Details of deployment of equipment and machinery, tools & tackles, etc, required for civil work, structural and equipment erection.
- iii) In case simultaneous erection work is carried out along with civil and structural works, the movement of men, machine and materials at site shall be planned suitably.

07.02.03 The successful tenderer shall have to submit the following -

- i) The Detailed project schedule both in hard and editable soft copy (in MS Project/Primavera) covering further details of construction, fabrication and erection activities, area-wise, within 2 month of effective date of contract for approval and finalisation of the Purchaser / Consultant.
- ii) The format of progress report to be discussed and agreed upon within 1 month of effective date of contract.
- iii) Updated Level-II network along with progress reports (on approved format) every month.
- iv) The erection micro schedule for execution stage is to be submitted 2 months before start of erection at site. However, the micro schedule shall only cover the critical areas.

07.03 **Progress Monitoring**

07.03.01 An effective system of progress monitoring is to be evolved to ensure timely completion of all project activities. In general, progress of the following major activities are to be reported.

- Site activities including receipt of material / equipment at site, erection, testing and commissioning.
- The Contractor shall submit a schedule for site-execution, along with quantitative program in terms of month-wise physical targets for various disciplines of work.
- The monthly progress report shall indicate progress of activities against targeted dates and targeted quantities. Reasons for shortfalls, if any, shall be clearly brought out and proposed remedial measures to arrest the delays shall be indicated by the Contractor in the progress report, wherever applicable.
- The Contractor shall furnish information on site activities viz: daily, weekly and monthly progress reports for construction, receipt of equipment, monthly construction/ erection plan, etc. The Contractor shall also indicate resource deployment at site, highlights of critical areas and constraints in the progress reports.
- Other information related to site activities as may be required by the Purchaser / his consultant, shall also be submitted by the Contractor.

In the interest of timely completion of the project, if required, the area of monitoring can be altered in consultation with the Purchaser/ Consultant.

07.03.02 The Purchaser/Consultant shall also have the right to :

- Invite the Contractor for monthly / fortnightly meetings to review the progress of each activity.
- Depute Purchaser's authorised representatives for ascertaining / expediting progress at contractor's works.
- Suggest remedial actions to bridge-up time gap between planned progress & observed progress.

8. DRAWINGS

- 8.1 Adequate care is taken in scrutiny of drawings and specifications, however any discrepancy between the specifications and the drawings or any error, omission or ambiguity in the specifications or the drawings, shall not invalidate the Contract. The Contractor shall check all drawings furnished to him after approval by Engineer-in-charge immediately upon their receipt and shall promptly notify to the Engineer-in-charge of any omission or discrepancies or mis-description in the drawings and obtain the instructions of the Engineer-in-charge. Any work carried out by the Contractor after discovery by him of such discrepancy, error, omission, or ambiguity without permission by the Engineer-in-charge will be entirely at the Contractor's risk.
- 8.2 Work(s) shown upon the Drawings but not mentioned in the specifications or described in the Scope of Work without being shown on the Drawings shall nevertheless be held to be included in the same manner as if they had been specifically shown upon the drawings and described in the specifications.
- 8.3 Any Work for which no specifications or Drawings have been prescribed or issued by HCL including execution of all details which shall also cover incidental works whether temporary or permanent, which must evidently be required by reasons of the nature of the works included in the contract and are to be carried out by the Contractor in all respects in accordance with the instruction of the Engineer-in-charge.
- 8.4 Drawings and prints or articles, machinery or fabricated materials of work entering into forming part of the permanent construction, which are not provided by HCL and which are required to be furnished by the Contractor, shall be submitted by the Contractor to the Engineer-in-charge for approval. Such approval shall not, however waive or modify any other provision(s) of the Contract.
- 8.5 The entire responsibility of executing the work in an efficient manner and in conformity with HCL's approved drawings and specifications with all modifications shall be that of the Contractor, except to the extent and for the purposes for which liability may have been assumed expressly under the said documents by HCL.
- 8.6 The approved drawings for the Work as and when provided will show conditions as they are believed by HCL to exist based upon the interpretation of field observations. It is not intended and should not be inferred that the conditions as shown therein constitute a representation by HCL or its representatives that such conditions actually exist, neither shall the Contractor be relieved of liability under the Contract nor HCL or any of its representatives shall be liable for any loss sustained by the Contractor as a result of any variation between conditions as shown on the drawings and actual conditions revealed during the progress of the work.
- 8.7 Job besides all other prints used in actual execution by the Contractor. This set shall be designated "Record Prints". A complete and exact record of any and all differences between the Works as actually executed, constructed, erected and the design indicated on the drawings shall be recorded on the "Record Print". Changes made from the design, drawings shall be got approved from the

Engineer-in-charge before any alteration work is started. All “Record Prints” shall become the property of HCL.

- 8.8 Revision of the Drawings: Revision of the drawings will be made as and when deemed necessary by the Engineer-in-charge during the progress of the Work. Additional detailed drawings will be supplied by the Contractor as and when required. These additional/revised drawings shall be considered as forming part of the Contract.
- 8.9 Drawings to be furnished by the Contractor: All drawings/specifications are to be furnished by the Contractor; the same shall be furnished within the specified time. Where approval of drawings before manufacture/construction/fabrication has been specified, it shall be Contractor/s responsibility to have these drawings prepared as per the direction of Engineer-in-charge and got approved before proceeding with manufacture/construction/fabrication as the case may be. Any changes that may have become necessary in these drawings during the execution of the work shall have to be carried out by the Contractor to the satisfaction of the Engineer-in-charge at no extra cost. All final drawings shall bear the certification stamp as indicated below duly signed by both the Contractor and the Engineer-in-charge. The contractor shall furnish drawings in hard copies minimum 3 sets and a soft copy. In addition to these drawings, the contractor shall also digitize the existing drawings used by him.

