Tender Document

Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Period of Contract: Seventeen Months

Part - I: Technical Bid

(Pages 1 – 293)

PREPARED BY CHECKED BY

APPROVED BY

CIVIL PROJECTS & SERVICES

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
BOILER AUXILIARIES PLANT
INDIRA GANDHI INDUSTRIAL COMPLEX
RANIPET - 632 406
TAMILNADU (STATE)

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Bharat Heavy Electricals Limited
Boiler Auxilaries Plant,
Ranipet –632 406

CHAPTER – I

Sealed tenders are invited in two parts bids as per following details in Civil Projects & Services Department, BHEL Ranipet, Tamil Nadu.

NOTICE INVITING TENDER	
1. NIT No	**Tender No – BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022.**
2. Name of work	**Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package.**
3. Period of contract	**Seventeen Months**
4. Estimated Cost of the work:	**Not Applicable – Bidder has to quote the value of contract.**
5. Tender Document Cost	NIL –(can be downloaded free of cost from BHEL web site – http://www.bhel.com/tender/list_tender.php) and from CPP Portal
6. **Earnest Money Deposit** (EMD) Amount	**Rs. 64,15,000/- (Sixty-Four Lakh Fifteen Thousand only).**
7. Last date & Time for receipt of the completed Tender	**22/06/2022 at 15.00 Hrs.**
8. Date of Pre-Bid Meeting	**09/06/2022 at 11.00 Hrs.**
9. Date of Technical Bid Opening	**22/06/2022 at 15.00 Hrs.**
10. Date of Price Bid Opening	Date will be intimated to technically qualified bidders.
11. Place of submission of Tender	**Tender Box placed in** **Office of the AGM,** **Civil Projects & Services,** **BHEL - BAP, Ranipet - 632 406.**
12. Address on the Sealed Tender Cover to be:	Office of The AGM, Civil Projects & Services, Bharat Heavy Electricals Limited, Ranipet - 632 406, Vellore District, Tamil Nadu State.
13. Venue of the Tender Opening	Office of the AGM / Civil Projects & Services ~~Office~~
14. Tender Document Contains:	Total **297** pages (Technical bid & Price bid)
Note : All corrigenda, addenda, amendments, clarifications etc. to the tender specification will be hosted in the web pages (www.bhel.com > Tender notifications . view corrigendum) and CPP Portal only and not in the newspapers. Bidders shall keep themselves updated with all such developments.	

PART 'I' – TECHNICAL BID

CHAPTER - II

INSTRUCTIONS TO THE TENDERERS:

1) The offer shall be submitted as per the instructions of tender document. Only one set of tender document duly signed by authorized representative of tenderer and signed & stamped on each page shall be submitted as detailed further. If a tenderer submits more than one offer, all the offers shall be rejected and none of their offer shall be considered.

2) Tenderer should note specifically that all pages of tender document, including the cover page for this particular tender shall be submitted by them (after signing/ stamping on each page) as a part of their offer. Price shall not be mentioned by them anywhere in the techno-commercial portion of offer, except in the relevant price bid and submitted in separate sealed envelope. In case of any clarification, tenderer may contact this office.

3) Tender documents are available on **BHEL web site** i.e**.** http://www.bhel.com/tender/tender_home.php as well as on **CPP Portal** https://eprocure.gov.in/epublish/app the same shall be downloaded and used as tender document for submitting the bid.

4) The Tender cost is **NIL**, however the expenses for arrangement of required enclosure documents, postage charges etc. shall be borne by the tenderer.

5) All documents submitted by the Tenderer in his tender shall be accompanied with a covering letter giving index interlinking all the documents.

6) No overwriting / correction in tender documents by tenderer shall be allowed. However, if correction is unavoidable, the same must be signed by authorized signatory.

7) Tender must be submitted in two parts, i.e., (I) Technical Bid and (II) Price Bid. The tenderer must submit their tenders in three separate sealed envelopes prominently super scribed as 01)'EMD Deposit', 02)Part – I 'Techno- commercial bid' and 03)Part-II 'Price Bid', along with NIT No. & due date written on each of the envelope. **These three separate envelopes shall together be kept in a fourth envelope super scribed with name of Work, NIT No. & due date of opening**.

8) Techno-commercial bid should contain all the documents in proof of Pre- qualifying criteria, signed tender document having all the pages including all annexures, General and Special Specifications, GCC etc. complete duly signed and stamped.

9) Tenders shall be submitted either by hand in the Tender Drop Box kept in the office of AGM, Civil Project & Services Office, BHEL Ranipet or by "Registered Post with Acknowledgement due". BHEL will not be responsible for the postal delay under any circumstances for non-receipt of Tenders by due date & time.

10) In case envelope is bulky and it is not possible to drop in the Tender Box, the same shall be handed over to any one of the following executives of BHEL.

A. Mr N Arun Prasath, Dy. Manager / Civil Projects & Services Department (CP&S)
B. Ms S.M. Kaviya, Dy. Manager / Civil Projects & Services Department (CP&S)
C. Mr. Amarjeet Kumar, Engineer / Civil Projects & Services Department (CP&S)

11) Tenders received late / Price bid in open condition/ Tenders without EMD shall be rejected summarily.

12) Tenders not meeting the tender Conditions and incomplete in any respect are likely to be rejected.

13) Price Bid should contain only the **"Part-II, Price Schedule"** after quoting the value as specified in the Price bid format.

14) Value quoted shall be inclusive of all like cost of materials, taxes on materials, cost of labours, carriage of materials at site and incidental charges etc. complete but excluding GST. The rate of GST shall be quoted separately in same price bid format.

15) The applicable GST (as quoted by the tenderer / limited to applicable tax, whichever is lesser) can be claimed from BHEL along with their monthly bills for further payment to be made for the authorities concerned. In case of reverse charge applicability, BHEL will not reimburse to the tenderer the reverse charge of GST paid by BHEL.

16) The tenderer, while quoting rate, take into the account the likely expenditure in complying with statutory compliances like PF & ESI contribution, Minimum Wages, Bonus, Holiday & EL wages including related laws and the expenditure. The tenderer shall refer to the General Conditions of Contract which forms a part of NIT in this regard.

17) The contractor shall strictly comply with all statutory regulations relating to labour laws like ESI, PF Contract Labour License (if applicable), Minimum Wages Act etc.,

18) The contractor shall maintain all the records w.r.t. ESI, PF, Wages & Attendance. The minimum wages shall be as per Tamil Nadu: Please note that the minimum wages are normally revised by the authorities from every year in the month of April.

19) Rate shall be quoted as total value of work. excluding GST, which shall be quoted separately in same price bid format.

20) Rates must be quoted in figures as well as in words.

21) On the date of opening of tender, only Technical Bid alone shall be opened.

22) BHEL shall be resorting to Reverse Auction (RA) (As per Guidelines of Reverse Auction 2021) for this tender.

23) The guidelines and terms & conditions for conducting Reverse Auction is given in **Chapter- VI.**

24) BHEL reserves the right to accept or reject any or all offers without assigning any reason thereof. Also BHEL shall not entertain any correspondence from tenderers in this matter (except for the refund of EMD).

25) In case any typing error/other clerical errors is noticed by the tenderer, in the tender documents, the same must be pointed out and got clarified before submission of offer, or else, BHEL's interpretation shall prevail & shall be binding on the tenderer.

26) The Tenderer should accept all terms & conditions of the tender unconditionally. Tenders with deviations from terms and conditions are likely to be rejected.

27) The Tenderers are required to quote for the complete scope of work. Tenders for part of the work or incomplete in any respect are liable to be rejected.

28) No party shall be permitted to tender for work in BHEL in which any of their near relatives is an employee connected with the award and execution of the contract. They shall also intimate the names of persons who are working with them in any capacity or subsequently employed by them and who are near relatives of any employee of the BHEL. Any violation of this condition which comes to the Notice of the BHEL after the contract is awarded will entitle the BHEL to treat the contractors as having committed a breach of contract and to exercise all the rights and remedies available to the BHEL on account thereof.

29) If any information/ documents submitted by contractor are found false/fake at any stage, tender will be cancelled and Earnest Money deposited (EMD) shall be forfeited.

30) Canvassing in any form in connection with tenders is strictly prohibited and the tenders submitted by the tenderers who resort to canvassing will be liable to rejection.

31) If tenderer expires after the submission of his tender or after the acceptance of his tender, BHEL may, at their discretion, cancel such tender. If a partner of a firm expires after submission of tender or after the acceptance of the Tender, BHEL may cancel such Tender at their discretion unless the firm retains its character.

32) The offer of the tenderers who are on the banned list as also the offer of the tenderers, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL web site http://www.bhel.com/vender_registration/pdf/Banned_firms_list_BHEL.pdf

33) Tenderers are requested to go through the scope of work, visit the site/location etc. and get fully acquainted with work place and prevailing working conditions to get all their doubts clarified regarding the work before submitting the offer. Engineer-in-charge's decision will be full and final in this regard. Any queries regarding this tender may be clarified from DM/CP&S on mobile no.:94880 52739, email: smkaviya@bhel.in

34) The tenderers or their representative may attend the opening of technical bid (Part-I) and the technically qualified tenderers or their representative may attend the opening of Price bid (Part-

II), if they so desire. The tenders (both the parts) shall be opened on schedule date & time even if the tenderers or their representative are not present. The representatives should bring authorization letter from their Company's Competent authority for attending the tender opening.

35) The General Terms and conditions and Special Terms & Conditions are complementary to each other and where they are conflict the Special Conditions shall prevail.

CHAPTER – III

Pre-Qualification Requirement

The Scope of Work consists of Design, Engineering Procurement and Construction (EPC), for the complete Civil & Structural & Architectural Works, in BHEL-BAP-Ranipet premises as per the Layout forming part of this tender document.

1) The Tenderer / bidder must have valid PAN no., GST registration No.

2) The tenderer / bidder must submit EMD of Rs. 64,15,000/- (Sixty-Four Lakh Fifteen Thousand only).

3) The tenderer / bidder should have average annual financial turnover not less than Rs. **16.24 Cr.** during the last three years ending on 31/03/2022 (If audited balance available for March 2022, else previous year).

4) The bidder shall furnish solvency certificate for 36Crores.

5) Bidder should possess minimum Three years of work experience during last seven years in similar nature of works like construction of RCC & Pre-Engineered industrial building or structure / manufacturing building or structure including design engineering, supply, fabrication & erection works in any of the following organizations Central government / PSU / State government / Reputed private sectors in any of Indian state or Union Territory as on the day of last date of submission of PQ document **(22/06/2022)** and should enclose proof of the same.

6) Bidder shall submit necessary evidence meeting the following criteria, like self-attested copies of work orders/work execution agreement/work completion certificates from clients.

   i) Three similar composite works each costing not less than Rs. **21.65 Cr.**

   (or)

   ii) Two similar composite works each costing not less than Rs. **27.06 Cr.**

   (or)

   iii) One similar composite work costing not less than Rs. **43.30 Cr.**

Work completion certificate shall comprise of order value and executed value. Bidders should have executed the work directly or through pre-bid consortium/partner.

In such case experience of consortium/partner, certificate of consortium in support of work completed shall be submitted.

In case the bidder does not have their own establishment of Workshop for PEB, then the bidder can have pre-bid tie-up with an agency having workshop facility and should have fabricated average annual job of minimum **500MT or more** during the last three financial year ending on 31/03/2022.

In case the bidder does not have their own establishment of Design & Engineering facilities, then the bidder can have pre-bid tie-up with a Design Consultant having average annual turnover of minimum **50 Lakh or more** during the last three financial year ending on 31/03/2022.

The bidding capacity of the applicant should be more than the quoted value of the work put to Prequalification.

The bidding capacity shall be worked out and declared by the applicant/ bidder and enclosed with the request for document based on the formula:

(A x N x 2) - B

where,
A- Maximum value of work executed during the contract period in the last 5 years at current price (CPWD price index) level taking into account the work completed as well as work in progress.

B- Value of existing commitments and ongoing work to be completed during the next 'N' years at current price level.

N- (N=1.50) Number of years prescribed for completion of the subject contract for which bids are invited.

Note: For evaluation of the bid the executed value mentioned in the work completion certificate will be considered. Bidder should specifically mention fulfilling of above criteria in their offer along with details of work orders & work completion certificates issued by clients.

DOCUMENTS REQUIRED IN SUPPORT OF PRE-QUALIFYING REQUIREMENT:

i) Complete tender document in all respects duly signed & stamped on each and every page by the authorized signatory of the tenderer as a token of acceptance of all the terms and conditions of tender.

ii) Self-attested Copy of the valid **PAN card and Certificate of Registration of GST**.

iii) Self-attested Copy of Balance Sheet and profits & loss Account statements duly certified by CA of last three financial years. Escalation of 50% will be considered for first covid 2019-20 and 30% for the second covid 2020-21 subject to previous years Turn over.

iv) Self-Attested copies of acknowledgements of IT return of last three financial years.

v) Self-attested Copies of Work Orders / Award letters / LOI / Contract Agreement along with certificates of successful completion in support of proof of experience for the works executed by the tenderer during last 7 years ending on the date of publishing of this tender. BHEL

reserves the right to cross check the documents from the issuing department, and / or call for any additional documents including Bank Statement for verification.

vi) The net worth of the bidder should be positive as evidenced from audited accounts of last financial year.

vii) In case Bidder is a Consortium / Joint deed of undertaking of company, the above requirements / credential of consortium leader / bidder shall be considered.

viii) If Bidder or its Partner(s) or Director(s) is / are / was Black Listed / Deregistered / Stopped or banned from dealing in the past by any Govt, Undertakings / Depts. / Authorities and Govt. supported companies / undertakings / organizations, bid of that party may be liable to be rejected.

ix) Integrity pact (IP) shall be applicable for this tender / contract. This integrity pact issued as part of the Tender documents, shall be submitted by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. Only those vendors / bidders who have entered into such an IP with BHEL shall be considered qualified to participate in the bidding. Entering into this pact shall be a preliminary qualification.

LANGUAGE OF BID:

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Company, shall be written in the English language. Any printed literature furnished by the Bidder, written in any other language shall be accompanied by an English translation for the purpose of interpretation of the Bid.

CHAPTER – IV

SPECIAL TERMS AND CONDITIONS FOR TENDERERS

1) **PRICE VARIATION:** The values quoted by the bidder are firm throughout the contract period of Seventeen months and as well as for the extended period also with ref to the extended period attributable to the bidder.

2) **PRE-BID CLARIFICATIONS:**

a) DM/ CP&S shall be contacted for clarifications of any doubts, on any conditions of the contract, specifications etc. through e-mail: smkaviya@bhel.in
b) Any modification arising out of the clarifications shall be formalized by issue of amendments to the Tender Documents in BHEL web site through corrigendum.
c) Tenderers are requested to visit the site before quoting to assess the nature and volume of work involved.
d) A pre-bid meeting shall be conducted with all prospective tenderers on dated: 09/06/2022 from 11:00 AM to 01:00PM in the office of AGM (CP&S), BHEL Ranipet, Tamilnadu.

3) **VALIDITY OF RATES:** Validity of rates will be **90 days** from the date of opening of the techno- commercial bid.

4) **EVALUATION CRITERIA**: Evaluation of the tender will be done on overall quote basis inclusive of GST. Order will be placed on overall L-1 rate for complete work. In case of tie between the rates of two or more tenderers, the Snap bidding system will be followed to arrive the L-1 tenderer. Tenderer should double ensure the rate quoted and calculation done.

5) **CORRECTION IN ARITHMETIC ERROR:** In case of error in calculation in quoting the rates by tenderer, correction shall be done as below:

   a) If, in the price quoted, there is a discrepancy between sl. no. of price schedule (1) Work value, (2) GST value & (3) Total value quoted by the tenderer and the sub total done, the subtotals shall prevail.

   b) If there is a discrepancy between writing the percentage and the value of percentage calculated on GST value, the percentage figure shall prevail and calculation shall be corrected provided the same percentage is written in words also. Unless in the opinion of the BHEL there is an obvious misplacement of the decimal point in the percentage rate, in which case the calculated price as quoted shall govern and the percentage rate corrected accordingly.

   c) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

   d) If there is a discrepancy between words and figures in quoting the percentage, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (a) and (b) above.

   e) If there is such discrepancy in an offer, the same shall be conveyed to the tenderer with target date up to which the tenderer has to send his acceptance on the above lines and if the tenderer does not agree to the decision of BHEL, the bid is liable to be rejected.

6) **EARNEST MONEY DEPOSIT (EMD):** Tenderer (including MSME) must submit EMD of **Rs. 64,15,000/- (Sixty-Four Lakh Fifteen Thousand only)** in a separate sealed envelope along with technical bid (Part-I). Tenders without EMD shall be rejected summarily.

   Earnest Money is to be paid by each tenderer (including MSME) to ensure that the tenderer does not refuse to execute the work after it is awarded to him. EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of acceptance of award of work. EMD shall not carry any interest. EMD by the Tenderer will be forfeited if:

   i) After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates.
   ii) The tenderer does not commence the work within the period as per LOI / Contract.

EMD shall be furnished only in the following forms:

a) Cash deposit as permissible under the extant Income Tax Act.
b) Electronic Fund Transfer credited in BHEL account.
c) Banker's Cheque / Pay Order / Demand Draft in favour of BHEL, payable at Ranipet.
d) Fixed Deposit Receipt (FDR) issued by scheduled Banks /Public Financial Institutions as defined in the companies Act (FDR should be in the name of the Contractor, a/c BHEL).
e) In addition to above, the EMD amount in excess of Rupees Two lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.

BHEL has now made arrangements for payment **of EMD thru' Online**: The steps to make online payment for EMD are detailed as below:

i) Visit https://www.onlinesbi.com/prelogin/icollecthome.htm
ii) Click 'Proceed' button.
iii) Select 'Tamilnadu' in the drop down menu under 'State of Corporate / Institution *"
iv) Select 'PSU-PUBLIC SECTOR UNDERTAKING' in the next drop down menu under "Type of Corporate / Institution"
v) Click 'Go' button
vi) Select 'BHEL BAP RANIPET' in the drop down menu under "PSU – PUBLIC SECTOR UNDERTAKING'
vii) Click 'Submit' Button
viii) Select 'EMD' in the drop down menu under 'Select Payment Category'
ix) Now Fill in the required details and ensure correctness of data filled. Ensure that you are entering correct enquiry/tender number and other details correctly.
x) Make payment for EMD as required in tender after entering the details and enclose copy of receipt along with tender documents. Scan and upload the receipt document in case of tender under e- procurement mode.

7) **CONTRACT PERIOD:** A contract agreement shall be signed by the successful tenderer before the start of work. The contract period will be for **Seventeen (17) Months.** Entire work has to be completed within the contract period failing which liquidated damages (L.D.) will be imposed.

8) **CONTRACT AGREEMENT:** A contract agreement shall be signed before the start of work on a non-Judicial stamp paper of minimum Rs 100/-. The contract agreement shall be deemed to have become effective from the forenoon of date of award, and will remain in force for the contract period of **Seventeen (17) Months.** However, this Agreement may be terminated earlier by BHEL at any time by giving one month's notice to the Contractor due to any failure on the part of the Contractor in discharging his obligations under the contact, without prejudice to the rights of BHEL to recover any money becoming due under this Agreement. In such a case, the Contractor shall not be entitled to any compensation thereof. The decision of the BHEL about the failure on the part of the Contractor shall be final and binding on the Contractor. The Contract Agreement will be governed by the BHEL General Conditions of Contract in force (GCC).

9) **GUARANTEE / MAINTENANCE PERIOD:** The guarantee / maintenance period is 12 months for this contract. 50% of the Security Deposit (SD) amount will be released after completion of contract subject to No Due Certificates produced by bidder & satisfactory certificate issued by Engineer-in-charge. Balance 50% SD will be released after completion of maintenance period subject to satisfactory certificate issued by Engineer-in-charge.

10) **SECURITY DEPOSIT:**

a) The total amount of **Security Deposit (SD) will be 5% of the contract value**. EMD of the successful tenderer shall be converted and adjusted against the security deposit.

b) 50% of the required Security Deposit, including the EMD, shall be collected before the start of the work. The balance amount to make up the required Security Deposit of 5% of the contract value may be submitted in the following forms:
   i. Cash (as permissible under the extant Income Tax Act)
   ii. Local cheques of scheduled banks (subject to realization)
   iii. Pay order / Demand draft / Electronic fund transfer in favour of BHEL,
   iv. Bank guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.
   v. Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/c BHEL, duly discharged on the back.
   vi. Securities available from Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed / hypothecated / pledged, as applicable, in favour of BHEL).

c) Balance of the Security Deposit can also be collected by deducting **10%** of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected.
(Note: BHEL will not be liable or responsible in any manner for the collection of Interest or renewal of the documents or in any other matter connected therewith.)

d) Security Deposit shall be released to the Contractor upon fulfillment of Contractual obligations as per terms of the Contract.

e) Security Deposit shall not carry any interest.

f) If the value of work done any time exceeds the contract value, the excess amount of Security Deposit so calculated shall be recovered from the contractor.

g) Failure to pay the security deposit shall be treated as failure to discharge the duties under the contract and shall result in cancellation of the contract and the contractor shall be liable to compensate BHEL for any losses incurred by BHEL. BHEL reserves the right to appropriate any part / whole of the amount of the security deposit without prejudice to other claims against the contractor for losses suffered by BHEL due to failures on the part of the contractor, due to termination of contract or contractor becoming disqualified because of liquidation / insolvency.

The decision of BHEL in respect of such losses, damages, charges, expenses or costs, shall be final and binding to the contractor.

11) **QUANTITY VARIATION:**

The quantity of items required to complete the entire work may vary on either side i.e. below or above due to prevailing condition at the time of engineering & execution of contract and contractor shall not claim any compensation due to quantity variation.

12) **WATER & ELECTRICITY:** Water and electricity shall be supplied to the contractor by BHEL subject to the following conditions: -

a) Water and Electricity required for the work will be given by BHEL from the nearest tapping point at the recovery rates specified below. The contractor should make necessary arrangement for tapping the same at his own cost.
b) The recovery rates towards the cost for these facilities mentioned in scope of work and charges will be effected from the bills on the executed value as certified by the Engineer- in-Charge based on the usage of power and water.

c) In case the above facilities are not provided by BHEL, the contractor has to arrange these facilities at his own cost and the recovery rates will not be effected on the executed value as certified by the Engineer- in-Charge.

d) Contractor shall make his/ their own arrangement of water/ electricity connection and laying of pipelines/ connection from existing main of source of supply as directed by Engineer-in-charge.

e) BHEL do not guaranty to maintain uninterrupted supply of water/ electricity and it will be incumbent on the contractor to make alternative arrangement for proper supply of the same at his/ their own cost in the event of any break down in the government water/ electricity mains so that the progress of his/ their work is not held up for the want of the same. No claim of damage or refund will be entertained on account of such break down.

13) **PAYMENT TERMS:**

a) Payment shall be made for the actual executed percentage of work after recording joint measurement protocol mutually agreed upon during engineering stage of contract by Engineer-in-charge.

b) All works percentage wise shall be paid as per the Percentage Breakup Schedule as approved during contract agreement.

c) For measurement of work the norms of Indian Standards (IS) as mentioned in CPWD specifications for each items of work shall be followed.

d) Measurement shall be taken jointly by Engineer-in-charge or his authorized representative on the part of the BHEL & the contractor.

e) The contractor shall provide assistance with appliance and other things necessary for measurement without extra charge.

f) If the contractor / his representative fails to attend when required for measurement, the Engineer-in-charge shall have power to proceed by himself to take measurements and in that case, these measurements shall be accepted by the contractor as final.

g) No advance payment will be made to the contractor.

h) No payment shall be made for the work done without the permission of Engineer-in-charge.

i) Running bills payment (If demanded by contractor) against the work executed shall be made to the contractor. However only one running bill will be accepted in a month.

j) After submission of bill by the contractor, the measurement shall be verified & checked and then only the bill shall be processed.

k) Running bills against work contractors shall be submitted to the finance for payment within 15 days from the date of measurement, Finance will process such bills and release the payment within 30 days normally after receiving the bills in Finance.

l) The payment of final bill will be made only after obtaining certificate of satisfactory completion of the work by the Engineer in-charge, clearance of the site, clearance of all the liabilities on contractor's part & submission of Indemnity Bond as per prescribed format. No claim will be entertained after signing the final bill.

m) Payment of GST will be made on actual applicable GST rate.

n) Applicable GST shall be paid by BHEL on submission of GST complied invoice under Goods and Service Tax Law.

o) The contractor shall not be entitled to any interest with respect to any money which may be due to him from BHEL.

p) All payment will be subject to deduction of taxes at source as per Income Tax Act & Rules.

q) Any tax incurred on purchase of materials by the contractor in respect of this contract shall be treated as included in the charges and BHEL will not entertain any additional claim whatsoever in this respect.

r) BHEL shall have the right to recover any money which in the sole opinion of BHEL is due from the Contractor from any money due to the Contractor under this Contract or any other contract or from the security Deposit furnished by the Contractor under this contract or any other contract.

s) All the bills of contractors will be cleared by Finance department subject to production of "Clearance certificate' by the contractors in respect of compliance of all statutory requirements, issued by IR /Welfare section of Human Resource Department.

14) **PROGRESS OF WORK AND L.D. FOR DELAY:**

The project is time bound and works shall have to be carried out at desired pace throughout the execution period so as to complete the work in the stipulated time.

In case work is not completed within schedule completion, the L.D. shall be imposed at the rate specified in clause 41 of GCC.

15) **TECHNICAL SPECIFICATIONS & SCOPE OF WORK:**

a) The work will be carried out as per Special Technical requirements annexed in file no-01 to file no-06.20 a**nd as per latest "CPWD Specifications"** for all the works. In case of any doubt regarding the specification and its quality of work, Engineer in Charge's clarification and decision will be final and binding on the contractor.

b) All the materials required to complete the work shall be arranged by the contractor. The materials should be conforming to the relevant IS codes of latest revision.

c) All tools and tackles required for proper completion of work shall be arranged by contractor.

d) The contractor should extend fullest co-operation with the third party agencies engaged, if any by BHEL to adhere the Quality Control Procedures ensuring quality.

e) The contractor should extend full co-operation to the other contractors who may be doing other works in the same area to enable them to execute their portions of work without any delay or difficulty.

f) The Engineer – in – charge will communicate or confirm his instructions to the contractor in respect of the execution of the work in a "**work site order book**" maintained at his office and confirm receipt of such instructions by signing the relevant entries in this book. Such entries will rank as order or notices in writing within the intent and meaning of these conditions.

16) **SUPERVISION OF WORK**:

The contractor will deploy sufficient numbers of Supervisors/ Engineers of appropriate qualification and experience to ensure proper execution of work. They will carry out instructions of Engineer-in-charge and other senior officers of BHEL during the progress of work.

17) **QUALITY OF WORK:**

a) After the award of work, the contractor shall prepare and submit **quality assurance program** and schedule for work completion / comply with any other quality plan requirement and schedule for work completion proposed by BHEL with all details and indicate the field equipment that he is going to use for quality assurance.

b) Any work found defective / unsatisfactory the contractor has to rectify the same at his own cost. In case the contractor fails to rectify the defects within a specified time as per the

Engineer – in – charge's instructions the same will be got done by BHEL at the risk and cost of the contractor and the cost deducted from the contractor's bill.

c) Regular meeting (fortnightly or as decided by BHEL) shall be held between BHEL and contractor to review the issues related to progress, penalty, quality and any other aspect.

18) **SITE CLEARANCE:**

a) Written permission for erection of temporary work sheds at site will have to be obtained from BHEL.

b) Once the work is completed, the contractor shall remove his temporary shed and the unwanted materials and also dispose the debris as instructed by the Engineer – in – charge.

c) Final bill shall be forwarded only after clearance of site as per the satisfaction of Engineer-in-charge.

19) **GOODS AND SERVICES TAX (GST) COMPLIANCE|:**

a) **Registration & GST Rate:**

i) Tenderer shall indicate GSTIN No. (Copy of GST registration to be enclosed) and PAN No. (copy of PAN to be enclosed).
ii) Central Tax/ State Tax/ Integrated Tax/ Union Territory tax to be quoted as extra in %.
iii) Tenderer to ensure correct applicability of Central Tax/ State Tax/ Integrated Tax/ Union Territory tax based on the Inter / Intra state movement Supply of goods and provision services or both.

b) **Invoicing & Payment:** The Tax Invoice for supply of Goods & Services shall be raised as per the provision of GST Act & Rules and must compulsorily mention the following: -

i) BHEL-RANIPET GSTIN: 33AAACB4146P2ZL
ii) HSN Code or Service Accounting Code for supply of goods or services.
iii) Name & address of supplier/ Contractor
iv) GSTIN of Supplier/ Contractor
v) Consecutive Serial Number & date of issue
vi) Description of goods or services
vii) Total value of supply
viii) Taxable value of supply
ix) Tax Rate – Central Tax & State Tax or Integrated Tax, Cess
x) Amount of Tax charged
xi) Place of supply
xii) Address of delivery if different from place of supply
xiii) Signature of authorized signatory

c) **Reimbursement of GST**: Reimbursement of GST to the tenderer/ vendor is contingent upon complying with the following condition by the service provider: -

i) Uploading the onward GST Return (GSTR-1) in GSTN Network portal within the statutory time period.
ii) Discharging the GST tax liability to the Government.
iii) Submission of Tax Invoice to BHEL.
iv) Submission of proof of payment of GST to BHEL.
v) Availing Input Tax Credit by BHEL.

d) **Input Tax Credit:**

i) In case GST credit is delayed/ denied to BHEL, due to non/delayed receipt of goods and/or services and/or tax invoice or expiry of timeline prescribed in GST Law for availing such ITC, or any other reason not attributable to BHEL, GST amount shall be recoverable from Vendor/ Contractor along with interest & penalty levied/ leviable.
ii) In case vendor/ Contractor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/ Contractor along with interest & penalty levied/ leviable on BHEL.
iii) In case of discrepancy in the data uploaded by supplier/ contractor in the GSTN portal or in case of any incomplete work/service, then BHEL will not be able to avail the tax credit and will notify the supplier/ contractor of the same. Supplier/ contractor has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal).
iv) For any such delay in availing of tax credit for reasons attributable to vendor / contractor (as mentioned above), interest as per the GST Act & Rules, along with penalty, if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.

e) **Penalty for Non-compliance of GST Act:** Penalty amount so determined along with GST if applicable thereon shall be recovered from the Tenderer/contractor.

f) **Other Provision:**

i) Any reduction in rate of Tax on any supply of goods or services or the benefit of input tax credit shall be passed on to the recipient by way of commensurate reduction in prices.

ii) The tenderer should quote the applicable taxes and duties in the price bid (Part-II).

iii) All the terms & conditions of the contract with respect to Taxes & Duties are subject to the new taxation laws introduced from time to time (e.g., GST). The terms & conditions will be modified in accordance with the revision laws.

20) **SUBMISSION OF DOCUMENTS OF LABOUR LICENCE, PF & ESI:** The contractor shall have Labour License PF code number & ESI code number before the start of work.

21) **COMPENSATION TO CONTRACT WORKERS:**

BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

i) **Victim:** Any person who suffers permanent disablement or dies in an accident as defined below.

ii) **Accident:** Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories / offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works / during working at BHEL Units / Townships and premises / Project Sites.

iii) **Compensation in respect of each of the victims:**

a) In the event of death or permanent disability resulting from Loss of both limbs: **Rs.10,00,000/- (Rs. Ten Lakh)**
b) In the event of other permanent disability: **Rs.7,00,000/- (Rs. Seven Lakh)**

iv) **Permanent Disablement:** A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923."

v) The compensation details are provided at: http://intranet.bhel.in/HR%20Cirulars/HR%20Circular%20No.%20016%20OF%202018.pdf

CHAPTER-V

SCHEDULES AND ANNEXURES FOR SUBMISSION BY TENDERER:

Following Annexures and schedules and shall be submitted by tenderer duly signed and stamped along with Techno-Commercial offer:

i) Contact details of the tenderer as per Annexure-I
ii) Declaration Certificate as per Annexure-II
iii) GST Quote as per Annexure-III
iv) Certificate of No Deviation as per Annexure- IV
v) Acceptance for payment by EFT/ RTG as per Annexure-V
vi) INTEGRITY PACT as per Annexure-VI
vii) Consortium Agreement as per Annexure-VII
viii) Indemnity Agreement as per Annexure-VIII
ix) SCHEDULE - A : List of Works & Prices
x) SCHEDULE - B : Free Issue of Materials
xi) SCHEDULE - C : List of Tools and Plants to be issued on hire to Contractor
xii) SCHEDULE - D : List of drawings

ANNEXURE- I

CONTACT DETAILS OF TENDERER

Name of the Contractor /Party/ Firm	
Name of Authorized Representative	
Mailing Address	
Phone/ Landline Nos.	
Mobile Nos.	
E-Mail Address	
Web Site Address (If Any)	

(Signature & seal of the Tenderer)

ANNEXURE-II

DECLARATION BY THE TENDERER

I / We, do hereby declare that there is no case with the Police/Court/Regulatory authorities against the proprietor/firm/partner. Also I/We have not been suspended / delisted / blacklisted by any other Govt. Department/ Ministry /Public Sector Undertaking/ Autonomous Body/Financial institution/Court. We also certify that either our firm or any of the partners are not involved in any scam or disciplinary proceedings settled or pending adjudication.

(Signature & seal of the Tenderer)

Place:

Date:

ANNEXURE-III

GST QUOTE BY THE TENDERER

Name of work: Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

The quoted rate for the work shall be inclusive of all taxes other than GST.

1. The tenderer has to quote GST rate extra as applicable in the tabulation given in the Price Bid. If GST is not indicated separately in the price bid schedule, it will be presumed that the quoted rate is inclusive of applicable GST and bids will be evaluated accordingly.

2. In case of reverse charge applicability, BHEL will not reimburse to the tenderer the reverse charge of GST paid by BHEL.

Tenderers are requested to fill the full GST for the quoted rate as applicable for this tender in the following tabulation.

Sl No	GST	Service Account Code (SAC)	Applicable GST % (Fill the applicable GST % as quoted by you in the Price Bid)	Applicable GST Amount (Amount not to be filled in this technical bid) - Tick Quoted / Not Quoted only	Remarks
1	CGST	9987		Quoted / Not Quoted	
2	SGST	9987		Quoted / Not Quoted	
3	IGST			Quoted / Not Quoted	
4	GGST			Quoted / Not Quoted	
5	CESS			Quoted / Not Quoted	

Note: Any statutory variation in GST rate during contract period shall be reimbursed by the Company based on claim by the Agency along with valid documentary evidence.

(Signature & seal of the Tenderer)

ANNEXURE-IV

CERTIFICATE OF NO DEVIATION

Tender Notice Ref - BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022

I / We have submitted our offer for this tender. I / We have fully gone through, understood and accepted all specifications, terms & conditions of the whole tender documents uploaded in BHEL web site including all corrigenda, addenda etc. published in the website time to time for this tender.

I / We hereby confirm that we have not changed/ modified/materially altered any of the tender documents as downloaded from the website/ issued by BHEL and in case of such observance at any stage, it shall be treated as null and void.

I / We also hereby confirm that we have neither set any Terms and Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT/Tender Specification.

I / We further confirm our unqualified acceptance to all Terms and Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

I / We have submitted our offer for this tender. I / We have fully gone through, understood and accepted all specifications, terms & conditions of the whole tender documents uploaded in BHEL web site including all corrigenda, addenda etc published in the website time to time for this tender.

(Signature & seal of the Tenderer)

Place:

Date:

Bharat Heavy Electricals Limited
Boiler Auxilaries Plant,
Ranipet –632 406

ANNEXURE – V

Acceptance for Electronic Fund Transfer / RTGS Transfer

01	**Name & Address Of The Supplier / Vendor**	Pan No | | | | | | | | | | | |
02	**Vendor Code** (If applicable)	
03	**Details of Bank Account:**	
A)	**Name & Address of The Bank** (With Pin Code)	
B)	**Bank Telephone Number** (With STD Code)	
C)	**Bank Branch Code**	
D)	**MICR Code**	
E)	**Account Number**	
F)	**Type of Account**	Current A/C / Od / Cash Credit
G)	**Vendor Name as per Bank Records**	
H)	**Bank Branch RTGS IFSC Code**	
I)	**Bank Branch NEFT IFSC Code**	
J)	**Your Email Id** (Give Two Ids)	01)
		02)
K)	**Name of Authorized Signatory**	

CERTIFICATE

I / We hereby agree to receive the payments due from BHARAT HEAVY ELECTRICALS LIMITED, RANIPET by the National Electronic Funds Transfer and/or RTGS Transfer mode by credit to my / our above mentioned Bank Account. I / We also agree that payments made to the above mentioned Account is a valid discharge of the liability of Bharat Heavy Electricals Limited, Ranipet. I / We also agree to bear the applicable Bank Charges for the above mode of transfer.

AUTHORISED SIGNATORY OF VENDOR WITH SEAL

Banker's Certification

We confirm that we are enabled for receiving RTGS and NEFT credits and we further confirm that the account number of _____
(name of account holder), the signature of the authorized signatory and the MICR and IFSC codes of our Branch mentioned above are correct.

PLACE:

DATE:

_____
(Manager / Officer's
signature Under Bank stamp)
Authorisation No._____

ANNEXURE – VI

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

……. (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

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

In order to achieve these goals, the Principal will appoint independent External Monitor(s), who will monitor the tender process and the execution of the Contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular. before and during the tender 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 tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other

statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or 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.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant India Penal Code(IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(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.

2.1.4 Foreign Bidder(s)/ Contractor (s) shall disclose the name and address of agents and representatives in India and Indian bidder(s(/Contractor(s) to disclose their foreign principals or associates. The bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

2.2 The Bidder(s)/ Contractor (s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The bidder(s)/Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from Tender process and exclusion from future Contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors" framed by the Principal.

Section 4 -Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 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 tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 -Equal treatment of all Bidders/ Contractors / Sub-Contractors

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all Bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Sub-contractors

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

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all Contract documentation of the Principal including that provided by the Bidder(s) / Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-Contractor(s). The Monitor is under Contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with non-disclosure agreement.,

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired, transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible who would look in to the records, conduct an investigation, and submit their joint recommendations to the management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the commission, in case of suspicion of serious irregularities requiring legal/administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9.IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organization.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty/guarantee etc. should be outside the purview of IEMs.

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

Section 10 - Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those Bidders / Contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

…… ……

For & On behalf of the Principal (Office Seal)

Place----------
Date----------

Witness:……
(Name & Address) ……

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

Place ----------
Date ----------

Witness:…….
(Name & Address) ……

ANNEXURE – VII

CONSORTIUM AGREEMENT

(To be executed on stamp paper of appropriate value)

THIS **CONSORTIUM** AGREEMENT is entered into on this the …… day of…… 2022,

AMONGST

1. {… ...., a company incorporated under the provisions of Companies Act,1956 / a partnership firm registered under the Indian Partnership Act, 1932 / Limited Liability Partnership Act, 2008} and having its {registered office/offices} at…… (hereinafter referred to as the **"First Part** "or the **"Primary Bidder"** which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

2. {…....., a company incorporated under the provisions of Companies Act,1956 / a partnership firm registered under the Indian Partnership Act, 1932 / Limited Liability Partnership Act, 2008}and having its {registered office/offices} at…… (hereinafter referred to as the **"Second Part"** or the **"1st Consortium Member"** which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

3. {… ....., a company incorporated under the provisions of Companies Act,1956 / a partnership firm registered under the Indian Partnership Act, 1932 / Limited Liability Partnership Act, 2008} and having its {registered office/offices} at…… (hereinafter referred to as the **"Third Part"** or the **"2nd Consortium Member"** which expression shall, unless repugnant to the context include its successors and permitted assigns)

The above mentioned parties of the FIRST, SECOND and THIRD PART are collectively referred to as the **"Parties"** and each is individually referred to as a **"Party"**

WHEREAS:

a) Bharat Heavy Electricals Ltd, a Government of India Undertaking, Ranipet (hereinafter referred to as the "BHEL" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) has invited bids **("bids")** by its tender vide reference No BAP:CP&S/ISRO/2022-23 dated: 28/05/2022 (hereinafter referred as **"TENDER") for "Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package" (the "Project/Contract").**

b) The Parties are interested in jointly bidding for the Contract as members of a Consortium and in accordance with the terms and conditions of the Tender Bidding Documents in respect of the Contract, and

c) It is a necessary condition under the Bidding Documents that the members of the Consortium shall enter into a Consortium Agreement (the **"Agreement")** and furnish a copy thereof with the bid.

NOW IT IS HEREBY AGREED as follows:

1. Definitions and Interpretations

In this Agreement, the capitalized terms shall, unless the context otherwise requires, have the meaning ascribed thereto under the Bidding Documents.

2. Consortium

The Parties do hereby irrevocably constitute a consortium **(the "Consortium")** for the purposes of jointly participating in the bidding process for the Project.

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 Contract, either directly or indirectly or through any of their associates.

3. Role of the Parties

The Parties hereby undertake that Party of the First Part is fulfilling the prequalification criteria as per the requirement of **"Tender"** in all respects and shall be the **"Primary Bidder"** 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 until the signing of the Contract when all the obligations of the Consortium shall become effective.

The project shall be executed by the **"Primary Bidder"** as a whole and solely responsible to BHEL for all the activities mentioned in the Tender Document including financial liabilities (Reference to the Tender Document).

4. Joint and Several Liability

The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the Project and in accordance with the terms of the Tender Bidding Documents and the Contract, during subsistence of the Contract.

5. 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 India 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 authorized by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution or any other resolution/ Power of Attorney in favor 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,

i) require any consent or approval not already obtained;
ii) violate any Applicable Law presently in effect and having applicability to it.
iii) violate the memorandum and articles of association, bye-laws or other applicable organizational documents thereof;
iv) violate any clearance, permit, concession, grant, license or other Governmental authorization, approval, judgment, 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 assets are bound or that is otherwise applicable to such Party; or
v) 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 other 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 business of such Party so as to prevent such Party from fulfilling its obligations under this Agreement;

c. This Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and

d. 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.

6. Conflict of Interest:

The Parties herein undertake to take all necessary measures in order to avoid any conflict of interest during the performance of the project or the contract for **"Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package"** and also to identify any conflict of interest so that BHEL Can consult with the Lead Partner and other Parties to sort out such Conflicts.

7. Post Contract Liabilities:

For any loss or damage on account of any breach of this Agreement or the contract for **"Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package**" or any shortfall in the execution of the Project, meeting the guaranteed performance/parameters as per technical specifications / documents relating to the Tender, **"Primary Bidder"** undertake to promptly make good such loss or damage on BHEL's demand without any demur. BHEL shall have the right to proceed against any one of the Parties herein in this regard without establishing the individual liability of such party and it shall neither be necessary nor obligatory on the part of BHEL to proceed against the **"Primary Bidder"** before proceeding against the other Parties herein.

8. **Assignment**:

The rights and obligations of First and Second Consortium Member under this Agreement shall not be assigned to any third party without the prior written consent of BHEL.

9. Employers' responsibility:

Each Party will be responsible according to the applicable laws and rules for their own personnel and property.

10. **Insurance**:

The Parties herein shall at their own expense take out and maintain insurance over as may be necessary to cover their liabilities.

11. Applicable Law:

This Consortium Agreement shall be governed, construed and interpreted in accordance with the laws of India and the Courts in _____ (Name of the place) shall have the exclusive jurisdiction in all matters arising hereunder.

12. Termination

This Agreement shall be effective from the date hereof and shall continue till the expiry of the Defect Liability period under the Agreement. However, in case the Consortium is either not pre-qualified or does not get selected for award of the Contract, the Agreement will stand terminated in case the Consortium is not prequalified or upon return of the tender EMD by BHEL to the Consortium, as the case may be. None of the parties will be entitled to terminate their association with the Consortium, till return of the tender EMD by the Consortium or payment of the amount specified in the Financial Bid by the Consortium, whichever is later.

13. Indemnification:

All consortium members of this agreement shall fully indemnify, hold harmless and defend BHEL and its officers etc., from and against all claims, liabilities, suits, damages including any criminal liability due to false declaration by the consortium members with regard to this Agreement (or) Tender transaction (or) Project (or) contract etc., caused due to negligence/commission/omission of the any of the consortium members (or) its employees and agents including representatives (or) sub-contractors (or) any other person claiming (or) any other person claiming under this tender (or) under the applicable laws of India.

The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior approval of BHEL.

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	For and on behalf of	For and on behalf of
LEAD MEMBER by:	SECOND PART by:	THIRD PART by:

(Signature)	(Signature)	(Signature)
(Name)	(Name)	(Name)
(Designation)	(Designation)	(Designation)
(Address)	(Address)	(Address)

In the presence of:

1.

2.

Notes:

1. *The mode of the execution of the Consortium Agreement should be in accordance with the applicable laws.*

2. *Each Consortium Agreement should attach a copy of the extract of the charter documents and documents such as resolution / Power of Attorney in favor of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Consortium Member.*

3. *The successful bidder shall have to execute the "JOINT DEED OF UNDERTAKING "in the format to be made available by BHEL at the time of awarding.*

ANNEXURE – VIII

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

This Indemnity Bond executed by <name of company> having their Registered Office at <xxxxxxxxxxx> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort, Asiad, New Delhi - 110049 through its Unit at Boiler Auxiliaries Plant, Ranipet –632 406, Tamilnadu. (Hereinafter referred to as the Company).

And whereas the Company has entered into a Contract with M/s xxxxxxxxx, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxx".

AND WHEREAS under the provisions of GCC further stipulates that the Contractor shall indemnify the Company against all claims of whatever nature arising during the course of execution of Contract including defects liability period of <xx Months > i.e. till <xx xx xxxx>.

Now this deed witness that in case the Company is made liable by any Authority including Court to pay any claim or compensation etc. in respect of all labourers or other matters at any stage under or relating to the Contract with the Contractor , the Contractor hereby covenants and agrees with the Company that they shall indemnify and reimburse the Company to the extent of such payments and for any fee, including litigation charges, lawyers' fees, etc., penalty or damages claimed against the Company by reason of the Contractor falling to comply with Central/States Laws, Rules etc., or his failure to comply with Contract (including all expenses and charges incurred by the Company).

The Contractor further indemnifies the Company for the amount which the Company may be liable to pay by way of penalty for not making deductions from the Bills of the Contractor towards such amount and depositing the same in the Government Treasury.

The Contractor further agree that the Company shall be entitled to withhold and adjust the Security Deposit and/or withhold and adjust payment of Bills of Contractor pertaining to this Contract against any payment which the Company has made or is required to make for which the Contractor is liable under the Contract and that such amount can be withheld, adjusted by the Company till satisfactory and final settlement of all pending matters and the Contractor hereby gives his consent for the same.

The Contractor further agrees that the terms of indemnity shall survive the termination or completion of this contract.

The contractor further agrees that the liability of the contractor shall be extended on actual basis notwithstanding the limitations of liability clause, in respect of:
1. breach of terms of contract by the contractor
2. breach of laws by the contractor
3. breach of Intellectual property rights by the contractor
4. breach of confidentiality by the contractor

Nothing contained in this deed, shall be construed as absolving or limiting the liability of the Contractor under said Contract between the Company and the Contractor. That this Indemnity Bond is irrevocable and the condition of the bond is that the Contractor shall duly and punctually comply with the terms and the conditions of this deed and contractual provisions to the satisfaction of the Company.

In witness where of M/s xxxxxxxxxxxxx these presents on the day, month and year first, above written at xxxxxxxx by the hand of its signatory Mr. xxxxxxxxxxx.

Signed for and on behalf of
M/s xxxxxxxxxxxxxxx

Witness:
1
2

(SCHEDULE – A): LIST OF WORKS AND PRICES

Details and quantities of each item shown in the bill of quantities here to are only approximate. They are given as a guide for the purpose of tendering only and are liable to variation and alteration at the discretion of the competent authority. The work under each item as executed shall be measured and priced at the corresponding rate quoted by the contractor in the bill of quantities attached hereto.

Sl. No.	Description of work/supply	Total amount of work / supply (in figures and words)	Period of Completion
1	**Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package**	**As per File No 07 – Price Schedule**	**Seventeen Months**

(ANNEXURE - A): BHEL GCC Acknowledgement

It is hereby agreed by me / us that the **BHEL General Conditions of Contract and Special terms & Conditions of this tender** including subsequent amendments / additions / deletions to clauses if any, and conditions pertaining to the settlement of disputes by Arbitration form an integral part of the tender documents and that the tender submitted by me / us is subject to the aforesaid BHEL General Conditions of Contract which has been read and accepted by me / us.

(Signature & seal of the Tenderer)

(SCHEDULE – B): FREE ISSUE OF MATERIALS FROM BHEL

NAME OF WORK: Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

The following materials will be issued to the contractor at BHEL stores / stock yard, if the same become required for the work.

SL.NO.	DESCRIPTION	PLACE OF SUPPLY	ISSUE / RECOVERY RATE
--- NIL ---			

(SCHEDULE – C): LIST OF TOOLS AND PLANTS TO BE ISSUED ON HIRE TO CONTRACTOR

SL.NO	QUANTITY	PARTICULARS	HIRE CHARGES PER UNIT PER DAY OF 8 HOURS	PLACE OF ISSUE	REMARKS
------ NIL ------					

(SCHEDULE – D): LIST OF DRAWINGS TO BE ISSUED TO CONTRACTOR

All drawings are to be signed by the contractor as well as the officer entering in to contract for

SL.NO	DRAWING NUMBER	DESCRIPTION	REVISION
------ NIL ------			

(Signature & seal of the Tenderer)

CHAPTER – VI

REVERSE AUCTION (RA) (as per Guidelines for Reverse Auction 2021)

Name of Work: "Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package."

BUYER NAME	**Bharat Heavy Electricals Limited** **Boiler Auxiliaries Plant** **Civil Projects & Services (CP&S)** **Ranipet-632 406** E-mail: smkaviya@bhel.in, arunn@bhel.in
AUCTION TO BE CONDUCTED BY	Name and Address of Service Provider
DATE OF AUCTION	**Auction Date: XX/06/2022** **Reverse Auction Time: 15.00 PM – 16.00 PM** Auction Website: xxxxxx
DOCUMENTS ATTACHED	1) Terms & conditions of reverse auction (Annexure I / RA) 2) Business rule for reverse auction (Annexure II / RA) 3) Mandate to Service Provider (Annexure III / RA) 4) Process Compliance Form (Annexure IV / RA) 5) List of bidders and their address / contact person details (Annexure V / RA) 6) Details of Item(s) for Reverse Auction (Annexure VI / RA) 7) Post RA price confirmation and breakup (Annexure VII / RA)
SPECIAL INSTRUCTIONS	**Bidding in the last minutes and seconds should be avoided in the bidder's own interest. Neither the Service Provider nor BHEL will be responsible for any lapses / failure on the part of the vendor, in such cases.**

Annexure - I / RA

Terms & Conditions of Reverse Auction:

1. Against this enquiry for the subject work as per tender enquiry, BHEL will resort to "REVERSE AUCTION (RA) PROCEDURE" i.e., ON LINE BIDDING (THROUGH Service Provider (Guidelines as available on www.bhel.com).

2. RA shall be conducted among all the techno-commercially qualified bidders. However, H1 bidder (whose offer is highest in envelope price bid) may not be allowed to participate in Reverse Auction process as may be decided by BHEL case-to-case basis.

3. Price bids of all techno-commercially qualified bidders shall be opened first before RA and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."

4. The start price shall be L1 price of sealed envelope price or lower as decided by BHEL, case to case basis.

5. The philosophy followed for Reverse auction shall be English Reverse (No ties). English Reverse (No ties) is a type of auction where the starting price and bid decrement are announced before start of online reverse auction. The interested bidders can thereupon start bidding in an iterative process wherein the lowest bidder at any given moment can be displaced by an even lower bid of a competing bidder, within a given time frame. The bidding is with reference to the current lowest bid in the reverse auction. All bidders will see the current lowest quoted price and their rank. The term 'No ties' is used since more than one bidder cannot give an identical price, at a given instant, during the reverse auction. In other words, there shall never be a tie in the bids.

6. BHEL will engage **Service Provider,** who will provide all necessary training and assistance before commencement of on line bidding on internet.

7. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

8. Business rules like event date, time, bid decrement, extension etc., also will be communicated through **Service Provider**. for compliance.

9. Bidders have to fax the Process Compliance form **(Annexure - IV / RA)** before start of Reverse Auction. Without this, the bidder will not be eligible to participate in the event.

10. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL", for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

11. Reverse auction will be conducted on scheduled date & time.

12. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

13. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup **(Post RA price confirmation and breakup -Annexure VII / RA)** to **Service Provider** within two working days of Auction without fail.

14. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry or incase of RA failure, the Price bids and price impacts, if any, already submitted and available with BHEL may be considered as per BHEL's standard practice.

15. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of **Service Provider.** using the Login IDs and passwords given to them by **Service Provider.** before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.

16. If the Bidder or any of his representatives are found to be involved in Price manipulation / cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped / aborted.

17. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

18. In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in paper price bid) may not be allowed to participate in further RA process.

Annexure - II / RA

Business Rules for Reverse Auction:

This has reference to tender no. Tender **No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022.**

BHEL shall finalize the Rates for **"Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package."** through Reverse Auction mode. BHEL has made arrangement with **Service Provider,** who shall be BHEL's authorized service provider for the same. Bidders should go through the guidelines given below and submit acceptance of the same.

The technical & commercial terms are as per (a) BHEL **Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022.** (b) Bidder's technical & commercial bid (in case of two-part bid) and (c) subsequent correspondences between BHEL and the bidders, if any.

1. Procedure of Reverse Auctioning:

I. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA
II. **Online Reverse Auction**: The "start price" and "bid decrement value" will be decided by BHEL. BHEL reserves the right to decide the L1 price of paper bid or the lower price as the start price for RA.
III. If BHEL decides the lowest sealed envelope price bid as the starting price, then the lowest bidder in sealed envelope price bid shall be shown as current L1 automatically by the system and no acceptance of that price is required. System shall have the provision to indicate this bid as current L1.
IV. Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process. However, no bidder shall be allowed to lower its bid below the current L1 by more than 5 decrements at one go.
V. After the completion of the online reverse auction, the Closing Price (CP) shall be available for further processing.
VI. Wherever the evaluation is done on total cost basis, after Reverse Auction, price of individual line items shall be reduced on pro-rata basis.

2. Schedule for reverse auction:

The Reverse Auction is tentatively scheduled on ***XX/06/2022*** and the duration will be as below.

Online Reverse Auction: -

*Start Time**: XX:XX Hrs.***
*Close Time**: XX:XX Hrs.***

3. Auction extension time: If a bidder places a bid in the last 10 minutes of closing of the Reverse Auction and if that bid gets accepted, then the auction's duration shall get extended automatically for another 10 minutes, for the entire auction (i.e. for all the items in the auction), from the time that bid comes in. Please note that the auto-extension will take place only if a bid comes in those last 10 minutes and if that bid gets accepted as the lowest bid. If the bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last 10 minutes. In case, there is no bid in the last 10 minutes of closing of Reverse Auction, the

auction shall get closed automatically without any extension. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the auto-extension period to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.

The above process will continue till completion of Reverse Auction.

Complaints / Grievances, if any, regarding denial of service or any related issue should be given in writing thru e-mail / fax to **Service Provider,** with a copy to BHEL within 15 minutes from the initial closing time of Online Reverse Auction.

4. **Bid price:** The Bidder has to quote the Price inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, taxes, duties, freight and insurance as specified in tender document, including loading (if indicated by BHEL due to deviations in commercial terms) for the Items specified. Details are as shown in Excel Sheet for calculation of total cost to BHEL.

5. **Bidding currency and unit of measurement:** Bidding will be conducted in {*Indian Rupees* per *Unit*} of the material as per the specifications.

   In case of foreign currency bids, exchange rate (TT selling rate of State Bank of India) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered for conversion in Indian Rupees. If the relevant day happens to be a bank holiday, then the forex rate as per the previous bank (SBI) working day shall be taken.

6. **Validity of bids:** Price shall be valid for **90 *days*** from the date of reverse auction. These shall not be subjected to any change whatsoever.

7. **Lowest bid of a bidder**: In case the bidder submits more than one bid, the lowest bid at the end of Online Reverse Auction will be considered as the bidder(s) final offer to execute the work.

8. Unique user IDs shall be used by bidders during bidding process. All bids made from the Login ID given to the bidders will be deemed to have been made by the bidder/ bidders' company. MSEs and Bidders qualified under PPP-MII, Order 2017 would see their category at all time in their login. Purchase preference, however, is subject to falling within the purchase preference criteria.

9. **Post auction procedure**: BHEL will proceed with the Lowest Bid in the Reverse Auction for further processing.

10. Any commercial / technical loading shall be intimated to bidders prior to RA. The excel sheet provided in this regard shall cover all these aspects. Commercial / technical loading if any, shall be added by the respective bidder in its price during online sealed bid & Online Reverse Auction. Modalities of loading & de-loading shall be separately intimated to the bidders. The responsibility for correctness of total cost to BHEL shall lie with the bidders.

11. Computerized reverse auction shall be conducted by BHEL (through **Service Provider.**), on pre-specified date, while the bidders shall be quoting from their own offices / place of their choice. Internet connectivity shall have to be ensured by bidders themselves.

    During the RA process if a bidder is not able to bid and requests for extension of time by fax / e-mail / phone then time extension of additional 15 minutes will be given by the service provider provided such requests come before 5 minutes of auction closing time. However, only one such request per bidder can be entertained.

In order to ward-off contingent situation of connectivity failure bidders are requested to make all the necessary arrangements/ alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the reverse auction successfully. Failure of power or loss of connectivity at the premises of bidders during the Reverse auction cannot be the cause for not participating in the reverse auction. On account of this, the time for the auction cannot be extended and neither BHEL nor M/s. **Service Provider** is responsible for such eventualities.

12. **Proxy bids**: Proxy bidding feature is a pro-bidder feature to safe guard the bidder's interest of any internet failure or to avoid last minute rush. The proxy feature allows bidders to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum that the bidder is willing to offer. Here the software bids on behalf of the bidder. This obviates the need for the bidder participating in the bidding process until the proxy bid amount is decrement ally reached by other bidders. When proxy bid amount is reached, the bidder (who has submitted the proxy bid) has an option to start participating in the bidding process.

    The proxy amount is the minimum amount that the bidder is willing to offer. During the course of bidding, the bidder cannot delete or change the amount of a proxy bid.

    Bids are submitted in decrements (decreasing bid amounts). The application automates proxy bidding by processing proxy bids automatically, according to the decrement that the auction originator originally established when creating the auction, submitting offers to the next bid decrement each time a competing bidder bids, regardless of the fact whether the competing bids are submitted as proxy or standard bids. However, it may please be noted that if a manual bid and proxy bid are submitted at the same instant manual bid will be recognized as the L1 at that instant. In case of more than one proxy bid, the system shall bid till it crosses the threshold value of each lowest proxy bid and thereafter allow the competition to decide the final L1 price.

    Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).

13. Bidders are advised to get fully trained and clear all their doubts such as refreshing of Screen, quantity being auctioned, tender value being auctioned etc. from **Service Provider**.

14. **Service Provider**, shall arrange to demonstrate / train the bidder or bidder (s) nominated person(s), without any cost to bidders. **Service Provider**, shall also explain the bidders all the business rules related to the Reverse Auction. Bidders are required to submit their acceptance to the terms and conditions / modalities before participating in the Reverse Auction in the process compliance form as enclosed. Without this, the bidder will not be eligible to participate in the event.

15. Successful bidder shall be required to submit the final prices (L1) in prescribed format (Annexure – VI) for price breakup, quoted during the Online Reverse Auction, duly signed and stamped as token of acceptance without any new condition (other than those already agreed to before start of auction), after the completion of auction to M/s. **Service Provider** besides BHEL within two working days of Auction without fail.

16. Any variation between the final bid value and that in the confirmatory signed price breakup document will be considered as tampering the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

17. Bidders' bid will be taken as an offer to execute the work / supplies the item as per Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022. Bids once made by the bidder, cannot be cancelled/ withdrawn and bidder shall be bound to execute the work as mentioned above at bidder's final bid price. Should bidder back out and not execute the contract as per the rates quoted, BHEL shall take action as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

18. Bidders shall be able to view the following on their screen along with the necessary fields during Online Reverse Auction:

a. Leading (Running Lowest) Bid in the Auction (only total price of package)
b. Bid Placed by the bidder
c. Start Price
d. Decrement value
e. Rank of their bid during bidding as well as at the close of auction.

19. BHEL's decision on award of contract shall be final and binding on all the Bidders.

20. BHEL reserves the right to extend, reschedule or cancel the Reverse Auction process / tender at any time, before ordering, without assigning any reason, with intimation to bidders.

21. BHEL shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause. In such cases, the decision of BHEL shall be binding on the bidders.

22. Other terms and conditions shall be as per bidder(s) techno-commercial offers and other correspondences, if any, till date.

23. If there is any clash between this business document and the FAQ available, if any, in the web site of **Service Provider**. the terms & conditions given in this business document will supersede the information contained in the FAQs. Any changes made by BHEL or **Service Provider**. (due to unforeseen contingencies) after the first posting shall be deemed to have been accepted if the bidder continues to access the portal after that time.

24. Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party. If the Bidder or any of his representatives are found to be involved in Price manipulation / cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines for suspension of business dealings (as available on www.bhel.com), shall be initiated by BHEL.

Bharat Heavy Electricals Limited
Boiler Auxilaries Plant,
Ranipet –632 406

Annexure - III / RA

Mandate to Service Provider

Ref : **Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022**

To,
M/s. **Service Provider**

Sub: Providing of Services for Reverse Auction.
Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022**.**

Dear Sirs,

Please conduct Reverse Auction as per the following details:

- **Scope:** Auction event management with training of BHEL and its bidders.

- Ensure process compliance form from all the bidders before start of RA event. In case of postponement of event to some other date, ensure acknowledgement from each bidder.

- Price: Rs. {……}/- . No other duties, Taxes, levies etc. except service tax @ {……}% shall be payable for conducting reverse auction. This price is firm.

- Payment Terms: 100% payment after successful completion of Auction.

- **Completion of Auction Process**: The auction process shall be deemed to have been successfully completed on receipt and acceptance of final report including hard copy/ email of the final bid with price break up, duly signed by the successful bidder who has participated in the reverse auction. The bill shall be submitted along with the completion report to the undersigned.

- Business Rules of the Reverse Auction are as per **Annexure – I/RA**.

- The list of bidders with their contact details is given in **Annexure – IV/RA**. and the details of the item (s) to be Reverse Auctioned are as per **Annexure – V/ RA**.

- Please acknowledge receipt of this letter order and also confirm that final report (duly signed and stamped by M/s. **Service Provider** including hard copy/ email of the final bid with breakup of prices duly signed by the successful bidder (duly endorsed by M/s. **Service Provider** shall be submitted within four working days of conclusion of auction.

Yours sincerely,

(for and on behalf of BHEL)

Note:

a) The case of rescheduled auction event will be considered separate event for the purpose of payment.
b) If the event has been conducted as per mandate, you shall be paid irrespective of RA outcome.

Annexure - IV / RA

Process Compliance Form

(The bidders are required to print this on their company's letterhead and sign, stamp before RA)

To

Service Provider name and address.

Sub: Agreement to the Process related Terms and Conditions.

Dear Sir,

This has reference to the Terms & Conditions for the Reverse Auction mentioned in the BHEL Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022**.**

This letter is to confirm that:

1) The undersigned is authorized official / representative of the company to participate in RA and to sign the related documents.

2) We have studied the Reverse Auction guidelines (as available on www.bhel.com), and the Business rules governing the Reverse Auction as mentioned in your letter and confirm our agreement to them.

3) We also confirm that we have taken the training on the auction tool and have understood the functionality of the same thoroughly.

4) We also confirm that, in case we become L1 bidder, we will FAX/ email the price confirmation & break up of our quoted price as per Annexure – VI/RA within two working days (of BHEL) after completion of RA event, besides sending the same by registered post/ courier both to M/s. BHEL and M/s. **Service Provider.**}

5) We, hereby confirm that we will honour the Bids placed by us during the auction process.

With regards
Signature with company seal
Name –
Company / Organization
Designation within Company / Organization
Address of Company / Organization

(Sign this document and Fax it to Service Provider, prior to start of the Event.)

Annexure - V / RA

List of bidders and their address / contact person details

Sl. No.	Address	Contact Person
1	Name of bidder - Full postal address - Fax: - Phone: - Email: - Initial bid (sealed envelope price bid) - MSE status - PPP-MII status	Contact person - Name: - Phone: - Email:
2		
3		
..		
..		

Annexure – VI / RA

Details of Item(s) for Reverse Auction

Name of Work: "Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package"

Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022.

(Details are available in Price Schedule)

Bharat Heavy Electricals Limited
Boiler Auxilaries Plant,
Ranipet –632 406

Annexure – VII / RA

Post RA Price Confirmation and Breakup

To

Service Provider Name and Address

CC: BHARAT HEAVY ELECTRICALS LIMITED
BOILER AUXILIARIES PLANT
CIVIL PROJECTS & SERVICES (CP&S)
RANIPET-632 406

Sub: Final price quoted during Reverse Auction and price breakup

Dear Sir,

We confirm that we have quoted.

Rs. {_____ in value & words **_____} for item covered under Tender No: BAP:CP&S/ISRO/2022-23 Dt: 28/05/2022.**

Total price of the items covered under above cited enquiries is inclusive of *Goods and Services Tax and other as per NIT*.

Our final landed prices as quoted during the Reverse Auction conducted today {*XX/X6/2022*} which will be valid for a period of 90 (Ninety) days.

The price break-up is as given below.

========

Total (Grand total including GST) - Rs. In value & in words

========

(Details of individual price breakups for each sections of price schedules are attached herewith in BHEL Excel sheet format)

Thanking you and looking forward to the valuable order from BHEL.
Yours sincerely,

For _____
Name:
Company:
Date:
Seal:

CONTACT INFORMATION:

Service Provider	Bharat Heavy Electricals Limited
Contact person Name Company Address Contact No E-mail ID	**Civil Projects & Services Department** **S.M. Kaviya,** **Dy. Manager / CP & S** **BHEL, Ranipet - 632 406** **Email : smkaviya@bhel.in** **Phone : 04172 284792** **N Arun Prasath,** **Dy. Manager / CP & S** **BHEL, Ranipet - 632 406** **Email : arunn@bhel.in** **Phone : 04172 284179** **Amarjeet Kumar** **Engineer / CP&S** **BHEL, Ranipet - 632 406** **Email : amarjeet@bhel.in** **Phone : 04172 283495**

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 01.00: Special Conditions of Contract

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

File 01.00: Special Conditions of Contract

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SPECIAL CONDITION OF CONTRACT

These Special conditions shall be construed as part of tender document and shall be read along-with General Conditions of Contract and technical specification including scope of work etc. In case of any conflict or inconsistency between the general and these special conditions, the same shall be brought out by the bidder in writing to BHEL for clarification during pre-bid discussions, failing which most stringent interpretation / clause in favor of BHEL shall be adopted and the same shall be binding to the contractor.

The plant site is located within the existing manufacturing unit of BHEL-BAP-Ranipet. The site is well connected by roads. The average elevation at site is 198.5 M above MSL.

Clause No	Description
1.0	**Scope of Work**
1.1	The scope of works civil work comprises of all design, engineering, necessary investigations, survey, foundations, building, superstructure and infrastructure required for the complete operation of the manufacturing plant as indicated in Specific Technical Requirement.
1.2	Bidders shall note the followings:
1.2.1	Shop-1 & 2: RCC Framed structure with RCC roof over deck slab with Structural Girder, Masonry cladding. Shop-3, 4, Tool shop & loading bay: Up to Plinth RCC Framed structure. Above plinth PEB Structural Steel with metal sheet roofing and part Masonry cladding and part corrugated metal sheeting. All other annex buildings: RCC Framed structure with RCC roof, Masonry cladding. All as per the standard practice. For detailed building specific requirements as required will be shared in due course
1.2.2	Following scope of work is excluded from tendered scope of work: a) Interior works of Shop 1&2 pertaining to clean shop classification 100000(shop1) & AC shop (shop2) like doors, windows, rolling shutters, wall paneling, false ceiling. b) Supply & fixing of EOT crane & Rails. c) Supply & fixing of Equipment / Machineries. d) HVAC, firefighting & alarms, lighting. e) Engineering and Laying of earthing mat & connecting earthing mat to the individual equipment.
1.2.3	The bidder has to arrange vetting of all design drawing of entire civil/structural should be vetted from IIT/IISC without any additional cost to BHEL.
1.2.4	Any Statutory approval, if required, shall be arranged by bidder at no extra cost to BHEL.
2.0	**Dewatering**
	Contractor shall ensure at all times that his work area & approach/access roads are free from accumulation of water, so that the materials are safe and the execution/progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.
3.0	**Consumable**
3.1	All tools & tackles, construction equipment, machineries, materials & consumables, like gas, electrodes, chemicals, lubricants etc. as required for the job, shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract.
3.2	All the above stated to be used for the job shall have to be approved by BHEL prior to use.
3.3	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with BHEL's overhead shall be paid by the contractor or deducted from the contractor's bills.
4.0	**Overrun Charge**
	No overrun charges shall be paid to the contractor in the event the completion period is extended for any reason whatsoever.
5.0	**Deviation**
	The bidder is required to submit with his offer in the relevant schedule / format, a list of any and all deviation taken by him without any ambiguity. Any assumptions, presumptions, deviations etc. indicated or implied anywhere by the bidder except those indicated in the deviation schedule / format will not be recognized and will not form a part of consideration /

	offer. In the absence of such filled-up schedule / format it will be understood and agreed that the bidder's offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any / all deviations submitted after opening of the bid.
6.0	**Test certificate**
	Necessary test certificates of all the materials supplied by contractor are to be produced to BHEL prior to use of those materials.
7.0	**Quality Control & Quality Assurance**
	Contractor's Engineers and supervisors shall be adequately qualified and also inclined to do a quality job. The quality assurance Engineer shall co-ordinate all aspects of quality control, inspection, implementation of quality assurance procedures laid down in Quality Plan and technical specification by BHEL. He shall fill up quality assurance log sheets / formats and submit to BHEL for joint inspection and acceptance. The contractor shall fill up, maintain & preserve the quality records in computerized media. BHEL's authorized representative shall be given free access at all time to such quality related records etc. for inspection, review etc. Field Quality Plans for Civil & Structural works as will be given by BHEL during execution to be adhered
8.0	**Project Management**
	To meet the need of construction management at site, Contractor shall provide the following services.
8.1	**Planning and Monitoring**
8.1.1	The bidder shall prepare construction schedule (L-2) as per completion schedule given in this document. This schedule must include all milestone and key activities for each subsystem/components in the areas of mobilization, engineering, procurement, manufacture (wherever applicable), dispatch, excavation/ construction/ erection/ commissioning/ handing over. This network must conform to the overall requirement of the project schedule. The bidder should also ensure monitoring of these activities at least on weekly basis to start with and on daily basis whenever required by BHEL.
8.1.2	The bidder will have to install 2 no's PCs of latest version with all application software's for the civil activities with laser jet printers compatible for A3 size printing with power backup at places, as per instruction of BHEL for exclusive use of BHEL. This computer/printer shall remain contractor's property and they will be allowed to take out the same after completion of the works under this tender specification. The contractor shall provide data / information etc. in prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc. The contractor shall also provide two computer operators and two numbers service staff for miscellaneous service for BHEL's use at site (Ranipet) for reconciliation & progress review & day-to-day planning purpose, documentation etc. right from start of work.
8.1.3	If contractor fails to provide computer/printer as per requirement for a continuous period of 15 days or more, BHEL shall have the right to deduct the amount as per following from Contractor's RA bill or any other dues: a) @ Rs 15000/- (Fifteen thousand) / month for each computer operator. b) @ Rs 15000/- (Fifteen thousand) / month for each computer with printer. c) @ Rs 12000/- (Twelve thousand) / month for each service staff.
8.1.4	The Contractor's site office must have following facilities of communications: a) E-mail. b) Scanner c) Telephone with STD facility.
8.2	**Progress Reporting**
8.2.1	The bidder shall prepare and submit WEEKLY PROGRES REPORT indicating progress/achievement, all activities, management summary for critical activities, and list of actions requiring attention of BHEL. This schedule is to be made in computerized project management software.
8.2.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the contractor intends to take to make good the slippage or lost time, so that further works again proceed as per the original program and the slippage's do not accumulate and effect the overall program.
8.2.3	Weekly progress review meetings will be held at site during which actual progress during the

	week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, the contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.
8.2.4	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at head office of AGM/Civil-BAP-Ranipet. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
8.2.5	Adequate numbers of color photographs, in triplicate, (Matt paper, post card size for each area per month of the contract execution period), depicting progress of the work or damage to the machine parts, if any, as directed by BHEL site engineer is to be arranged by the successful bidder at his own cost.
8.2.6	Successful bidder has to provide for electronic / computerized storing and re-production / printing / plotting of various data, log sheets, protocols, measurements etc. These may be stored in virus free CD/Pen drive (as per requirement) and handed over to BHEL as per requirement.
8.3	**Site Organization**
8.3.1	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by a competent construction manager for site operations with sufficient level of authority to take site decisions. The contractor shall ensure the posting of at least one representative from the Design Section for day to day co-ordination / execution of site activities. The organization should have organization chart with individual bio-data indicating various levels of experts to be posted for supervision in the fields in design, execution, quality, material management, planning, safety, commissioning, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule without any commercial implication to BHEL.
8.3.2	BHEL reserves the right to reject or approve the list of personnel proposed by the contractor. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not generally be permitted.
8.3.3	In addition to above, a well-experienced qualified engineer to be designated, as 'Project Co-coordinator', shall be deployed by the contractor. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc. to contractor's own team during the complete execution period of contract.
8.4	**Erection Schedule**
8.4.1	In order to achieve the overall completion schedule, the contractor shall provide BHEL all the information covering construction sequence, testing, and execution activities. These schedules may be based on the recommended procedures and will be subject to discussions/agreements with the owner/BHEL after the award of contract.
8.4.2	The successful bidder shall have to provide all the above schedules in a tabular form in addition to that in the form of network and these shall necessarily include information not limited to the earliest and latest dates for various activities / submissions and also any related constraints.
8.5	**Management**
	The contractor should also submit network programs for the execution of various items. These networks shall show the owner/BHEL hold points (critical hold points, i.e. CHP), which have to be cleared by owner/BHEL, or their authorized representatives before further execution can take place. These programs for the execution would clearly identify responsibilities of the contractor and owner /BHEL. It is the responsibility of the contractor to get the Networks approved by BHEL within FOUR weeks of the date of finalization of award of work/placement of LOI.
8.6	**Construction Management**
8.6.1	Based on the approved program the contractor shall submit a program of construction / execution for the implementation. These programs would be amplified showing start of execution and subsequent activities and shall form the basis for site execution and detail monitoring. The monthly rolling program with the first week's program being tentative based

	on the site condition would be prepared based on these programs. The contractor shall also be involved along with owner / BHEL to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
8.6.2	The program would be jointly finalized by the site in-charge of the contractor with BHEL Site / owner's project coordinator as well as the site-planning representative. The execution program will also identify the sequential events matching financial turnover.
8.7	**Safety**
8.7.1	The contractor shall ensure the safety of all workers, materials, and equipment either belonging to him or to others working at site. One trained SAFETY OFFICER will have to be identified & deployed at site. He shall observe & implement the safety rules and codes applied by the owner / BHEL at site without exception.
8.7.2	Non-conformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the contractor on each incident/each non-conformity as per details given below:

Safety Measure	**Fine**
Not wearing safety helmet/shoe.	500/- per workmen.
Not wearing safety belt.	1000/- -do-.
Grinding without goggles.	500/- -do-.
Not using 24V supply for internal work.	500/- per incident.
Electrical plugs not used for hand machines.	500/- per incident.
Welding cables, electrical wires using with lot of joints and not insulated as per standard.	500/- per joints.
Not removing scrap materials/not adhering to proper housekeeping after notification by BHEL.	Actual cost of work + 30%.
Gas cutting without taking proper precaution/not using sheet below gas cutting place.	500/- per incident.
Electrical winches – having no guards, not earthed properly etc.	500/- per incident.
Improper earthing of electrical T&P.	500/- per equipment.
Not protecting/locating the gas cylinder to avoid catching of fire.	1000/- per cylinder.
Not providing earth leakage circuit breaker as per direction of BHEL.	1000/- per point.

8.7.3	Any other nonconformity noticed not listed above will also be decided by Engineer in charge BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected on the above will be utilized for giving award to the employee who could avoid accidents by following safety rules. Also, the amount will be spent for improving the safety at site.
8.8	**Health Safety & Environment**
8.8.1	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
8.8.2	Bidders to note that: One number experienced paramedical personnel with first aid facility at site is must. No medical facility within / near the site shall be provided by BHEL (unless otherwise in the state of emergency). No staff quarter shall be provided by BHEL. No borrow area for earth shall be arranged / provided by BHEL.
8.8.3	The contractor shall solely be responsible for the safety, quality, & quantity of material after it is handed over and issued to contractor by the BHEL.
9.0 .	**I M T E** The contractor shall ensure deployment of reliable and calibrated Instrument, Measuring, and Test Equipment (IMTE). The IMTE shall have test calibration certificate from authorized / Govt. approved agencies. The contractor shall also keep provision of alternate engagement for such IMTE so that the work does not suffer when a particular IMTE is sent for calibration. Re-testing / re-calibration shall also be arranged by the contractor at their own cost at regular interval during the period of use as advised by BHEL.
10.0	**Test Certificate for T&P**

10.1	All T&P, lifting tackles, pulling devices, slings, winches and its rope, material/ passenger lift and its rope, to be deployed by the contractor, must bear valid / latest test certificates for their suitability, and the documents shall be preserved at site. In case of expiry of validity of any such test certificate during construction, the contractor shall arrange for revalidation of the same well in advance, so that the construction activities do not suffer on account of non-availability of such Test certificates.
10.2	The contractor should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed/taken out from site without written permission of BHEL.
11.0	**Certificate Towards Completion**
	The work under the scope of the contractor shall be deemed to have been completed in all respects only when so certified by BHEL. The decision of BHEL in this regard shall be final and binding on the contractor.
12.0	**Guarantee / Warrantee**
12.1.	The Contractor shall provide a Warranty in respect of the equipment and materials to be furnished by him for the following :
12.1.1.	All equipment and materials shall be new and in accordance with the Contract Documents, all equipment shall be free from any defect due to faulty design, materials and/or workmanship.
12.1.2	The equipment used for construction activities and for the construction shall perform satisfactorily and the performance and efficiencies of the specified equipment shall not be less than the respective guaranteed values.
12.1.3	The efficiencies, temperature rise and other performance data of all equipment shall be as per the Contract Documents.
12.1.4	All other works including civil, structural and architectural works shall be in accordance with the contract documents and free from any defect and omission.
12.2	The Warranty has to be furnished on forms approved by BHEL and shall be signed by the Contractor and if needed, also by his sub-contractor(s).
12.3	If the Contractor finds, after his Tender is accepted, that a variation in work, construction technique or the quality of materials is necessary to fulfill the Warranty called for, such variations may be made with the approval of the Owner, provided the request for changes is made before signing of the Contract Agreement and the changes are to be made without any increase in the price.
12.4	The above Warranty shall be valid for a period of twelve (12) calendar months commencing from the date of taking over of the fully completed Plant or fully completed unit under the scope of this tender specification, at the discretion of the Owner. This period of the Warranty shall be called the "Warranty Period". During this period, the Contractor's liability shall be limited to the replacement of any defective parts that may develop in plant of his own manufacture or those of his associate(s) and sub-contractor(s) under the conditions provided for by the Contract under proper use and arising solely from faulty design, materials or workmanship provided always that such defective parts as are not repairable at site, and are not essential in the meantime in the commercial use of the plant, are promptly returned to the Contractor's works unless otherwise arranged. All such replacements of defective parts mentioned above shall be made free of cost at site by the Contractor and the return of the defective parts to the Contractor's works shall be the Contractor's responsibility and shall be made at his expense. In the case of these defective parts which are not repairable at site but are essential for the commercial operation of the equipment, the Contractor and the Owner shall mutually agree to a program of replacement or, renewal which will minimize interruption to the maximum extent in the operation of the equipment.
12.5	The cost of any special or, general overhaul rendered necessary during maintenance period due to defects in the Plant or defective work carried out by the contractor, the same shall be borne by the Contractor. The Owner will, however, render such assistance in this matter as will expedite the same. In the case of defective parts not repairable at the Site but essential in the meantime for the commercial use of the Plant, the Contractor shall replace at the Site, free of cost of the Owner the said defective parts before the defective parts are removed to his works.
12.6	If for rectification or replacement of any part of equipment or work due to defective materials, manufacture or design or workmanship, the services of the Contractor's personnel are requisitioned within the Warranty Period, these services shall be made available free of any cost to the Owner.
12.7	If it becomes necessary for the Contractor to replace or renew any defective portions of the Plant

	under this Clause, the provisions of this Clause will apply to the portions of the Plant so replaced or renewed until the expiration of twelve (12) months from the date of such replacement or renewal. This will remain applicable till 12 months warranty period is successfully completed after last repair/ replacement/ defect attendance without any defects or short-fall in guaranteed performance.
12.8	If any defect be not remedied within a reasonable time, the Owner may proceed to do the work at the Contractor's risk and expenses but without prejudice to any other rights which the Owner may have against the Contractor in respect of such defects.
12.9	If the replacements or renewals are of such character as may affect the efficiency of the Plant, the Owner shall have the right to give to the Contractor within one (1) month of such replacement or renewal, notice in writing that "tests on completion" be made, in which case such tests shall be carried out as provided in Clause Tests on completion and Trial Run at the Site" in the Technical Specifications. Should such tests show that the Plant sustains the guarantee given in the Contract, the cost of the test shall be borne by the Owner. Should the guarantee be not sustained, the cost of the test shall be borne by the Contractor. Further, all necessary works will be carried out by the Contractor to achieve guarantee given in the contracts and perform tests to prove the same at his own cost.
12.10	All replacements or renewals to be carried out by the Contractor during the Warranty Period shall be subject to such clause of these General Conditions as may be considered reasonable by the Owner.
12.11	Until the final certificate has been issued, the Contractor shall have the right of entry at his own risk and expenses by himself or his duly authorized representatives whose names shall previously have been communicated in writing to the Owner at all reasonable working hours of the Plant and taking notes there from and, if he desires, at his own expenses making any tests, subject to the approval of the Owner that will not be unreasonably withheld.
12.12	The issue of the Owner's Certificate referred to in clause "Certificate of the Owner" shall in no way exempt the Contractor from the provisions of this clause.
12.13	At the end of the Warranty Period, the liability of the Contractor ceases and the Owner will issue final acceptance certificate for the Plant/or the portion of the Plant taken-over as the case may be.
12.14	In respect of Goods supplied by sub-contractor(s) to the Contractor where a longer guarantee more than twelve (12) months is provided by such sub-contractor(s) the Owner shall be entitled to the benefit of such longer guarantee.
12.15	**For Civil Portion**
	Even though the work will be carried out under the supervision of BHEL engineers, the contractor shall remain responsible for the quality of workmanship, quality of materials/items and design and shall guarantee the work executed under the scope of the contract for a period of 12 (twelve) months from the date of start of guarantee period as certified by the Engineer (i.e. on completion of total work under scope and / or taking over by BHEL to be certified by BHEL site-in-charge) and shall rectify free of cost all defects due to faulty supply or work done. In case the contractor fails to repair / replace the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs / replace such defective works at contractor's risk and cost without prejudice to any other rights and recover the same from security deposit / other dues.
13.0	**Insurance**
13.1	BHEL shall arrange insurance coverage for the material and properties of BHEL covering the risks during transit, storage and execution.
13.2	It is the entire responsibility of the contractor to insure his workmen / staff against accident and injury while at work as required by the relevant rules and to pay compensation, if any, to their workmen as per workmen's compensation act. The contractor has also to insure his staff against accident/injury. The contractor has to take insurance cover for his tools and plants, assets etc. This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948 (Government of India). This policy shall also cover the Contractor against claims for injury, disability disease or death of his or his Sub-Contractor's employees, which for any reason are not covered under the Workmen's Compensation Act, 1948. The liabilities shall not be less than Workmen's Compensation As per statutory Provisions Employee's liability.
13.3	These insurance covers have to be taken within One Month from date of LOI and the Policy shall be made available to BHEL Site in-charge for necessary record. However, the sole

	responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc. at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with the Insurance Company for all matters regarding the insurance in his scope.
14.0	**Work and Safety Regulations**
14.1	The Contractor shall ensure proper safety of all the workmen, materials, plant and equipment's belonging to him or to others, working at the Site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and the BHEL as he may deem necessary.
14.2	All equipment used in construction and erection by Contractor shall meet Indian/International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment's shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation Manual and safety instructions and as per Guidelines/Rules of BHEL in this regard.
14.3	Periodical Examinations and all tests for all lifting/ hoisting equipment & tackles shall be carried-out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated Laws/Rules in force from time to time. A register of such examinations and tests shall be properly maintained by the Contractor and will be promptly produced as and when desired by BHEL or by the person authorized by him.
14.4	The Contactor shall be fully responsible for the safe storage of his and associates his Sub-Contractor's radioactive sources in accordance with BARC/DAE (Bhabha Atomic Research Center/ Department of Atomic Energy, Govt. of India) Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, Contractor would take storage and handling of such material.
14.5	The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by BHEL who will also have right to examine these safety equipment's to determine their suitability, reliability, acceptability and adaptability.
14.6	The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, the Contractor only shall use good and standard quality of material.
14.7	The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the BHEL or other Contractors under any circumstances, whatsoever, unless expressly permitted in writing by the BHEL to handle such fuses, wiring or electrical equipment.
14.8	No electric cable in use by the Contractor/BHEL will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
14.9	The Contractors shall employ necessary number of qualified, full time Electricians/ Electrical Supervisors to maintain his temporary electrical installations.
14.10	The Contractor, shall employ trained Safety Officer to supervise day to day safety aspects of the equipment's and workmen, who will co- ordinate with the BHEL Safety Officer. The name and address of such Safety Officer of Contractor will be promptly informed in writing to BHEL with a copy to Safety Officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of the Contract.
14.11	In case any accident occurs during the construction/ erection or other associated activities undertaken by the Contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the BHEL in prescribed form and also to all the authorities envis-aged under the applicable laws.
14.12	The BHEL shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment's. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly.
14.13	The Contractor shall not be entitled for any damages/ compensation for stoppage of work due to safety reasons above and the period of such stoppage of work will not be taken as an

	extension of time for completion of the facilities and will not be the ground for waiver of levy of liquidated damages.
14.14	The Contractor shall follow and comply with all Safety Rules of the BHEL, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any inconformity between statutory requirement and BHEL Safety Rules of the BHEL referred above, the later shall be binding on the Contractor unless the statutory provisions are more stringent
15.0	**Taxes and Duties**
15.1	All taxes (except Goods and Services Tax), charges, royalties, duties, octroi etc. and other taxes for materials obtained for the work and for the execution of the contract shall be borne by the contractor and shall not be payable extra. Any increase at any stage and new taxes leviable during contract execution shall not be reimbursed by BHEL.
15.2	Goods and Services tax (and Educational Cess, if applicable), shall be paid extra on submission of documentary evidence. Vendor should avail abatement available as per prevailing GST rules. BHEL will reimburse GST of contract executed bill value after availing abatement. As such, bidder's quoted rate shall be exclusive of GST. Any changes in GST rules (by Government) shall be complied with.
16.0	**Facilities to be Provided by BHEL**
16.1	**Land**
16.1.1	Minimum Open space for contractor's office, storage yard / sheds, Fabrication yard etc. will be made available by BHEL free of cost. BHEL will provide land for such use at different places. Contractor shall develop these areas (including work areas as provided by BHEL) including grass/tree cutting, removal of debris, leveling, grading etc. at his own cost. However, Fabrication Yard will be provided with specific time frame and whole or part area of the same may have to be released for construction work as per project requirement, within ONE Month's notice period.
16.2	**Water**
16.2.1	BHEL will provide construction/drinking water on chargeable basis (which will be @ 1% of contract value) at one point within 500M from given work premises. Further distribution beyond above mentioned point shall be arranged by the contractor at his own cost. Construction water will be supplied in adequate quantities but only in periodicity of 2 to 3 times in a day. For ensuring uninterrupted water supply for construction work, vendor must construct water tank / ground reservoir of approximately 400 cum capacity. Necessary pumping facilities, laying of underground pipeline network, pumping to work site etc. need to made by the vendor within his quoted price.
16.2.2	Contractor should arrange for drinking/utility water for their labour colony within their quoted price.
16.2.3	Water will be supplied 2 to 3 times in a day. Contractor will have to arrange for storage of water to meet the day-to-day requirement.
16.2.4	The availability of water (construction as well as drinking) in BHEL-BAP_Ranipet is limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
16.2.5	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water for which no separate payment shall be made by BHEL.
16.3	**Electricity**
16.3.1	The contractor shall be provided with supply of electricity for the purpose of the execution of works under this contract, only at one point within 500M from given work premises on chargeable basis. The bidder shall provide required number of metered connection to calculate the usage of electricity (if required).
16.3.2	Further distribution (including laying of power cables etc. / installation DBs, etc. at various points and maintenance of the same for entire construction period) beyond this point to be arranged by the contractor at his own cost. If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in

	an efficient manner and the same may be audited / inspected by BHEL time to time.
16.3.3	The bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives / T&Ps are deployed.
16.3.4	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds. The contractor shall make his own arrangement for alternative source of power supply through deployment of adequate number / capacity of DG Sets at his own cost.
16.3.5	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of workmen.
16.3.6	Contractor should arrange for power supply for their labour colony within their quoted price.
17.0	**Cement and Steel – The stated specifications are minimum requirements to be complied**
17.1	**Cement:** Unless otherwise specified or called for by the Engineer-in-charge, cement shall be ordinary Portland cement or / and Portland puzzolena cement in 50 kg bags. The use of bulk cement will be permitted only with the approval of the Engineer-in-charge. Ordinary Portland cement (OPC) 43 or 53 grade (as specified or as Decided by Engineer-in-Charge) manufactured as per I.S. specifications ACC/ Ultra tech/ coromandel / Dalmia or any other approved brands by BHEL shall be procured and used on the work. Joint account of cement consumed at site for every day for items of work carried shall be maintained by the Contractor for verification to ensure effective control on quality of work. A certified report attesting to the conformity of the cement to IS specifications by the cement manufactures chemist shall be furnished to the Engineer-in-charge, if demanded. In-case the cement is required to be arranged by the Contractor, the Contractor will have to make his own arrangement for the storage of adequate quantity of cement. Cement in bulk may be stored in bins or silos which will provide complete protection from dampness, contamination and minimize caking and false set. Cement bags shall be stored in a dry enclosed shed (storage under tarpaulins will not be permitted), well away from the outer walls and insulated from the floor to avoid contact with moisture from ground and so arranged as to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the site. The storage bins and storage arrangements shall be such that there is no dead storage. Not more than 12 bags shall be stacked in any tier. The storage arrangement shall be got approved by the Engineer-in-charge. Consignments in cement shall be stored as received and shall be consumed in the order of their delivery Contractor shall establish cement/concrete/soil testing laboratories at site of work with qualified person to handle the laboratory. Every consignment of cement procured shall accompany test certificate from the company indicating lot No… etc. Sample shall be taken for each lot and sent to Standard Approved Material Testing Laboratory for physical and chemical analysis. The cost of testing shall be borne by the Contractor. Cement held in store for a period of 90 (ninety) days or longer shall be retested before use in work. Should at any time the Engineer-in-charge have reasons to consider that any cement is defective, then irrespective of its origin and / or manufacturers test certificate, such cement shall be tested immediately at a National Test Laboratory or such approved laboratory, and until the results of such tests are found satisfactory, it shall not be used in any work.
17.1.1	Cement, for use in the work covered under the scope of this tender specification will have to be arranged by the contractor and his offer, shall be inclusive of all such components. No cement shall be issued by BHEL.
17.1.2	The contractor shall submit the total quantity of cement inclusive of a maximum of (+) 2 (TWO) % towards wastage required for the works covered under this contract along with the bid in the prescribed format.
17.1.3	In case if cement is supplied in quantity less than that indicated above, BHEL shall recover the differential quantity, at the rate of loading price decided by BHEL at the time of Final Reconciliation.
17.1.4	Cement to be used in works shall be as per Technical Specification. The contractor shall procure cement from reputed direct manufacturers like, Century, Lafarge, L&T, Grasim, ACC,

	etc., after obtaining approval from BHEL.
17.1.5	The contractor shall arrange for proper storage for the cement as per norms laid down in Bureau of Indian Standards (BIS), within the site premise. The contractor shall maintain a ready stock of cement compatible to the requirement.
17.1.6	The contractor shall maintain a minimum stock of 30 (Thirty) days requirement in advance.
17.1.7	Clotting of cement must be avoided. In case, due to any cause attributable to the Contractor such clotting of cement occurs rendering the same unusable, then such quantity of cement shall be removed from site immediately by the contractor at no extra cost.
17.1.8	Empty cement bag shall be the property of the contractor which shall be disposed off by the contractor fulfilling all statutory norms, as applicable, at no extra cost to BHEL.
17.1.9	The contractor shall take care of material and shall protect the same from damage and weathering. Contractor shall construct waterproof cement store of adequate capacity as per requirement as shall be agreed upon at site with BHEL, for storing and stacking of cement.
17.1.10	However, in case, exact quantities required during the execution exceed the quantities over and above the projected quantity as mentioned, the bidder shall have to provide such excess materials at his own cost as per the quality and specification as underlaid in the Technical Specification.
17.1.11	**Cement Consumption and Reconciliation**
17.1.11.1	The contractor shall maintain proper store account for cement and shall give three copies of monthly-computerized reconciliation statement.
17.1.11.2	No cement can be taken out of the project site unless otherwise permitted by BHEL.
17.1.11.3	The theoretical consumption of cement shall be based on the following: a) For design mix concrete as per approved design mix. b) For nominal mix concrete work, as per minimum cement as specified or as approved by Engineer-in-charge. c) For item of works, where volume mix is permitted in writing by the BHEL, for masonry works, plaster, finishing works and other miscellaneous items, the cement consumption shall be governed by the "Statement of Cement Consumption" attached to Delhi schedule of Rates of CPWD-DSR-2018 unless otherwise specified in the specifications or the drawing of contract of contract or mutually agreed by Engineer-in-charge and contractor.
17.1.12.4	Wastage for reconciliation purpose shall be as per following: Allowable wastage: Two percent (+2%) of theoretical consumption of cement.
17.2	**Structural Steel:** All steel and other materials used for steelwork and in association with steelwork shall conform to appropriate Indian standards. Only tested materials shall be used unless written authority is obtained for the use of untested materials for certain secondary structural members. Unless otherwise specified in the drawings. **REINFORCEMENT STEEL:** Steel reinforcement bars, if supplied or arranged by contractor, shall be either plain round mild steel bars grade as per IS 432 (Part-I) or medium tensile steel bars as per IS 452 (Part-I) or hot rolled mild steel and medium tensile steel deformed bars as per IS 1139 or cold twisted steel bars and high yield strength deformed bars as per IS 1786, as shown and specified on the drawings. Wire mesh or fabric shall be in accordance with IS 1566. Substitution of reinforcement will not be permitted except upon written approval from Engineer-in-charge. All steel shall be grade I quality unless specifically permitted by the Engineer-in-charge. No rolled material will be accepted. If demanded by the Engineer-in-charge. Contractor shall submit the manufacturers test certificate for steel. Random tests on steel supplied by contractor may be performed by Engineer-in-charge as per relevant Indian Standards. All costs incidental to such tests shall be at contractor's expense. Steel not conforming to specifications shall be rejected. All reinforcement shall be clean, free from grease, oil, paint, dirt loose mill, scale dust, bituminous materials or any other substances that will destroy or reduce the bond.
17.2.1	Reinforcement steel and structural steel for use in the works covered under this tender specification for concreting work, masonry works, MS embedment parts and structural steel works including PEB structures shall have to be arranged by the contractor and his offer, shall be inclusive of all such components. No cement shall be issued by BHEL.
17.2.2	Bidder to note that supply of all types of fasteners like MS/HT/HSFG bolts/nuts for structural and civil works, lock nuts, washers, foundation bolts, pipe sleeves, rail sections (rail sections

	for EOT not to be consider), handrails, MS flats, material for gratings fencing material, fencing posts, Anchor fastener etc., shall also be in the scope of the contractor under this contract.
17.2.3	Steel required for his enabling job like store/site office etc. shall be arranged by the bidder at his own cost.
17.2.4	Reinforcement Steel & Structural Steel to be used in works shall be as per Technical Specification. The contractor shall procure the same from reputed direct manufacturers like, SAIL etc., after obtaining approval from BHEL.
17.2.5	The contractor shall submit the total quantity of reinforcement steel and structural steel required for the works covered under this contract along with the bid in the format indicated below.
17.2.6	However, in case, exact quantities required during the execution exceed the quantities over and above the projected quantity as mentioned, the bidder shall have to provide such excess materials at his own cost as per the quality and specification as underlaid in the Technical Specification.
17.2.7	Fabrication wastage, if any due to bidder's workmanship, shall not be compensated by BHEL.
17.2.8	The contractor shall maintain proper store account for all steel materials issued by BHEL and shall give three copies of monthly-computerized reconciliation statement of such account to BHEL. Approved drawings and Bar bending schedule shall be the basis for actual material consumption for reconciliation purpose.
17.2.9	No material can be taken out of the project site unless otherwise permitted by BHEL.
17.2.10	**Reinforcement & Structural Steel-Consumption & Wastage**
17.2.10.1	**Consumption**
17.2.10.1.1	The theoretical consumption of various sections and/or diameter of reinforcement steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. In case any such sectional weights are not available in the above documents, the manufacturer recommendation shall be binding. No extra cost shall be payable to the contractor for any deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.
17.2.10.1.2	Actual consumption = Usage – Surplus.
17.2.10.1.3	Wastage = Actual consumption – Theoretical consumption.
17.2.10.2	**Wastage**
17.2.10.2.1	Allowable wastage: (+5%) of the theoretical consumption shall be considered as allowable wastage.
17.3	**Reconciliation of Materials**
17.3.1	The contractor shall submit a reconciliation statement of cement and steel with each RA Bill.
17.3.2	At the time of submission of bills, the contractor shall properly account for the material as specified herein to the satisfaction of BHEL certifying that the balance material is available with contractor's custody at site.
17.3.3	The reference drawings for actual material consumption to be used for the purpose of reconciliation, shall be drawings prepared by the contractor and drawings approved by BHEL for fabrication works and such other drawings approved by BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.
17.4	**Material Handling (BHEL Issued Materials)**
17.4.1	Unloading of materials at the storage yard, using contractors own cranes, trailers and other equipments with the valid road permits for their operation, unloading and stacking etc. shall be the responsibility of the contractor under this contract.
17.4.2	It will be the responsibility of the contractor to submit computerized account of all such consignments of materials received by him daily to BHEL.
17.4.3	The Contractor shall take responsibility of safety of the materials supplied at his own cost and store the same at his stores as per standard norms. The bidder shall make complete arrangement of necessary security personnels, to safeguard all such materials in his custody.
17.4.4	The contractor shall take care of their materials and shall protect the same from theft, damage and weathering.
17.4.5	The contractor shall maintain proper store account for all the materials and shall give three copies of monthly-computerized reconciliation statement .
17.4.6	Contractor shall also carryout in association with BHEL, the material management functions and execution like day to day update of materials, issued to contractor. These functions shall

	also be carried out through computerized system utilizing suitable software. No material can be taken out of the project site unless otherwise permitted by BHEL.
18.0	**Construction of Temporary Office Stores Etc.**
18.1	The contractor shall arrange at his own cost cleaning/ clearing of grass, shrubs etc. and grading of area allotted, construction of his temporary office, open / covered / semi covered stores, cement stores, fabrication yards, labour colony etc. and also the watch and ward of all the above.
18.2	Contractor should construct adequate numbers of Covered Cement Stores for different type of cement. Cement has to be kept over wooden raised platform as specified in relevant IS Code. Stacking of cement is to be done as per IS codes with proper illumination and locking arrangements.
19.0	**Tools & Plants (to be Provided by Contractor)**
	The list of major T&Ps to be deployed by the contractor for successful completion of work shall be furnished along with the bid document in toto for the work completion. No T&P will be provided by BHEL
19.1	Any addition of T&Ps requirement to meet the schedule shall be complied by the contractor at no extra cost to BHEL**.**
19.2	The contractor at his cost shall arrange operator, diesel, petrol and other consumables required for the tools and plants, equipments etc. including preventive and routine maintenance of tools and plants.
19.3	All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition.
19.4	The contractor shall bring to Site all equipment, components, parts, materials, including construction equipment, tools and tackles for the purpose of the Works under intimation to BHEL. All such T&Ps/equipments/materials shall, from the time of their being brought to site, shall not on any account be removed or taken away by the Contractor without the written permission of BHEL.
19.5	The list of major T&Ps to be deployed by the contractor for successful completion of work is mentioned below:

Sl No	**Description of T&P**
1	1 Nos tower crane of 60m arm length with 2 cum capacity at the end of arm.
2	1 No 35 / 40 T crawler crane.
3	2 No Hydra (8 / 10 T Cap).
4	2 No Radial drill machine
5	4 No Submerged Arch Welding machine (1st lot)
6	6 No MIG machine (1st lot)
7	100 No Welding Rectifier
8	2 No Power Driven HSFG bolt tightening m/c
9	1 No Automatic Batching Plant (@ 20 Cum / Hr)
10	Minimum 2 No. Transit mixer in working condition
11	1 No. Concrete Pump (20 Cum/Hr minimum with 30 Mtr concrete lifting capacity) with 100 mtr pipeline per pump. (For roof concreting)
12	1 no Air Compressor
13	4 Nos Self priming Dewatering pump (2 no's 5 HP & 2 no's 10 HP) (Diesel/Electric)
14	2 Nos Submersible Dewatering pump (1 no 5 HP & 1 no 10HP)
15	2 Nos Self priming Dewatering pump 2 HP
16	1st Sludge Pump – Submersible
17	2 Nos Curing pump.
18	One Hydraulic Excavator /Poclain with rock breaker attachment
19	One Dozer
20	02 Nos Dumper (During initial excavation period additional 02 no's dumper required)
21	02 Nos Reinforcement bending machine
22	02 Nos Reinforcement cutting machine
23	50,000 RM (minimum) MS scaffolding pipe with suitable cup locks
24	01 No Power driven earth rammer
25	01 No. Vibromax
26	01 Nos Compression testing machine (200 T cap.)
27	Other field test lab equipment for testing of various materials including laboratory building.
28	02 Nos Electric Winch with hoist.
29	01 Nos Total Station. with all accessories & staff.
30	04 Nos Auto level & staff
31	01 Nos DG set (62.5 / 125 KVA)
32	54 Nos Concrete Cube Molds
33	One Hydraulic Excavator cum pay loader / JCB
34	01 No Trailors
35	01 No Drinking Water tank – 3000 Lit.
36	01 No Truck mounted water tank with Sprinkler arrangement for dust suppression.
37	01 No. Ultrasonography testing machine for structural work.
38	01 No. Radiography source
39	Electrode Baking Oven
40	03 Nos Portable Electrode Baking Oven
41	Whenever need arises higher capacity crawler crane shall be deployed other than mentioned above list.
20.0	**Civil Laboratory**
20.1	Contractor shall establish, commission and start maintaining civil laboratory with necessary equipment to carryout following tests as listed below within 30 days from date of LOI.
20.1.1	Compressive strength of cement, concrete cubes, bricks etc.
20.1.2	Water absorption test of bricks.
20.1.3	Earth compaction test (proctor density/dry density and optimum moisture content, etc.).
20.1.4	Conducting of test for setting time and compressive strength of cement.
20.1.5	Sieve analysis of fine aggregates and coarse aggregates.
20.1.6	Bulking test of fine aggregates.
20.1.7	Specific gravity, density, void & absorption test of fine aggregates.
20.1.8	Sieve analysis, moisture content, specific gravity and crushing strength of course aggregates.
20.1.9	Weighing Balances, Drier, Thermometer, Hydrometer, Hand scoop, Glass beakers, Measuring

	Cylinders, Desiccators, Burette and its stand, Pipette, Wooden Mallet, Hair Brush, Wire Brush, Buckles, Test Tubes, Working Platforms.		
20.1.10	Soil Testing apparatus for Particle size analysis, Index properties of soil , Moisture Density relations of soil, Specific Gravity, Density of Soil in place by Sand replacement method.		
20.1.11	Dye penetration test and Ultra sonic Test.		
20.2	Other than above mentioned test, any testing required to be carried out at site as per Quality Plan and technical specification have to be arranged by contractor for all the works at his own cost.		
21.0	**Construction Schedule**		
21.1	While submitting the offer, the contractor shall furnish (L-2) construction schedule indicating all milestones on the basis of major activities indicated below in MS project preferably		
	01	**Design & Detailing and RFC drawing submission.**	
		Shop1 - Upto plinth - From plinth to roof bottom - RCC Roof over metal decking sheet with girders	4th week 5th week 6th week
		Shop2 - Upto plinth - From plinth to roof bottom - RCC Roof over metal decking sheet with girders	5th week 6th week 7th week
		Shop3&4 - Upto plinth - From plinth to Roof sheet bottom - Roof Sheeting	6th week 7th week 8th week
		Balance Structures	9th – 11th week
	02	**Major Milestone** - which includes design, detailing & Construction of Foundation, superstructure, Roof (RCC/Sheet), Brick work / Sheet cladding, plastering, grade slab of all structures.	**Completion period from date of LOI - 13 month maximum**
21.2	Contractor shall submit daily work program based on approved construction schedule.		
21.3	The above work schedule shall be reviewed from time to time and based on the project requirement.		
22.0	**Completion Period**		
22.1	The completion period of major activities as mentioned in the construction schedule have to be followed. All major works including Design, Engineering, Construction activities as required for production shall be successfully completed in all respect within **13 (Thirteen)** months (including handing over) from the date of issue of LOI. All other construction in all aspects shall be completed on or before 17 (Seventeen) months of the LOI		
	The entire work shall be carried out in accordance with the construction schedule. Construction schedule after firming up all design activities to be submitted progressively within 4 months of the LOI		
22.2	The contractor shall mobilize T&P required to start the excavation work within 15 days from the date of placement of LOI and balance mobilization (related to civil works) progressively as per T&P mobilization schedule.		
22.3	Contractor shall establish concrete mix design/ trial mix within 40 days from the date of placement of LOI.		
23.0	**Compensation for Delay**		
	This shall be as per the relevant clause of GCC		
24.0	**Mobilization Advance**		
24.1	Not applicable for this tender.		
25.0	**Secured Payment**		
25.1	No secured advance will be paid by BHEL against value of any erection equipment brought to site by the contractor.		
26.0	**Interim Payment**		
26.1	Not applicable for this tender.		
27.0	**Price Variation**		

27.1	Not applicable for this tender. Bidder's quoted rates/price shall remain firm throughout the contract including extension, if any.
28.0	**Quality Assurance Programme**
	The contractor shall have suitable quality assurance programme to control all activities pertaining to the scope of work, as necessary. Such programs shall be outlined by the contractor and shall be finally accepted by BHEL .A quality assurance programme of the contractor shall generally cover the following :
	Organization Structure and qualification data for key Personnel of the contractor for the management and implementation of the proposed quality assurance programme.
	The procedure for source inspection, incoming raw material inspection, verification of material purchased etc. System for maintenance of records. General requirements – quality assurance The materials, components and equipment covered under the specification shall be procured, manufactured, erected, commissioned and tested, as applicable, at all stages as per comprehensive quality assurance programme. An indicative programme for inspection /test, to be carried out by the contractor, for some of the major items is given in the respective technical specification.
	Field quality plan will detail out the quality practices and procedures etc. to be followed by the contractor's site quality control organization, during various stages of site activities from receipt of material /equipment at site. Casting and forging used for construction shall be of tested quality. Details of results of chemical analysis, mechanical properties test result, as necessary, shall be furnished.
	All welding shall be carried out as per procedure drawn and qualified in accordance with the requirements of ASME Section- 1X/BS 4870 or other international equivalent standard acceptable to BHEL.
	All welders etc. employed on any part of the contract at contractors' work or at site shall be qualified as per ASME Section – IX or BS 4871 or equivalent international standard approved by BHEL. Such qualification test shall be conducted in presence of BHEL.
	All non-destructive examinations (NDT) shall be carried out in accordance with approved international standard. NDT operators shall be qualified as per SNT-TC-IA (of American society of non-destructive examination) Results of NDT shall be properly recorded and submitted for approval.
	All the purchase specifications for the major bought out items list of which shall be drawn up by the contractor and finalized with BHEL shall be furnished to BHEL for comments and approval before placement of orders.
	BHEL reserves the right to carry out quality audit and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit.
	Quality audit/approval of the results of test and inspection will not prejudice the right of BHEL to reject an equipment service not giving the desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment/service as per specification. Repair/rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.
	All the latest relevant IS codes as per technical specification should be available with the contractor at site within 45 days from the date of placement of LOI.
29.0	**Design Office**
	Since time is the essence of the contract, the contractor shall indicate the location of the design office where from such detail activities will be operative. However, the contractor shall maintain a liaison office in or around BHEL-BAP-Ranipet for coordination with BHEL.
30.0	**Site Visit**
	Contractor should visit BHEL-BAP-Ranipet Project site and acquire full knowledge and information about site conditions. The bidder must visit site, to acquaint himself with the conditions prevailing at site and in and around the plant premises at Ranipet, together with all the statutory, obligatory, mandatory requirements of various authorities before submission of the bid.

	Any hutment/temporary / old structures made of concrete or masonry and any buried pipe /cable coming in the working fronts are to be removed safely by the contractor at no extra cost to BHEL. The bidders to note that making of approach roads including culverts etc., as may be necessary, for transporting earth/ash for filling work from existing location or any other area, shall be in the scope of the bidders.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 02.00: Scope of Work

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

1.0 **Background and Location**

The BHEL-BAP is setting up an Aero space component manufacturing plant at Ranipet, Tamilnadu.

1.01 **APPROACH**

The site is well connected by roads with important industrial centers in the area and is within 1 Km from the Mukundarayapuram Railway Station of the Southern Railway of India. The nearest port of entry is Chennai, which is about 150km from Mukundarayapuram Railway Station.

2.0 SITE DESCRIPTION

It is an existing site where BHEL-BAP manufacturing unit is in operation. The proposed area where the plant is to be located is shown in the enclosed General Layout Plan Drawing.

3.0 INTENT OF SPECIFICATION

3.01 PLANT CAPACITY

The proposed plant shall comprise of four manufacturing shops (1. Clean room classification 100000, 2. Air conditioned shop 3. Furnace shop 4. Milling shop) along with annex buildings.

3.02 SCOPE OF WORK

The Scope of Work consists of Engineering Procurement and Construction (EPC), for the complete Civil & Structural & Architectural Works, for BHEL-BAP-Ranipet and shall necessarily be inclusive but not limited to the following: -

3.02.01 All incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of the plant, all in accordance with the specifications, during execution of the work, and handing over to BHEL.

3.02.02 Preparation & Providing Engineering Drawings, Data, As Built Drawings, and Other Information. The bidder has to arrange vetting of all design drawing of entire civil/structural from IIT/IISC without any cost to BHEL. All changes encountered during execution shall also be carried out with the vetting of IIT/IISC

3.02.03 Close interaction has to be ensured by the bidder from vendors entrusted with the job of Mechanical, Electrical, and Balance job for obtaining inputs from EPC contractors supplying Balance of Plant for the Project. Interface for above on receipt of inputs from other bidders is the responsibility of the bidder.

3.02.04 No work at site shall be executed without approval of BHEL/consultant. Bidder to declare the consultant details along with the bid. The Owner/BHEL may at its discretion review the design/drawings of the EPC Contractor. However, such review will not relieve the contractor of his responsibilities under the contract. The contractor shall take full responsibility for the design and execution of the work and shall be responsible for close monitoring of the quality of work being carried out. In case of any failure/collapse the contractor shall assume complete and total responsibility for all liabilities and shall keep the Owner/BHEL indemnified.

3.02.05 Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required without any additional cost to BHEL.

3.02.06 Complete Civil, Structural and Architectural works, including Fabrication, Erection, providing Construction Offices, Field Laboratory and Construction equipments, Construction Power distribution from the supply point of BHEL and Construction Water supply from a water source to be identified by BHEL.

3.02.07 Receipt, storage, preservation and conservation of equipment at the site.

3.02.08 Satisfactory conclusion of the contract.

3.02.09 Bidder is advised to visit and familiarize himself with existing site conditions prior to submission of bid. No extra claim/compensation shall be admissible, due to lack of information furnished by BHEL, during execution of project.

3.02.10 The civil works are to be carried out near the existing manufacturing unit of BHEL-BAP-Ranipet and hence all the construction activities shall be planned and executed in such a way that no hindrances occur due to the existing plant/structures/facilities. Wherever, there is a space restriction for providing adequate side slopes for the excavations, necessary timbering (shoring) and/or strutting or sheet piling shall be provided to protect the adjacent structures/facilities. Blasting shall not be permitted for excavation in rock or for any other purpose adjacent to any existing building/facilities. Hence, excavation in rock shall be carried out using other mechanical means like chiseling, drilling, or loosening the rock by expansive type chemical grouting etc. However, for open areas where blasting is specifically approved by BHEL, controlled blasting shall be carried out through a specialized agency so that the existing buildings/facilities are not affected. All debris or dismantled items, if any, that are not to be re-used or are unfit for re-use shall be returned to Project Stores or as identified by BHEL.

3.02.11 RCC staircase shall be provided for office buildings. For access to roof of other structure / building cage ladder with suitable platforms shall be provided by the bidder.

3.03 BHEL has carried out detailed GEO TECHNICAL investigation within plant area. The detailed Soil Report will be made available for the Bidder's study at BHEL Office, if required. This report is to facilitate & provide an idea of the soil condition as per BHEL. The onus of correct assessment/interpretation and understanding of the existing sub-soil condition/data is on the bidder. The bidder should note that nothing extra whatsoever on account of variation between furnished soil data and that encountered during execution of foundation works shall be payable.

3.04 The bearing capacity, higher than mentioned in the report shall not be permitted. At intermediate levels, the bearing capacity shall be considered same as the net allowable bearing pressure corresponding to the intermediate shallower level mentioned in the report.

3.05 The scope of Civil, Structural and Architectural works shall include Site Clearance, Micro Leveling, and preparation of Construction Drawings and getting approval of the same from the BHEL and construction of all Civil Structural and Architectural Works including supply of all materials complete for all Buildings, Structures, Equipment, and Facilities under the scope. The nature of work shall generally involve Site Clearance, Excavation in soil and rock, De-watering, Dressing to the required profile, Sheet Piling or shoring/strutting, Controlled Filling with earth/sand/, Back -Filling around completed structures and Plinth Filling, Disposal of Surplus Earth and rock, Concreting including Reinforcement and Form work, Brick Masonry work, Plastering, Painting, Roofing including Permanent Steel Decking, Cladding, Flooring/IPS flooring, Acid and Alkali resistant lining, Steel/coloured anodized Aluminum/Wooden Doors/Windows, Ventilators, Glass & Glazing (as per architectural requirement), False Flooring, Roof Water Proofing with Walkway at Roof-top, Fabrication and Erection of all Structural Steel and Miscellaneous Steel (i.e. steel staircase, ladders, walkways, railing, chequered plate/grating floor, inserts, anchor bolts, expansion fasteners etc.) Paving, Plinth Protection with drains around all buildings, Gravel Filling, Pre-cast covers, Trestles with foundations, expansion joints, Rain Water Pipe, Water Supply, Toilet fittings, Sewerage, Insulation, Damp Proofing, Water Proofing, Anti Weed and Anti – Termite treatment, Roads within Main Plant Area, Drainage, Fencing, Micro grading and site clearance before handing over, other related items of work etc. complete. **Any work not**

explicitly defined above which may crop up during smooth execution/functioning of the plant shall be included in the scope of the bidder. The layout and building dimensions may vary between the bid stage and contract stage drawings as required. The bidder to take into account such variations. No compensation, whatsoever, will be payable to the bidder on this account.

3.06 The work to be performed under this specification consists of Design, Engineering, and Construction of all buildings structures and facilities required as mentioned here-in and in Technical Specifications including all labour, materials, consumables, equipment, Temporary Works, Temporary Storage Sheds, Temporary Labour and Staff Colony, Temporary Site Offices, Construction Plants, Fuel Supply, Transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of plant, all in strict accordance with the specifications including revisions and amendments there to as may be required during the execution of work from time to time. Detailed design criteria for selection and sizing of various systems and structures, etc. including basis of design shall be prepared by the bidder based on various requirements specified elsewhere in the specifications. All the above documents shall be finalized after approval from the appropriate authority as the case may be and form the basis of detailed engineering work. The scope of Bidder for Civil, Structural and Architectural works shall also include but not limited to the following areas and facilities:

3.06.01 Complete storm water drainage system for Main Plant**,** up to the identified disposal point with provision of garland drains around them, including providing drainage pumps (if required) alongwith pump house, keeping provision for connection of drainage from buildings/facilities, provision of storm water drains along the roads on both sides of the road, etc.

3.06.02 Civil and Structural works associated with Plant Potable Water Supply, Sewage collection including Septic Tanks, Soak Pits & Man holes complete with Pipe fittings and fixtures (for all Buildings and facilities within Main Plant Area).

3.06.03 Shop-1 & 2: RCC Framed structure with RCC roof over deck slab with Structural Girder, Masonry cladding.

3.06.04 Shop-3, 4, Tool shop & loading bay: Up to Plinth RCC Framed structure. Above plinth PEB Structural Steel with metal sheet roofing and part Masonry cladding and part corrugated metal sheeting.

3.06.05 All other annex buildings: RCC Framed structure with RCC roof, Masonry cladding. All as per the standard practice.

3.06.06 Plant Roads and Drains within Main Plant Area including Approach roads to all buildings, Interfacing with balance of plant and drains etc.

3.06.07 Culverts at Crossing of all Roads/ Facilities (Included in The Scope of Bidder) With Channels/Drains/Roads/Rail Tracks/Pipes/ Other Facilities Etc**.**

3.06.08 Any other Building/facilities/structures that would be required as per system requirements.

4.0 CONSTRUCTION FACILITIES

4.01 The following are also in the Bidder's scope of work pertaining to construction facilities for the project.

4.02 All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony wherever required, shall be carried out by Bidder.

4.03 The Bidder shall develop his temporary staff colony and labour colony along with fencing etc.

4.04 The bidder shall make all arrangements for distribution of construction power at various locations as per his requirements from the single supply point of BHEL.

4.05 The Bidder shall make all arrangements for the supply of construction water from a water source to be identified by BHEL.

4.06 The Bidder shall provide temporary construction office, construction stores (open/covered), workshops, material/field testing laboratory and any other temporary building and construction equipment, labour and materials.

4.07 The Bidder shall provide all necessary fire fighting devices/equipment/fire tender etc. required during the project execution stage.

4.08 The Bidder shall provide all the tools and tackles required for the work.

4.09 The Bidder shall arrange skilled/semiskilled/unskilled labour from local source(s) as far as available in this country and supervisory staff for quality execution of all civil, structural and architectural works.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 03.00: Specific Technical Requirement (Civil Works)

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

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1. GENERAL

1.1 This specification covers design, preparation of general arrangement drawings, construction and fabrication drawings, supply of labour, materials and construction of all civil, structural and architectural works, for the Main Plant Area.

1.2 These Specific Technical Requirements are **over and above** the specifications furnished by BHEL vide specifications for Civil, Structural & Architectural works.

1.3 Description of various items of work under this specification and nature of work in detail are given hereinafter. The complete work under this scope is referred to as Civil Works. Various Buildings, Structures, Facilities etc. covered under the scope is specified elsewhere.

1.4 The layout and building dimensions may vary between the bid stage and contract stage. The bidder to take in to account such variations. No compensation, whatsoever, will be payable to the bidder on this account.

1.5 Some revisions may also take place during the execution stage. The bidder to take in to account such revisions also and no extra claim on this account shall be payable.

1.6 The work to be performed under this specification consists of Design, Engineering and providing all Labour, Materials, Consumables, Equipment, Temporary Works, Temporary Storage Sheds, Temporary Labour And Staff Colony, Temporary Site Offices, Constructional Plant, Fuel Supply, Transportation, Loading/ Unloading and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of the Plant, all in strict accordance with the specifications and including revisions and amendments thereto as may be required during the execution of the work.

1.7 All materials of construction like fine aggregate, course aggregate, bricks, soling stone, cement, reinforcement steel and structural steel etc., shall be arranged by the Bidder.

1.8 The scope shall also include setting up by the Bidder a complete testing laboratory in the field to carry out all relevant tests.

1.9 The work shall be carried out according to the design/drawings to be developed by the Bidder and approved by BHEL. **All design drawing building/structures shall be vetted IIT/IISC by the bidder at his own cost. Bidder shall have necessary tieups with IIT/IISC till the contract completion of all construction activities and till the guarantee period of the contract.** All changes encountered during execution shall also be carried out with the vetting of IIT/IISC. For all buildings & structures, foundations, etc. except for those supplied by BHEL, necessary layout and details are to be developed by the Bidder keeping in view the statutory & functional requirements of the plant & facilities and providing enough space & access for operation, use and maintenance. Certain minimum requirements are indicated in this specification for guidance purpose only. However, the Bidder's offer shall cover the complete requirements as per the best practices and to complete satisfaction of the BHEL.

1.10 The land shall be given to the Bidder by BHEL. Micro - levelling works shall be done by the Bidder. Soil Investigation Report shall be furnished to the Bidder. In case of additional requirement, over and above that contained in the Soil Investigation Report, the same shall be carried out by the Bidder at his cost.

1.11 All the quality standards, tolerances, welding standards and other technical requirements as covered in this specification shall be strictly adhered to by the Bidder.

1.12 The Bidder should fully apprise himself of the prevailing conditions at the proposed Site, climatic conditions including monsoon pattern, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.

2. SUBMISSIONS

2.1 The following documents shall be submitted for the approval of BHEL, prior to commencement of fabrication & erection/construction. All civil/structural design shall be made using STAAD pro (latest) and its original file format shall be submitted for documentation and verification. All drawings shall be of standard sizes (Metric System) and shall be made on TEKLA (latest) / REVIT (latest) and output of drawings shall be submitted in DWG format. Detail drawings made in original format of TEKLA/REVIT shall be submitted for documentation. All project planning documents such as CPM, PERT etc. shall be in MS-Project or equivalent. Typical 2D/3D-structural frame analysis & design shall be submitted by bidder.

2.2 Construction drawing shall include but not be limited to the following (for specified Scope of Work specified elsewhere): -

i. General plant layout drawing with coordinates of roads, boundary wall, buildings and facilities, piping/cable corridors, diversion drains etc.
ii. Drawings showing underground facilities with co-ordinates and invert levels of these facilities like buried pipes, trenches, sewers, drains, sumps, pits, culverts, foundations etc.
iii. Architectural floor plans, elevations, cross-sections and perspective view in colour of all buildings including provision of skylight in roof structural buildings. For RCC Building, Bidder shall submit a scheme along with a report elaborating the underlying philosophy of the proposed architectural concepts.
iv. Basis of design of all buildings, facilities, services and structures.
v. Design calculations and drawings for foundations/sub-structure and superstructure of all buildings / structures.
vi. Design calculations including dynamic analysis and drawings for all foundations subjected to dynamic loads.
vii. Design calculations and drawings for all facilities and services like roads, culverts, road/rail crossings, drains, water supply, water tank, sumps, transfer points (to the extent included in the scope of this contract), trenches etc.
viii. Drawings of all architectural works including finish schedule, colour scheme (both internal and external), doors & windows, flooring and false ceiling etc.
ix. Design calculations and drawings for plumbing and building drainage.
x. Write-up on various statutory and regulatory requirements and their compliance for various buildings and facilities.
xi. Copy of all reports of studies /investigations carried out by the Bidder as per scope.
xii. Shop drawings/fabrication drawings of all structural steel works including PEB structures & design calculations for important joint connections.
xiii. Construction and erection procedure for all major structures with specific reference to RCC Building / Structural buildings and other machine foundations.
xiv. Marking scheme identifying the equipment laydown areas (equipment details and location will be given by BHEL during engineering stage).
xv. All other designs, details/drawings or any other submission as indicated elsewhere in this specification and as required by the BHEL/Owner.

xvi. All construction drawings shall include total quantity of concrete (grade wise), reinforcement steel (diameter wise) and structural steel (section wise).

3. DESIGN CRITERIA

3.1 General

3.1.1 This includes all structures and buildings, namely, Shop-1 (clean room classification 100000), shop-2 (air conditioned shop) Shop-3&4 (PEB), Tool shop & loading bay (PEB) and annex buildings like X-ray room, NDT room, AHU-1&2, PPT area with bund wall, PPT control room, Gas bank, switch gear room, painting booth, office building, boundary wall with gate, toilets and various other works including Roads, Drains etc. covered in this specification.

3.1.2 Structures shall be designed for the most critical combinations of dead loads, imposed loads, equipment loads, crane loads, piping loads (static and dynamic), wind loads, seismic loads and temperatures loads. In addition, load and forces developed due to differential settlement shall also be considered.

3.2 Loading

3.2.1 Dead Loads

a) Dead loads shall include the weight of structure complete with finishes, fixtures and portions and shall be taken as per IS: 875 (Part – I).

b) Imposed Loads

Imposed loads shall be considered as per latest relevant IS codes.

3.3 Design Concepts

3.3.1 All buildings shall have framed super structure.

3.3.2 Shop-1 (clean room classification 100000) and shop-2 (air conditioned shop) shall have RCC framed structure with RCC roof over structural deck sheet.

3.3.3 Shop-3&4, Tool shop & loading bay shall have Pre-Engineered Steel framed super structure.

3.3.4 All other buildings may have either RCC or structural steel frame work.

3.3.5 Unless specified, all buildings shall have minimum one brick thick wall cladding on exterior face. Minimum clear width of all walkways/staircases shall be 1200 mm unless specified otherwise.

3.3.6 Individual members of the frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion, etc.

3.3.7 The different load combinations shall be taken as per IS: 875 (Part –V) and other relevant IS Codes.

i. Wind and seismic forces shall not be considered to act simultaneously.

ii. `Lifted load' of crane shall not be considered during seismic conditions and wind conditions simultaneously in design.

iii. In case more than one crane is provided and tandem operation is not envisaged the load shall be taken as one crane fully loaded and second crane without lifted load but standing idle adjacent to first crane.

3.3.8 Dispersion of load in any direction through soil shall be as per IS: 9009 (relevant part latest). Dispersion of load through concrete shall be considered at an angle of 45 degree with horizontal from the edge of contact area.

3.3.9 Permissible deflection (unless specified otherwise in this specification) for latticed frame work and beams of floors other than drive floor shall be span /325.

The allowable deflection for beams directly supporting drive machinery shall be restricted to span/500 unless otherwise stated in this specification.

3.3.10 The design and construction of RCC structures shall be carried out as per IS :456 (latest). Working stress method shall be adopted for the design wherever specifically mentioned in this specification.
For design and construction of steel-concrete composite members, IS : 11384 (latest) shall be followed.
For reinforcement detailing, IS : 5525 (latest) and SP:34 (latest) shall be followed.
Two layers of reinforcement (on inner and outer face) shall be provided for RCC wall sections having thickness more than 150 mm.

3.3.11 For design of all underground structures/foundations, ground water table shall be assumed at the finished ground level unless specified otherwise.

3.3.12 Earth pressure for all underground structures shall be calculated using coefficient of earth pressure at rest, co-efficient of active or passive earth pressure whichever is applicable depending upon the structural configuration.

3.3.13 Following loading conditions shall be considered, in addition to the loading from super structure for the design of channels, sumps, tanks & trenches, other underground structures:

i. Water pressure from inside and no earth pressure, ground water pressure & surcharge pressure from outside (applicable only to structures which are liable to be filled up with water or any other liquid).
ii. Earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside.
iii. Design shall also be checked against buoyancy due to the ground water during construction and after construction stages. Minimum factor of safety as per IS : 3370 (latest) against buoyancy shall be ensured considering empty condition inside and ignoring the superimposed loadings.

3.3.14 All water retaining structures shall be tested for water tightness as per the provisions of IS : 3370 (latest) and IS : 6494 (latest) and chemical injection grouting to be provided, incase required.

3.3.15 If RCC floor/roof is assumed to act as diaphragm transmitting lateral loads to braced bays, it shall be provided with shear connectors. However, whenever large/more number of cut-outs are provided in the floor slab, horizontal floor bracings shall be provided below slab to transfer horizontal force to columns without considering diaphragm action from slab.

3.3.16 All roads shall be designed for class `E' of traffic i.e. traffic intensity of 450 –1500 per day (heavy vehicles exceeding 3 tonnes laden weight) as per IRC – 37 – 1984 "Guidelines for the design of flexible pavements." The road slab be designed for 30 years of life and considering a minimum traffic growth of 1%. However, the inspection and maintenance roads shall be designed for a vehicular traffic of 0-15 nos. of vehicles per day.

3.3.17 A minimum clearance (clear head room) of 8M shall be kept for all road/rail crossing and in other areas as specified elsewhere for all pipe/cable galleries conveyors etc. Before and after the crossings, barrier of suitable height shall be constructed so as to prevent the approach of cranes (having height more than 8 M etc. upto the pipe/cable racks.

3.3.18 Storm Water drainage

i. The plant area drainage shall be designed to cater to storm water run off resulting from a 3-hour storm or 1-hour rainfall intensity with a return period of 50 years which ever is higher. The 3 hour and 1 hour values shall be based on the recommendation of Indian Meteorological Department (IMD).
ii. The plant storm water drainage shall be designed taking into account the finished grade levels of the plant and invert levels of existing drains, area drainage pattern within and outside plant area, intensity of rainfall etc. The maximum velocity for pipe drains and open drains shall be limited to 2.4 m/sec and 1.8m/sec respectively. However, minimum velocity

of 0.6m/sec. for self cleansing shall be ensured. Bed slope not milder than 1 in 1000 shall be provided.

3.3.19 Sewers

Sewers shall be designed for a minimum self cleansing velocity of 0.75m/sec and the maximum velocity shall not exceed2.4 m/sec.

3.3.20 Architectural Concepts

i. RCC building shall be architecturally treated in such a way that it retains a monumental scale, yet presents a pleasing composition of mass and void with suitable and functionally designed projections and recesses. The overall impact of the building shall be one of aesthetically unified architectural composition having a comprehendible scale, blending tonal values with the surroundings and taking full consideration of the climatic conditions and the building orientation.

ii. All other buildings including switch gear room, and any other permanent structure shall be architecturally treated in such a way so as to be in complete harmony with the main plant and surroundings.

4. GEO-TECHNICAL INVESTIGATION & FOUNDATION SYSTEM

4.1 In case Geo-technical investigation report is available, the same shall be furnished to the bidder. The report shall be solely for the purpose of guidance to the bidder. BHEL/owner does not take any responsibility about the accuracy and applicability of the geo-technical data furnished herewith. The onus of correct assessment / interpretation and understanding of the existing sub-strata conditions is on the bidder. Any variation in the data between the one indicated in the geo-technical investigation report and to that found during additional geo-technical investigation/execution of the work at site shall not constitute a valid reason in affecting the terms & conditions of this bid and the bidder should note that nothing extra will be payable on this account. The bidder shall fully satisfy himself about the nature of the sub-strata expected to be encountered including the type of foundation, ground water table and construction methodology to be adopted etc prior to the submission of the bid. If the bidder desires to carry out additional geo-technical investigation, he may do so with prior information/permission of BHEL/owner at no extra cost to BHEL/owner. No extension in time schedule shall be permitted on this account.

4.2 **Dynamic properties such as dynamic shear modulus, poisson's ratio, co-efficient of elastic uniform compression etc of the sub-strata at various depths to be used for design of machine foundations.**

4.3 Foundation system

4.3.1 General Requirements.

i. All equipments/structures shall be supported on suitable open foundation required along with any special requirements/remedial measures/treatment called for subsoil/foundations as approved by BHEL/owner.
ii. All foundations shall be designed in accordance with the provisions of relevant part of the latest revisions of Indian Standards.
iii. No major foundation shall rest on filled up ground/soil.
iv. Foundations shall be designed to resist loading derived from environmental loads including loads due to wave, current, wind or seismic, gravity loads, construction loads, static and moving loads and any other loads as applicable and as specified elsewhere in the specification.
v. Foundation shall be designed for worst combination of loads as described elsewhere in the specification.

vi. For identifying the sub-strata for founding purposes the bidder shall depute/post an experienced geologist/geo-technical engineer so that the foundation rests in the specified stratum.

vii. Ground water table shall be considered at finished ground level for design purposes unless specified elsewhere in the specification.

4.3.2 **Open foundations**

In case open foundations are adopted the following shall be adhered to.

- Minimum width of foundation shall be 1.0m.

- Minimum depth of foundation shall be 1.5m below natural ground level.

- It shall be ensured that all foundations of a particular structure / building / equipment shall rest on one bearing stratum, i.e. either over burden or rock.

- Wherever the intended bearing stratum at the founding level is weathered rock but the actual stratum encountered during foundation excavation consists of both overburden soil and weathered rock, under such cases either the foundation shall be lowered completely into the weathered rock (with redesign) or the overburden soil upto the weathered rock level shall be removed completely and built up with PCC up to designed foundation level.

- Net allowable bearing pressure values as approved by BHEL/owner shall be adopted for design. The permissible settlement as mentioned under para "permissible settlement of foundations" or the permissible settlement from functional requirements whichever is more stringent shall be adopted for the design.

4.3.3 Permissible settlement of foundations:

The permissible total settlement and differential settlement of foundation resting on soil and rock mass shall be shall be governed by IS:1904 (latest) and IS:13063 (latest) respectively and from functional requirements whichever is more stringent.

However, the total settlement of foundation resting on soil shall be restricted to the following.

All foundations (isolated/strip/combined/raft) in main plant – 25mm.

All foundations other than those mentioned above.

Isolated/strip footings of width upto 6m : 40mm

Footings of width greater than 6m (raft) : 75 mm

a) The total settlement of any foundation resting on rock mass shall be restricted to 12mm.

b) Analysis and proportioning of footings to minimize differential settlements shall be carried out for all major foundations and the same shall be submitted for BHEL/owner's approval.

4.3.4 Machine Foundations/Heavy Equipment Foundations: -

Criteria as laid down in Detailed Specifications and as approved during Detailed Engineering Stage will be followed:

i. For the foundations of machine / equipment etc. detailed static and dynamic analysis shall be done. The static analysis shall include all operating conditions, load cases and abnormal loads like short circuit, loss of blade, unbalance and seismic forces. Unbalanced loads as given by machine manufacturer and/or relevant IS codes (latest) whichever is more

conservative shall be used for calculating dynamic response. The dynamic analysis shall consist of free vibration analysis and forced vibration analysis. Transient analysis shall be carried out for the short circuit condition with an appropriate force function. Frequency separation criteria and amplitude criteria as laid down in IS: 2974 (latest) and/or as required by the machine manufacturer, whichever is more stringent shall be satisfied. RCC design shall be done by working stress method for all machine foundations. A suitable fatigue factor shall be considered for dynamic forces. Minimum reinforcement shall be governed by IS: 2974 (latest) as well as IS: 456 (latest).

ii. The special requirements for concreting including grade, type of aggregate, use of admixtures, temperature control, ultrasonic testing, etc., shall be as mentioned in special technical requirements elsewhere.

iii. All block foundations supporting rotating equipments resting on soil shall be designed using the elastic half space theory. The mass of the RCC block shall not be less than three times the mass of the machine. Dynamic analysis shall be carried out to calculate natural frequencies in all the modes including coupled modes and to calculate vibration amplitudes. Frequency and amplitude criteria as laid down in the relevant codes and/or by machine manufacturer whichever is more stringent shall be satisfied. Minimum reinforcement shall be governed by IS:2974 (latest) and IS: 456 (latest).

iv. For the foundations supporting minor rotating equipment weighing less than one tonne or if the mass of the rotating parts is less than one hundredth of the mass of the foundation, no dynamic analysis is necessary. However, if such minor equipment is to be supported on building structure, floors etc. suitable vibration isolation shall be provided by means of springs, neoprene pads etc.

4.4.5 Concrete work shall be carried out as per IS: 456 (latest). Mix design concrete shall be used for all areas other than lean concrete work and plain cement concrete where nominal/volume mix can be permitted. Design mix shall be carried out as per is: 10262 (latest). The minimum grades of reinforced concrete for foundations shall be M-25.

4.4.6 Unless specified 20mm and down aggregates shall be used for all structural concrete works. However, 40mm and down aggregates may also be used under special conditions for the mass concreting in foundation.

4.4.7 Foundation Sizing

i. The outline plan dimensions of foundations shall be given by the machine supplier. The depth of foundation shall be selected after taking into consideration soil strata and operating level of the machine. The eccentricity of common CG of machine and foundation with respect to the centroid of base area should not exceed 5% of the corresponding base dimensions of foundation.

ii. In order to reduce the horizontal amplitudes, the height of foundation should be selected as small as possible. A Larger base dimension should be selected in the direction of rocking moment, if any, acting on the foundation.

4.4.8 Miscellaneous Machine Foundations

i. For the large variety of other types of machines there are numerous foundation designs and the most suitable one shall depend on the particular application.

ii. Foundation for pumps, and minor rotating equipment etc., are usually in the form of solid block foundations, resting on the ground or on a floor of the building.

iii. At such machine support, floor may be thickened and extra reinforcements provided. Also, the machines, which are almost vibration free and are light to moderately heavy, may be supported in the above manner. Rubber or neoprene pads may have to be used under some of these machines to reduced transmission of vibrations to the supporting floor.

4.5 Other Requirements

4.5.1 Cement type: As approved by the BHEL based on soil water chemical environment / bidder's recommendation.

4.5.2 Concrete grade: Minimum grade of concrete shall be M25 unless specified otherwise elsewhere. Concrete shall be dense & durable.

4.5.3 Reinforcement steel Type: As approved by the BHEL based on soil water chemical environment / bidder's recommendation.

4.5.4 Cover to reinforcement: As per IS 456 (latest), subject to minimum of 50 mm for foundations, column – 40 mm.

4.5.5 Based on soil and water analysis, in case protection against corrosions is required, all surfaces of foundations and substructures in contact with soil shall be provided with three coats of hot applied industrial bitumen conforming to IS: 702 latest of Grade 85/25 at the rate of 1.7 Kg/sq.m./coat with anti-stripping compound.

4.5.6 In case the presence of high water table is encountered while excavating, comprehensive dewatering arrangement shall be required and in case deep well point system is required, the same shall be provided. In addition to above, at certain places sheet piling to support sides of excavations may also be required. Scheme for dewatering and design with all computations and back-up data of dewatering and sheet pilling shall be submitted for BHEL/Owner's information.

4.5.7 The founding level for trenches/channels shall be decided as per functional requirement. The bottom of excavation shall be properly compacted prior to casting of bottom slab of trenches/channels.

4.5.8 Excavation for open foundations shall be covered with PCC immediately after reaching the founding level. In case of any local loosening of soil at founding level during excavation, the same shall be removed and compensated by PCC. The foundation pits shall be maintained dry during the complete construction period by means of dewatering systems.

4.5.9 Backfilling around foundations shall be carried out with excavated materials in layers not exceeding 30cm thickness and each layer shall be compacted to 90% standard proctor density for cohesive soil and to 75% of relative density for non-cohesive soils.

5. MAIN PLANT AND AUXILIARY BUILDINGS

5.1 Main plant shall comprise of:

Type of framing, floor slabs and finishes to be provided has been described elsewhere in this specification.

5.1.1 Main plant building consisting of Shop-1 (clean room classification 100000), shop-2 (air conditioned shop) Shop-3&4 (PEB), Tool shop & loading bay (PEB) and annex buildings like X-ray room, NDT room, AHU-1&2, PPT area with bund wall, PPT control room, Gas bank, switch gear room, painting booth, office building, boundary wall with gate, toilets and various other works including Roads, Drains etc located there in.

5.1.2 All floors shall generally be provided with cast-in-situ RCC slab. However, steel grating, chequered flooring as well as pre-cast RCC covers shall be provided as per the functional requirements.

6. CONCEPTUAL ARRANGEMENT AND FINISHING SCHEDULES

6.1 Conceptual Arrangement of Roof, Floors and Cladding System for Various Plant and Non Plant Buildings

6.1.1 The conceptual arrangement of plant buildings in general shall be as follows:

BUILDING	TYPE	INTERMEDIATE FLOOR	ROOF	GROUND FLOOR	SIDE CLADDING
Shop -1 (Clean room classification 100000)	RCC framed Structure	N/A	Cast in Situ RCC Slab over permanent metal decking	150 mm thk RCC Grade Slab	Brick Cladding
Shop -2 (Air conditioned room)	RCC framed Structure	N/A	Cast in Situ RCC Slab over permanent metal decking	150 mm thk RCC Grade Slab	Brick Cladding
Shop-3	Steel frame (PEB) on RCC foundations	N/A	Metal sheet roofing	150 mm thk RCC Grade Slab	Metal sheet & Brick cladding
Shop-4	Steel frame (PEB) on RCC foundations	N/A	Metal sheet roofing	150 mm thk RCC Grade Slab	Metal sheet & Brick cladding
Tool Shop	Steel frame (PEB) on RCC foundations	N/A	Metal sheet roofing	150 mm thk RCC Grade Slab	Metal sheet & Brick cladding
Loading Bay	Steel frame (PEB) on RCC foundations	N/A	Metal sheet roofing	200 mm thk RCC Grade Slab for loading & unloading	Metal sheet & Brick cladding
Pressure Proof Test (PPT) building	RCC framed Structure / Steel frame (PEB) on RCC foundations	N/A	RCC Slab / Metal sheet roofing	150 mm thk RCC Grade Slab	Metal sheet & Brick cladding
NDT Building	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
X-ray Building	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
Air Handling Unit (AHU) – 1 & 2	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding

BUILDING	TYPE	INTERMEDIATE FLOOR	ROOF	GROUND FLOOR	SIDE CLADDING
PPT control room	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
Painting booth	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
Gas Bank	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
Switch gear room	RCC framed Structure	N/A	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding
Office Building	RCC framed Structure	RCC slab	RCC Slab	150 mm thk RCC Grade Slab	Brick cladding

6.2 Interior Finish Schedule will be as per Detailed Specifications and as approved during Detailed Engineering stage.

Note: All material and workmanship for finishing work specified herein shall be as per provision of relevant I.S. codes. In absence of such codes it shall be as per manufacturers' recommendations or as per instruction of engineer in charge.
The nominal thickness of floor finish shall be 50 mm.

6.3 Exterior Finish Schedule will be as per Detailed Specifications and as approved during Detailed Engineering stage.

6.4 Paving

6.4.1 RCC paving minimum 150 mm thick of grade M20 (with minimum reinforcement of 8 dia (CTD/TMT) @ 200 c/c both ways top and bottom) over an underbed as specified herein shall be provided for areas mentioned below. The underbed shall consist of preparation and consolidation of subgrade to the required level, laying of stone soiling of 225 mm compacted thickness with 63 mm and down aggregate with interstices filled with selected sand followed by 75 mm thick 1:4:8 PCC (1-part cement, 4 parts sand and 8 parts stone aggregate) with 40 mm nominal size aggregate.

i) Ground floor of all buildings

7. ARCHITECTURAL CONCEPTS AND DESIGN

An Architectural Design Basis Report shall be submitted to the BHEL including proposals for the following scheme components: shape, form, colour, and basic materials for interior and exterior architecture along with an appropriate landscaping scheme. All schemes shall be supported by architectural statement explaining the factors considered in the design.

General design criteria for the architectural systems shall be as follows:

7.1 Wall/Cladding System

7.1.1 Brick Work

All walls shall be non-load bearing infilled panel walls.

All internal walls shall be with brick masonry and all toilets shall be provided with minimum one brick thick masonry walls.

RCC Transoms and Mullions shall be provided wherever necessary to reinforce the brick work

50 mm thick DPC in cement concrete (1:1:5:3) with water proofing compound followed by two layers of bitumen coating 85/25 grade as per IS:702 @ 1.7 kg/sq m shall be provided at plinth level before starting the masonry work.

The bricks used shall be of minimum class designation 50. The bricks shall be laid with cement mortar (1:6) for one brick thick walls and (1:4) for half brick thick walls. IS:1905 (latest), IS:2212 (latest) and SP-20 (latest) shall be followed for brick work design and construction.

Wall cladding loads along with the effects of wind, earthquake etc. on it shall be considered in the design of beams supporting the walls.

Partition walls for A.C area shall be provided with glass partition and anodized aluminium frame. Provision of double glass partition shall be provided between air-conditioned and non-air-conditioned areas.

7.2 Acid Alkali Resistant Lining

7.2.1 Shop-4

For Floor & Dado bitumen primer followed by 12 mm thick bitumastic, 6 mm thick potassium silicate mortar bedding and 20 mm thick A.R. tiles shall be provided. Dado height shall be as per requirement and cladding shall be painted with chemical resistant epoxy paint at applicable area only.

7.2.2 For MS Grating /Chequered plate cover and any other steel structure likely to come in contact with chemicals Epoxy coating of 150 microns thick over epoxy primer shall be provided.

Note:

i. Wherever required, all structures shall be tested for water tightness before application of A.R. lining.
ii. Pointing shall be with either Epoxy/Furane/CNSL.
iii. Surface on which lining is to be applied shall be prepared in accordance with IS:2395 (latest).
iv. The joints between the AR bricks/tiles shall be filled with resin type of mortar conforming to IS:4832 (Part-11) (latest). Seal coat of ready made epoxy paint shall be provided on joints to cover up any porosity that may be left in mortar. End sealing may be done with bitumastic. Acid curing of the lining shall be done in the line with the manufacturer's recommendations.
v. AR bricks shall be laid with 6mm wide & 20mm deep pointing.
vi. Under side of all precast slabs/steel covers over effluent drain shall have 2 coats of epoxy coating (150 microns thick).

7.2.3 Acid /Alkali resistant lining material shall conform to the following:

a) Bitumen primer shall conform to IS: 158 (latest).
b) Bitumastic compound shall conform to IS:9510 (latest).
c) AR Bricks/Tiles shall conform to class II of IS:4860 & IS:4457 (latest) respectively.
d) Mortar: Potassium silicate/resin type mortars shall conform to IS:4832 Part – I & II (latest) respectively.
e) Requirements for acid alkali/resistant flooring and lining for different areas shall be as specified elsewhere in the specification.

8. MISCELLANEOUS SPECIFICATIONS

8.1 Expansion joints for all underground structures shall be made water tight by ribbed PVC water stops with central bulb or of kicker type, the thickness and width of PVC water stops shall be as per the

requirement of design. However, the minimum thickness and width shall be 6 mm and 230 mm respectively

8.2 Preformed bitumen impregnated fiber board conforming to IS:1838 (latest) shall be used as joint filler. Two-part polysulphide sealent conforming to IS:12118 (latest) shall be used for sealing of joints

8.3 A screed or concrete layer not less than 100 mm thick and of grade not weaker than M-10 conforming to IS:456 shall be provided below all water retaining structures. A sliding layer of bitumen paper or craft paper shall be provided over the screed layer to destroy the bond between the screed and the base slab concrete of the water retaining structure.

8.4 Minimum 100 mm thick lean concrete (1:3:6) shall be provided below all other underground structures, foundations, trenches, etc. to provide a base for construction.

8.5 Doors and windows on the external wall of building with metal cladding shall be fixed by creating recesses in the cladding system

8.6 Doors and windows on external brick walls of buildings shall be provided with RCC sunshades over the opening extending 300 mm on either side of the opening, projection of sunshade from the wall shall be minimum 450 mm over window openings and 750 mm over door openings

8.7 Monorails, monorails girders and fixtures shall be provided, wherever required to facilitate erection/maintenance of equipment.

8.8 All stairs shall have a maximum riser height of 180 mm and a minimum tread width of 250 mm. Minimum clear width of stair shall be 1000 mm. Aluminium angle nosing with min 50 x 25 x 3 mm angle shall be provided for edge protection in RCC stairs. Stairs with grating treads shall be provided with non-skid nosing.

8.9 In design of all buildings, fire safety requirements conforming to IS:1641 and IS:1642 (latest) shall be followed in addition to TAC requirements.

8.10 Wherever possible all floor openings shall be provided with 100 mm thick 150 mm high RCC kerb all around. Angles 50x50x6 mm (minimum) with lugs shall be provided for edge protection all around cut outs/openings in floor slabs, edges of concrete drains supporting grating/covers, edges of RC cable/pipe trenches supporting covers/chequered plates, edges of manholes supporting covers, supporting edges of precast RCC covers and any other place where breakage of corners of concrete is expected.

8.11 All drains inside the building shall have minimum 40 mm thick grating covers. In areas where heavy equipment loads would be coming, precast RCC covers shall be provided in place of steel grating.

8.12 All drains outside building shall have perforated precast RCC covers of minimum 50 mm thickness with provision of openable steel grating cover at about 4.0 m interval. In areas where vehicular loads would be coming precast RCC covers of suitable thickness without perforations and designed for the vehicular loading shall be provided.

8.13 Floor of switchgear room shall be provided with embedded M.S. channel suitable for easy movement of breaker panels.

8.14 Anti-termite chemical treatment shall be given to all vulnerable areas susceptible to termite including column pits, wall trenches, foundations of buildings, fillings below the floors, etc. as per IS:6313 (latest) and other relevant Indian standards

8.15 Wherever required minimum 900 mm high hand railing shall be provided around all floor/roof openings, projections/balconies, walkways, platforms steel stairs etc. All handrails and ladder pipes

shall be 32 mm nominal bore MS pipes (medium class) conforming to IS:1161 (latest) and shall be galvanized as per IS:4736 and IS1239 (latest). All rung and ladders shall be painted with anti-corrosive paint.

8.16 For RCC stairs, hand railing with 20 mm sq MS bar balustrades with suitable MS flats and aluminium hand rail shall be provided. All buildings having metal cladding shall be provided with a 4m height brick wall at the edge of the floor towards the metal cladding.

8.17 In all buildings, suitable arrangement for draining out water collected from equipment blowdowns, leakages, floor washings, fire fighting etc. shall be provided for each floor with suitable floor drains

8.18 All cable and pipe routing in outlying area shall be clubbed and shall run over ground on steel trestles or other supporting structures at a height of not less than 3000 mm above grade for easy inspection and maintenance except in some localized area (approved by owner) where the same can run in trenches. In case cable route is not envisaged in the area, pipe shall be routed on ground over RCC pedestals at height of not less than 500 mm. All trenches shall be of RCC with removable RCC covers. Corner angles with lugs shall be provided at corners of all R.C.C. pre-cast covers with holes for water draining and lifting hooks. All trenches shall be provided with edge protection angles of size 65 x 65 x 6 with lugs.

8.19 Trenches located outside buildings shall project atleast 200 mm above the finished formation level so that no storm water shall enter into trench. The bottom of the trench shall be provided with a slope of 1:500 for draining out the collected water into a sump pit to be provided at suitable location with dewatering arrangement to the nearby storm water drain. The precast covers shall not be more than 300 mm in width. Lifting hooks shall be provided in the precast covers. The trenches shall be given a slope of 1 in 200 in the direction perpendicular to the run of the trenches. PVC water stops shall be provided at all expansion joints of all trenches.

8.20 All steel platform above grade shall be provided with kick plates at edge of platforms to prevent tools or materials falling off the platforms.

8.21 RCC staircase shall be provided for office buildings. For access to roof of other structure / building cage ladder with suitable platforms shall be provided by the bidder.

8.22 Independent network of lines for sewerage and drainage shall be provided

8.23 Unless specified all sand filling shall be compacted to minimum 75% of the relative density and back filled earth shall be compacted to minimum 90% of the Standard proctor density at OMC.

8.24 However, the sub-grade for the roads and embankment filling shall be compacted to minimum 95% of the standard proctor density at optimum moisture content (OMC).

8.25 Detailed scheme for dewatering shall be prepared before starting of deep excavation work. IS:9758 (latest) shall be followed as general guidance for dewatering.

8.26 All underground concrete structures like basements, trenches, pump houses, all water retaining structures etc. shall have plasticizer cum water proofing cement additive conforming to IS:9103 (latest). In addition, limit on permeability as given in IS:2645 (latest) shall also be met with.

8.27 Plywood formwork shall be used for all water retaining/conveying structures and for all over ground concrete works. For all other areas steel/plywood formwork shall be used.

8.28 All buildings shall be provided with Brick/RCC peripheral (garland) drains by the side of plinth protection for catering the storm water from roofs and adjacent area.

8.29 Parapet, chhajjas over window and door heads, architectural fascias, fins, etc shall be provided with drip course in cement sand mortar 1:3

8.30 Fencing shall be of the same type as per specification.

8.31 Plinth level of all buildings shall be kept at least 500 mm above the finished grade / formation level. In case of excess requirement of filling earth other than available in site, bidder shall provide the required quantity at his own cost including all charges like leading, loading, unloading, royalty, octori and other statutory requirements.

8.32 For efficient disposal of rain water, the run off gradient for the roof shall not be less than 1:100. This gradient can be provided either in structure or subsequently by screed concrete 1:2:4 (using 12.5 mm coarse aggregate) and / or cement mortar (1:4). However, minimum 25 mm thick cement mortar (1:4) shall be provided on top to achieve smooth surface.

8.33 Roof of all buildings shall be provided with access through staircase or cage ladder.

8.34 RCC parapet wall of minimum 900 mm height for all accessible roofs and 600 mm height for all non-accessible roofs shall be provided.

8.35 Concrete:

Concrete work shall be carried out as per the latest version of IS:.456 (Code of Practice for Plain and Reinforced Concrete). Mix design concrete shall be used for all areas other than lean concrete work and plain cement concrete work where nominal/volume mix can be permitted. Mix design shall be carried out as per IS: 10262 (latest).

8.36 Encasement of column base:

Structural steel column base plates and bolts, gussets, etc. shall not project above floor level. The same shall be encased by concrete cover up to floor level with concrete grade M25.

i. All inserts, embedment, corner angles, etc. for all civil works, including BHEL supplied equipments etc. stated/unstated but required from the system point of view pertaining to slab, beams, columns, all foundation, cable trenches, pipe trenches etc. required, including designs, supply, erection, Complete shall be in Bidder's scope of work.
ii. Only foundation bolts for BHEL supplied equipment shall be in BHEL's scope.
iii. Grouting for all equipments and structure is in the scope of bidder.
iv. Structures required for all equipments, pipes, cables, maintenance/operating platforms, access platforms, walkways, staircases, ladders, cross-overs etc. (Including that required for BHEL supplied equipments) including foundation, design, supply and erection, all complete, shall be in Bidder's scope of work.

8.40.1 All quality requirements pertaining to civil, structural, architectural work has to be met by the bidder and shall have approval of BHEL. No extra claim whatsoever shall be entertained on any account by BHEL.

8.40.2 Field quality plan: Field quality plan for civil, structural and architectural work shall be prepared by the bidder and got approved by BHEL after award of work. BHEL's comments, if any, shall be incorporated without any financial implications whatsoever.

8.40.3 Number of hard copies and soft copies of design calculations, construction drawings and as-built drawings shall be submitted by bidder to BHEL as decided during detailed engineering stage and shall have approval of BHEL. No extra claim whatsoever shall be entertained on any account by BHEL.

9. PLANT AND STORM WATER DRAINAGE

9.1 Plant area drainage

9.1.1 The plant area drainage scheme shall be designed so as to discharge by gravity flow. For this a network of open rectangular or pipe drains shall be constructed for efficient discharge of storm

water. The thickness of sides and bottom of rectangular drain shall be as per design considerations and shall be of minimum M-25 grade concrete. RCC or pipe culverts shall be provided for road and rail crossings. Drains shall be provided on both sides of the road.

9.1.2 For pipe drains, concrete pipes of class NP 2 shall be used. However, for road and rail crossings concrete pipes of class NP 3 and NP 4 respectively shall be used. In this case open catch water drain shall be provided on the other side of road and connected to manholes. The manholes shall be provided at every 30 m interval along the length, at connection points and at every change of alignment, gradient or diameter of pipe line.

9.1.3 The run off collected by the above drains shall be suitably discharged in the existing drain at a suitable location/at plant boundary as decided by BHEL. The invert levels of the new plant drains shall be kept such that water can be discharged by gravity to the existing drains when the highest design water level occurs. Suitable modifications for connecting the new drains to the existing drains at the Junction points shall be carried out by the bidder, after the scheme is approved by the Engineer.

10. ROADS

California Bearing Ratio (CBR) shall be followed for the design of roads. A detailed CBR test which is an adhoc penetration test shall be carried out as per the procedure outlined in IS:2720 (Part XVI), compacted moorum shoulders of minimum 150 mm thickness shall be provided on either side of the roads.

11. SEWERAGE

11.1 Suitable PVC pipes as per relevant codes shall be used below ground level for sewage disposal. However, salt glazed stoneware pipes of diameter not exceeding 150 mm can be used in localized areas not subject to any traffic load.

11.2 Manholes shall be provided at every 30 m along the length at connection points and at every change of alignment, gradient, change in diameter of a sewer pipeline.

12. FENCING

12.1 All nuts, bolts, fasteners, clamping strips, clamps, clips, etc. shall be hot dip galvanized. Weight of zinc coating shall be at least 610 g/sq m.

12.2 All fence post including stay post and straining posts shall be of 75 x 75 x 6 MS angles placed at 2.5 m c/c. All corner posts shall have two stay posts and every tenth post (straining post) shall have transverse stay post. Suitable RCC foundations for the post and stays shall be provided based on the prevailing soil conditions.

12.3 Toe walls either of brick masonry with bricks of minimum 50 kg/sq.cms crushing strength or of hollow concrete block masonry shall be provided between the fence posts all along the run of the fence with suitable foundation. Toe wall shall be min 200 mm above the paving level with 50 mm thick P.C.C. coping (1:2:4) and shall extend minimum 300 mm below the paving level. Toe wall shall be plastered with cement sand mortar (1:6) on both sides and shall be painted with two coats of textured cement paint (Sandtex mat or equivalent) of approved colour and shade. Toe wall shall be provided with weep holes at appropriate spacing. All gates shall be of structural steel and shall be painted with anti-corrosive paint.

13. MATERIALS

13.1 Cement

13.1.2 As approved by the BHEL based on soil water chemical environment / bidder's recommendation.

13.2 Aggregates

Coarse aggregate – coarse aggregate for concrete shall be chemically inert, hard, strong durable against weathering, of limited porosity and free from deleterious materials. It shall be properly graded. Coarse aggregates shall either be crushed gravel or stone. It shall meet the requirements of IS:383 (latest).
Sand – sand shall be hard, durable, clean and free from adherent coatings or organic matter and clay balls or pellets, Sand, when used as fine aggregate in concrete shall conform to IS:383. For plaster, it shall conform to IS:1542 (latest) and for masonry work to IS:2116 (latest).

13.3 Reinforcement steel

13.3.1 As approved by the BHEL based on soil water chemical environment / bidder's recommendation.

13.3.2 Mild steel and medium tensile steel bars and hard drawn steel wire shall conform to grade-1 of IS:432 (part-1) (latest). Welded wire fabric shall conform to IS:1566 (latest).

13.4 Structural Steel: - Will conform to customer specifications.

13.5 Bricks

13.5.1 Burnt clay bricks conforming to IS:1077 (latest) shall be used. The crushing strength of bricks shall be minimum 50 kg/sq. cm.

13.5.2 The bricks shall be well burnt, of uniform size, shape, having sharp edges and cherry red colour. These shall be free from cracks, flaws or nodules of free lime and shall emit clear ringing sound when struck. These should not absorb water more than 20% of their weight when completely immersed in water for 24 hours.

13.5.3 Fly ash bricks shall be conforming to IS:12894. Clay ash bricks shall be conforming to IS:13757 maximum %age of fly ash = 25%.

13.6 Water

13.6.1 Water used for cement concrete, mortar, plaster, grout, curing, washing of coarse aggregate, soaking of bricks, etc. shall be clean and free from oil, acids, alkalis, organic matters or other harmful substances in such amounts that may impair the strength or durability of the structure. The bidder shall carry out necessary tests in advance to prove the suitability of the water proposed to be used. When water from the proposed source is used for making the concrete, the maximum permissible impurities, development of strength and initial setting time of concrete shall meet the requirements of IS:456 (latest).

13.7 Admixtures

Approved Plasticizers-cum-retarder type admixture shall generally be added to concrete for promoting workability in addition to retarding setting time for mass concreting work.

13.8 Grade Slab/Paving:

RCC paving minimum 150 mm thick of grade M20 (with minimum reinforcement of 8 dia (HYSD) @200 c/c both ways top & bottom) over an underbed as specified herein shall be provided for areas mentioned below. Underbed shall consist of preparation and consolidation of sub-grade to the required level, laying of stone soling of 230mm compacted thickness with 63mm and down aggregate with interstices filled with selected sand followed by 75mm thick 1:4:8 PCC (1 Part cement, 4 parts sand and 8 parts stone aggregate) with 40mm nominal size aggregate.

i. Ground floor of all buildings.

13.9 Plinth Protection

All buildings shall be provided with 750 mm wide and 75mm thick plain cement concrete (1:2:4) paving all around on the outside. The plinth protection shall be laid over prepared sub-grade and base formed with broken bricks, or rubble compacted to a thickness of 75 mm. Brick/RCC peripheral drains by the side of plinth protection for catering the storm water from roofs and adjacent area shall be provided.

13.10 Grouting/Encasing

Non-shrink flowable grout shall be used for under-pinning work below base plate of columns. Nominal thickness of grout shall be 50mm. Non shrink cum Plasticizers admixture shall be added in the grout. Crushing strength of the grout shall generally be one grade higher than that of the base concrete. Minimum grade of grout shall be M-25.

Structural steel column base plates and bolts, gussets etc. shall not project above the floor level. These shall be encased by concrete cover upto floor level with concrete Grade M-25 with suitable reinforcement.

13.11 Curing

13.11.1 Concrete shall be protected from loss of moisture for not less than 7 days after the concrete is placed. Trowelled surfaces, except those that receive separate finish or coating, shall be cured. Only water curing shall be used if the surface receives a separate finish.

13.11.2 Water Curing: Water saturation of concrete surfaces shall begin as quickly as possible after initial set of the concrete. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff.

13.12 Damp Proofing

Damp proof course in a thickness of 50 mm and consisting of cement concrete 1:1.5:3 with admixture of approved water proofing compound, shall be provided at plinth level for masonry walls in super structure.

13.13 Miscellaneous Metal Items

13.13.1 Steel Grating: All gratings shall be electro-forged type. Minimum thickness of the grating shall be 40mm for indoor installations and 32mm for outdoor installations. All grating located inside the building shall be cleaned by sand blasting and provided with two coats of suitable primer and two coats of (BIack Colour) finish paint as per approved painting system. All gratings located outside the building shall be hot dip galvanized at the rate of 610gm/sqm.

13.13.2 Guard rail /Handrail: Guard rail shall be a two-rails system with the top rail 1000 mm above the walkway/platform/floor surface and the intermediate rail 500 mm below the top rail. Guard rail post spacing shall be proportioned to the length of the protected horizontal opening, but shall not exceed 1500mm centre-to-centre of posts. All handrails/guard rails shall be 32mm nominal bore GI pipes (medium class).

14. STATUTORY REQUIREMENTS

14.1 Bidder shall comply with all the applicable statutory rules pertaining to Factories Act. Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control, Explosives Act, etc.

14.2 Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkway minimum 500 wide along the crane-girder level on both sides of building, comfortable approach to EOT crane cabin, railing, fire escape, locker room for workmen, pantry, toilets, rest room, etc.

14.3 Provisions for fire proof doors number of staircases, fire separation wall, lath plastering/encasing the structural members (in the fire prone areas), type of glazing etc. shall be made according to the recommendations of Tariff Advisory Committee.

14.4 Statutory clearances and norms of State Pollution Control Board shall be followed.

14.5 Bidder shall obtain approval of Civil/Architectural drawings from concerned authorities before taking up the construction work.

15. GENERAL LAYOUT

15.1 The general layout plan proposed for the project is shown in drawing titled, "Plot Plan". It shall form the basis for further elaboration by the Bidder for the plant facilities which are in his scope.

15.2 Bidder shall prepare the detailed layout of the plant facilities which are in his scope and shall submit the same for BHEL approval.

15.3 While preparing the detailed layout, planning his facilities and deciding upon the transportation and erection strategy he shall ensure the following aspects:

15.3.1 All statutory requirements including safe distances between various facilities as per applicable rules/laws/acts are met.

15.3.2 Face of the buildings and facilities are located in such a way so as to have an offset of minimum 25 m. with respect to center line of double lane road and 20 meters with respect to center line of single lane road.

15.3.3 The entire construction activity shall take into account the commissioning of the unit matching with the phased commissioning of the plant.

15.3.4 The interface requirements with the plant and construction/erection activities of other contracting agencies engaged by BHEL. These agencies shall be working parallely with the bidder within the plant premises.

15.3.5 Though, the areas for construction/erection activities like offices, stores, lay down and pre-assembly etc. bidder shall have to share these areas with other contracting agencies engaged by the owner/BHEL. The final location and extent of area allocated to each contactor shall be as directed by the engineer.

16. INSPECTION, TESTING AND QUALITY CONTROL FOR CIVIL WORKS

16.1 Sampling and testing for major items of civil works viz earthwork, concreting, structural steel work (including welding) etc. shall be carried out in accordance with the requirements of this specification. Wherever nothing is specified relevant Indian Standards may be used, in absence of Indian Standards, equivalent International standards may be used.

16.2 The bidder shall submit for BHEL's approval a detailed field quality assurance programme for civil works before starting of the construction work. This shall include frequency of sampling and testing

nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer and the Bidder shall submit to the Engineer, the test results in triplicate. In addition, the bidder shall furnish the original test certificate from the manufacturer of various materials to be used in the construction.

16.3 PERMISSIBLE TOLERANCE FOR CIVIL WORKS

Workmanship and dimensional tolerances shall be checked as stipulated below:

16.3.1 Excavation and filling

Tolerance on finished levels for filling areas shall be as specified under the clause pertaining to "Site Levelling and Slope Protection Work"

16.3.2 Cast-situ concrete works

The dimensions of concrete as cast when compared with those on the drawings shall be within the tolerances given below:

Description of item Structural element	**Permissible in mm**	**Deviation**
Faces of concrete in foundations and structural members against which backfill is placed	+25	-10
Location of footing (for RCC framed structures only)	+25	-25
Eccentricity of footing	2% of footing width in direction of mis-placement but limiting to 50 mm	
Top surfaces of slabs and of concrete to receive base plates to be grouted	+5	-5
Alignment of beams, lintels, columns, walls, slabs and similar structural elements	+5	-5
Cross sectional dimensions of walls, slabs and similar structural elements	+5	-5
Deviation from specified dimensions of cross-section of columns and beams	+12	-6
Alignment of holding down bolts without sleeves	+1.5	-1.5
Alignment of holding down bolts with sleeves	+5	-5
Level of holding down bolt assemblies	+10	-10
Embedded parts (in any direction)	+5	-5
Centers of pockets or holes with greatest lateral dimension not exceeding 150 mm	+10	-10

Variation in steps:

Riser	+1.5	-1.5
Tread	+3.0	-3.0
Plumb	3 mm for every meter subject to a maximum of 10 mm	

16.3.3 Form work

Levels and heights	± 6 mm
Plumb	3 mm for every meter subject to a maximum of 10 mm
Unevenness of any surface	± 3 mm
Length or breadth	± 12 mm
Diagonals	± 15 mm

In case of inclined surfaces like folded plates etc. the deviation in the alignment of inclined surfaces, shall not exceed 3 mm with reference to the theoretical alignment, for a length of 1000 mm measured vertically, subject to a maximum of 10 mm.

16.3.4 Masonry

All masonry shall be built true and plumb within the tolerances prescribed as below Care shall be taken to keep the perpends properly aligned.

i. Deviation in verticality in total height of any wall of a building more than one storey in height shall not exceed ± 12.5 mm
ii. Deviation from vertical within a storey shall not exceed ± 6 mm for 3 m. height.
iii. Deviation from the position shown on the plan of any brickwork more than one storey in height shall not exceed 12.5 mm.
iv. Relative displacement between load bearing walls in adjacent storeys intended to be in veritical alignment shall not exceed 6 mm.
v. Deviation of bed joint from horizontal in any length upto 12 m shall not exceed 6 mm and in any length over 12 m it shall not exceed 12.5 mm total.
vi. Deviation from the specified thickness of bed-joints or perpends shall not exceed ± 3 mm.

16.3.5 Plastering work

The finished plastered surface shall not show any deviation more than 4 mm when checked with a straight edge of 2-meter length placed against the surface.

The thickness of the plaster shall be measured exclusive of the thickness of key i.e. grooves or open joints in brickwork. The average thickness of plaster shall not be less than the specified thickness. The minimum thickness over any portion of the surface shall not be less than the specified thickness by more than 3 mm for plaster thickness above 12 mm and 1 mm for ceiling plaster. Extra thickness required in dubbing behind rounding of the corners at junctions of wall or in plastering of masonry cornices etc. shall be ignored.

16.3.6 Pre-cast concrete work

a) Length ± 0.1 percent subject to maximum range of -5 mm to +10 mm.
b) Cross-sectional dimensions ± 3 mm or ±0.1 percent which ever is greater
c) Straightness of Bow: 1/750 of the length subject to minimum of – 5 mm and maximum of + 10 mm

d) Squareness: When considering the squareness of the corner, the length of the two adjacent sides being checked shall be taken as the base line. The shorter side shall not vary in length from the perpendicular by more than 5 mm

e) Flatness: The maximum deviation from a 1.5 m straight edge placed in any position on a nominal plane surface shall not exceed 5 mm.

16.3.7 Reinforcement work

Description of item Structural element	**Permissible Deviation in mm (Max.)**	
Placing of reinforcement		
For effective depth 200 mm or less	+10	-5
For effective depth more than 200 mm or	+15	-10
Cover to reinforcement	-	-5
Cutting of re-enforcement		
When minimum length specified	+75	-
When maximum or minimum length not specified	+75	-25

16.4 Structural steel work

16.4.1 Tolerances on dimensions for fabrication of steel structures shall be according to IS:7215 (latest)

16.4.2 Tolerances on dimensions for erection of steel structures shall be according to IS:12843 (latest)

17. CONSTRUCTION/ERECTION METHODOLOGY

17.1 Construction excavation activities shall be fully mechanized from the start of the work.

17.2 All excavation and backfilling work shall be done using excavators, loaders dumpers, dozers, poclains, excavator mounted rock breakers, rollers, sprinklers, water tankers, etc. Manual excavation can be done only on isolated place with specific approval of engineer.

17.3 For controlled rock blasting, specialized agency equipped with sensors to assess the impact of the blast on the adjoining existing structures, shall be employed.

17.4 Dewatering shall be done using the combination of electrical and stand-by diesel pumps.

17.5 For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.

17.6 All fabrication and erection activities of structural steel shall be carried out using automatic submerged arc welding machines, cutting machine, gantry cranes, crawler/tyre mounted heavy cranes and other equipments like heavy plate bending machines, shearing machines, lathe, milling machines etc. Use of derricks shall not be permitted. Special enclosures, for blast cleaning of steel structures surface preparation, shall be used.

17.7 All handling of materials shall be with cranes. Heavy tailors shall be used for transportation.

17.8 Mechanized modular units of scaffolding and shuttering shall be used.

17.9 Grouting shall be carried out using hydraulically controlled grouting equipment.

17.10 Roadwork shall be done using pavers, rollers and premix plant.

17.11 All finishing items shall be installed using appropriate modern mechanical tools. Manual punching etc. shall not be permitted.

17.12 Heavy duty hoist for lifting of construction materials shall be deployed. Compressors for cleaning of foundations and other surfaces shall be used.

17.13 Field laboratory shall be provided with all modern equipment for survey, testing of soil, aggregates, concrete, welding etc. For testing of steel works, ultra sonic testing machines, radiographic testing machines, dye penetration test equipment, destruction testing equipment, etc shall be deployed.

17.14 All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.

17.15 Fabrication and Erection of all fabricated columns shall be done in single piece unless otherwise provided for in the approved drawings. All shop and site splice shall suitably staggered. The erection splice shall be provided with full strength splice cover plate over the butt weld. Contractor shall submit the erection scheme for the erection of all type of structures and carryout the erection work only after approval of the scheme by the owner.

18. ANNEXURE-I

Bidder shall provide minimum following facilities in the field laboratory for material testing.

18.1 General Equipment

Sl.No.	Description	Sl.No.	Description
1.	Balances	10.	Burette stand
2.	Drier	11.	Pippette

3.	Thermometer	12.	Wooden mallet
4.	Hydrometer	13.	Hair brush
5.	Hand-scoop	14.	Wire Brush
6.	Glass beakers	15.	Buckets
7.	Measuring Cylinder	16.	Test Tubes
8.	Desiccator	17.	Working platforms
9.	Burette		

18.2 Soil testing apparatus for conducting the following tests:

18.2.1 Particle size analysis and index properties of soil
18.2.2 Moisture-density relations of soil
18.2.3 Specific gravity of soil
18.2.4 Density of soil in place by sand replacement method

18.3 Testing Equipment for conducting the following tests on concrete samples:

18.3.1 Compressive strength of concrete
18.3.2 Slump of concrete
18.3.3 Specific gravity and absorption and bulking of fine aggregates
18.3.4 Sieve analysis of fine aggregates and coarse aggregates

18.4 Tests equipment for conducting the following tests on welds for fabricated structural steel members:

18.4.1 Dye penetration test
18.4.2 Ultrasonic test

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 04.00: Technical Specification for civil, structural and Architectural works - General

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

Final				
Draft				
Issue	**Date**	**Prepared**	**Reviewed**	**Approved**

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GENERAL

1.00.00 **INTRODUCTION**

This specification covers design and construction of Civil, Structural and Architectural works associated with the Aero Space Equipment Manufacturing Plant. The scope of works covers design and construction of complete Civil, Structural and Architectural Works including supply of all materials, labour, tools and plants as required for successful execution of the contract.

This section lists Codes and Standards to be adopted and the principal structures of the plant, and briefly describes the basic concept, requirements and features pertinent to each. Documents to be submitted have also been brought out in this section along with the procedure to be followed for the same.

2.00.00 **CODES AND STANDARDS**

Following is a general listing of Codes and Standards to be used in the design of the Plant. Specific applicable codes and standards will be identified in System Design Descriptions / Technical Specifications as appropriate. The latest editions / revision of following codes and standards along with addendums/ amendments, if any, shall be followed:

2.01.00 **General**

a) Internationally accepted design Codes and Standards which are equivalent or more stringent than corresponding Indian Standards.

b) National Building Code of India.

c) "Accepted Standards" and "Good Practice" listed in the appendix to National Building Code of India.

d) IS-1200: Method of measurement of Building and Civil Engineering Works.

e) IS-1256: Code of Practice for Building Bylaws.

2.01.01 **Earthwork**

a) IS-1498: Classification and identification of soils for General Engineering purposes.

b) IS-3764: Safety Code for excavation work.

c) IS-7293: Safety Code for working with construction machinery.

2.01.02 **Concrete**

a) IS-269: Ordinary Portland Cement - 33 Grade.

b) IS-383: Coarse and fine aggregate from natural sources for concrete.

c) IS-432: Mild Steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.

d) IS-455: Portland Slag Cement.

e) IS-456: Code of Practice for Plain and reinforced concrete.

f) IS-460: Test Sieves (all parts).

g) IS-516: Methods of test for strength of concrete.

h) IS-1199: Methods of sampling& analysis of concrete.

i) IS-1489: Portland Pozzoloana Cement.

j) IS-1566: Hard drawn steel wire fabric for concrete Reinforcement.

k) IS-1786: High strength deformed steel bars and wires for concrete reinforcement.

l) IS-1834: Hot applied sealing compounds for joints in concrete.

m) IS-2386: Methods of test for aggregates for concrete (all parts).

n) IS-2502: Code of practice for bending and fixing of bars for concrete reinforcement.

o) IS-3370: Code of practice for concrete structures for storage of liquids (all parts).

p) IS-3414: Code of practice for design and installation of joints in buildings.

q) IS-4948: Welded steel wire fabrics for general use.

r) IS-6909: Specification for super sulphated cement.

s) IS-6452: High Alumina Cement for Structural use.

t) IS-7320: Concrete slump test apparatus.

u) IS-7861: Code of practice for extreme weather concreting (all parts).

v) IS-8041: Rapid Hardening Portland Cement.

w) IS-8112: 43 grade ordinary Portland Cement.

x) IS-10262: Recommended guidelines for concrete mix design.

2.01.03 **Foundations**

a) IS-1904: Code of practice for design and construction of foundations in Soils: General requirements.

b) IS-2950: Code of practice for design and construction of raft foundations.

c) IS-2974: Code of practice for design and construction of Machine foundations (all parts).

d) IS-2911: Code of practice for design and construction of pile foundation.

e) Standard Specification and code of Practice for Road Bridges Section VII: Foundation and substructure by Indian Road Congress (IRC).

f) IS-9795 (Part-I): Guidelines for the choice of the type of diversion works: coffer dams 1981

g) IS-10084 (Part-I): Criteria for design of diversion works: coffer dams. 1982 (R 1991)

2.01.04 **Loading**

a) IS-875: Code of practice for design loads (other than earthquake) for building and structures.

b) Code of Practice for Road Bridges (All Sections), Indian Road Congress (IRC).

2.01.05 **Masonry**

a) IS-712: Building limes.

b) IS-1077: Common Burnt Clay Building Bricks.

c) IS-1127: Recommendations for dimensions and workmanship of natural building stones for masonry work.

d) IS-1528: Methods of sampling and physical tests for refractory materials.

e) IS-1597: Code of practice for construction of stone masonry (all parts).

f) IS-2212: Code of practice for brickwork.

g) IS-2116: Sand for masonry mortars.

h) IS-2185: Concrete masonry units. (all parts - Hollow and Solid concrete blocks).

i) IS-2250: Code of practice for preparation and use of masonry mortars.

j) IS-2572: Code of practice for construction of hollow concrete block masonry.

k) IS-2691: Burnt clay facing bricks.

l) IS-3414: Code of practice for design and installation of joints in buildings.

m) IS-3495: Methods of tests of burnt clay building bricks.

n) IS-4441: Code of practice for use of Silicate type chemical resistant mortars.

o) IS-4860: Acid Resistant Bricks.

2.01.06 **Doors, Windows and Ventilators**

a) IS-399: Classification of commercial timbers and their zonal distribution.

b) IS-883: Code of practice for design of structural timber in building.

c) IS-1003: Timber paneled and glazed shutters (all parts).

d) IS-1038: Steel doors, windows and ventilators.

e) IS-1081: Code of practice for fixing and glazing of metal (steel and aluminum) doors, windows and ventilators.

f) IS-1361: Steel windows for industrial buildings.

g) IS-2835: Flat Transparent sheet glass.

h) IS-1948: Aluminum doors windows and ventilators.

i) IS-1949: Aluminum windows for industrial building.

j) IS-2191: Wooden flush door shutters (Cellular and hollow core type).

k) IS-2202: Wooden flush door shutters (solid core type).

l) IS-3103: Code of practice for Industrial ventilation.

m) IS-3548: Code of practice for glazing in buildings.

n) IS-3614: Fire check doors.

o) IS-4021: Timber door, windows and ventilator frames.

p) IS-4351: Steel door frames.

q) IS-6248: Metal rolling shutters and rolling grills.

2.01.07 **Roof and Flooring**

a) IS-2204: Code of practice for construction of reinforced concrete shell roof.

b) IS-3201: Criteria for the design and construction of pre-cast trusses and purlins.

c) IS-2210: Criteria for Design of R.C. shell structures and folded plates.

d) IS-809: Rubber flooring materials for general purposes.

e) IS-1195: Bitumen mastic for flooring.

f) IS-1196: Code of practice for laying bitumen mastic flooring.

g) IS-1198: Code of practice for laying, fixing and maintenance of linoleum floors.

h) IS-1237: Cement concrete flooring tiles.

i) IS-1443: Code of practice for laying and finishing of cement concrete flooring tiles.

j) IS-2114: Code of practice for laying in situ terrazzo floor finish.

k) IS-2571: Code of practice for laying in situ cement concrete flooring.

l) IS-5491: Code of practice for laying in situ granolithic concrete floor topping.

m) IS-5766: Code of practice for laying burnt clay brick flooring.

n) IS-1197: Code of practice for laying of rubber floors.

o) IS-2441: Code of practice for fixing ceiling coverings.

2.01.08 **Waterproofing**

a) IS-1322: Bitumen felts for waterproofing and damp proofing.

b) IS-1346: Code of practice for waterproofing of roofs with bitumen felts.

c) c) IS-1609: Code of practice for laying damp proof treatment using bituminous felts.

d) IS-3036: Code of practice for laying lime concrete for a waterproofed roof finish.

e) IS-3037: Bitumen mastic for use in waterproofing of roofs.

f) IS-3067: Code of practice for general design, details and preparatory work for damp proofing and water proofing of buildings.

g) IS-3384: Bitumen primer for use in water proofing and damp proofing.

h) IS-4365: Code of practice for application of bitumen mastic for waterproofing of roofs.

2.01.09 **Soil Engineering**

a) IS-1498: Classification and identification of soils for general engineering purposes.

b) IS-1892: Code of practice for sub-surface investigation for foundations.

c) IS-2131: Method for standard penetration test for soils.

d) IS-2720: Methods of test for soils (all parts).

2.01.10 **Water Supply, Drainage and Sewerage**

a) IS-404: Lead pipes

b) IS-458: Pre-cast Concrete pipes (with and without reinforcement)

c) IS-651: Salt glazed stoneware pipes and fittings.

d) IS-771: Glazed fire-clay sanitary appliances (all parts).

e) IS-774: Flushing cisterns for water closets and urinals (other than plastic cisterns).

f) IS-783: Code of practice for laying of concrete pipes.

g) IS-1172: Code of basic requirements for water supply, drainage and sanitation.

h) IS-1626: Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing.

i) IS-1742: Code of practice for building drainage.

j) IS-2064: Code of practice for selection, installation and maintenance of sanitary appliances.

k) IS-2065: Code of practice for water supply in buildings.

l) IS-2470: Code of practice for installation of septic tanks (all parts).

m) IS-3114: Code of practice for laying of Cast Iron pipes.

n) IS-4127: Code of practice for laying of glazed stoneware pipes.

o) IS-12251: Code of practice for Drainage of Building Basement.

p) IS-1200 [Part XVI]: Method of measurement: Laying of water and sewer lines including appurtenant items.

q) IS-1536: Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.

r) IS-1537: Vertically cast iron pressure pipe for water, gas and sewage.

s) IS-3486: Cast iron spigot and socket drain pipes.

t) IS-5329: Code of practice for sanitary pipe work above ground for buildings.

u) IS-3076: Low density polyethylene pipes for potable water supplies.

v) IS-1538: Cast iron fittings for pressure pipes for water, gas and sewage.

w) IS-1230: Cast iron rainwater pipes and fittings.

x) IS-1729: Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.

y) IS-784: Pre-stressed concrete pipes.

z) IS-1726: Cast iron manhole covers and frames.

aa) IS-5961: Cast iron grating for drainage purposes.

bb) IS-5219 [Part-I]: Cast copper alloys traps: `P' and `S' traps,

cc) IS-772: General requirements for enameled cast iron sanitary appliances.

dd) IS-775: Cast iron brackets and supports for wash basins and sinks.

ee) IS-777: Glazed earthenware wall tiles.

ff) IS-2548: Plastic water closet seats and covers (all parts).

gg) IS-2527: Code of practice for fixing rainwater gutters and down pipes for roof drainage.

2.01.11 **Paving and Road works**

a) IS-73: Paving bitumen

b) IS-702: Industrial Bitumen

c) IS-1201 thru' 1220: Method of testing tar and bituminous materials.

d) Practice followed by Indian Road Congress (all parts).

2.01.12 **Earthquake Resistant Design**

a) IS-1893: Criteria for earthquake resistant design of structures.

b) IS-4326: Code of practice for earthquake resistant design and construction of buildings.

2.01.13 **Structural Steelwork**

a) IS-800: Code of practice for general construction in steel.

b) IS-802: Code of practice for use of structural steel in Overhead Transmission Line, towers.
Part-I: Load and permissible stresses.
Part-II: Fabrication, Galvanizing, Inspection and Packing.

c) IS-806: Code of practice for use of steel tubes in general building construction.

d) IS-808: Dimensions for hot rolled steel beams, channels and angle sections.

e) IS-813: Scheme of symbols for welding.

f) IS-814: Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.

g) IS-816: Code of practice for use of metal arc welding for general construction in mild steel.

h) IS-817: Code of practice for training and testing of metal arc welders.

i) IS-818: Code of practice for safety and health requirements in electric and gas welding and cutting operation.

j) IS-819: Code of practice for Resistance spot welding for light assemblies in Mild Steel.

k) IS-822: Code of procedure for inspection of welds.

l) IS-919: ISO system of limits and fits.

m) IS-1024: Code of practice for use of welding in Bridges and Structures subjected to Dynamic loading.

n) IS-1161: Steel tubes for structural purposes.

o) IS-1182: Recommended practice for Radiographic Examination of Fusion Welded Butt joints in steel plates.

p) IS-1200 [Part-VIII]: Method of measurement of steelwork and ironwork.

q) IS-1239: Mild steel tubes, tubular and other wrought steel fittings (all parts).

r) IS-1363: Hexagonal head bolts, screws and nuts of product Grade `C' (all parts).

s) IS-1364: Hexagon head bolts, screwed and nuts of product grades A and B.

t) IS-1365: Slotted counter sunk head screws.

u) IS-1367: Technical supply conditions for threaded steel fasteners.

v) IS-1608: Method for tensile testing of steel products.

w) IS-1730: Dimensions for steel plates, sheets, strips and flats for structural and general engineering purpose.

x) IS-1731: Dimensions for steel flats for structural and general engineering purposes.

y) IS-1852: Rolling and cutting tolerances for hot rolled steel products.

z) IS-1977: Structural steel (Ordinary quality)

aa) IS-2016: Plain Washers

bb) IS-2062: Steel for General structural purposes.

cc) IS-2074: Ready mixed paint, air drying, red oxide zinc-chrome, priming.

dd) IS-2633: Methods of testing uniformity of coating of zinc coated articles.

ee) IS-3613: Acceptance tests for wire-flux combinations for submerged-arc welding.

ff) IS-3664: Code of practice for Ultrasonic Pulse echo testing by contact and immersions methods.

gg) IS-3757: High strength structural bolts.

hh) IS-4000: High strength bolts in steel structures.

ii) IS-4759: Hot dip zinc coatings on structural steel and other allied products.

jj) IS-5334: Code of practice for Magnetic Particle Flaw detection of welds.

kk) IS-7215: Tolerances for fabrication of steel structures.

ll) IS-7280: Bare-wire electrodes for sub-merged arc welding of structural steels.

mm) IS-7318 [Part-I]: Approval test for welders when welding procedure approval is not

required - Fusion welding of Steel.

nn) IS-8500: Structural steel – micro-alloyed (medium and high strength qualities).

oo) IS-9595: Recommendation for metal arc welding of carbon and carbon manganese steels.

pp) IS-11592: Code of practice for selection and design of belt conveyor.

qq) AWS D.1.1 Structural Welding Code.

2.01.14 **Painting**

a) IS-348: Specification for French Polish.

b) IS-427: Specification for Distemper, dry colour as required.

c) IS-428: Specification for Distemper, oil emulsion, colour as required.

d) IS-1477 [I & II]: Code of practice for painting of ferrous metal in buildings.

e) IS-2338 [I & II]: Code of practice for finishing of wood and wood based materials.
f) IS-2339: Specification for Aluminium Paints for general purposes in dual containers.

g) IS-2395: Code of practice for painting concrete, masonry and plaster surface.

h) IS-2932: Specification for enamel, synthetic, exterior - a) undercoating, b) finishing.

i) IS-2933: Specification for enamel, exterior - a) undercoating, b) finishing.

j) IS-5410: Specification for cement paint.

2.01.15 **Bridge and Culvert Work**

a) Indian Road Congress (IRC) Bridge Codes (all parts).

b) Indian Railway standard bridge rules.

3.00.00 **SCOPE OF CIVIL WORKS:**

The scope of civil work comprises all necessary investigations, survey, foundations, building, superstructures and infrastructure required for the complete operating power station.

The work under this Section consists of Civil, Structural and Architectural works, but not limited to items mentioned below.

- Demolition and site clearance
- All temporary works such as construction site office, canteen etc.
- Construction water and construction power
- Site levelling & grading and preliminary works
- In Plant Roads
- Drainage (Storm water, Sanitary and Industrial effluent)
- Shop-1 (Clean room classification 100000)
- Shop-2 (Air conditioned shop)

- Shop-3 (Stretch Forming & Furnace)
- Shop-4 (Chemical milling & Anodizing with ETP)
- Pressure Proof Test building & Bund Area
- Gas Bunk
- Tool Shop
- Loading bay
- X-ray & NDT Building
- Painting Booth
- AHU-1&2
- PPT Control Building
- Switch Gear Building
- Office Building
- Architectural finishing including flooring, paving, brick masonry, walls, plastering, painting, false ceiling, doors & windows, plumbing etc., for main plant, ancillary buildings
- Landscaping
- All other civil items not covered above but required for completion and proper functioning of the plant shall form part of the scope.

The scope shall also include setting up by the Contractor a complete testing laboratory in the field to carry out all relevant tests required for the civil works for the project.

The work shall have to be carried out both below and above the ground level. The work shall be executed accordance to the relevant Indian Standard Code, and in its absence, the work shall be executed according to the best prevailing local Public Work Department (PWD) practices or to the recommendations of relevant American and British Standards or to the instructions of the BHEL's Engineer. This shall prevail in respect of civil works for which no specification has been prescribed in this section.

The work shall be carried out according to the design / drawings to be developed by the Contractor and approved by the Owner. For all building, structures, foundations, etc., necessary terraced layout and details are to be developed by the Contractor keeping in view the statutory & functional requirement of the plant & facilities and providing enough space & access for operation, use and maintenance.

The land will be given to the Contractor by the Owner. All site investigations, surveys, grading and leveling and other additional works shall be carried out by the Contractor.

The layout and levels of all structures shall be made by the Contractor at his own cost from the general grid of the plot and the nearest GSI bench mark or other acceptable bench mark of Govt. Dept. The Contractor shall be solely responsible for the correctness of the layout and levels.

All the quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to by the Contractor.

4.00.00 **MAIN PLANT STRUCTURES/COMPONENTS**

The description of some of the major structures/components covered under the Main Plant Package is given in **Annexure: 01** as **"Structure Wise Brief Scope of Work**"

a) **Roads and Drains**

The roads within the plant area shall be so laid out as to provide access to all the plant buildings and facilities. The major roads shall be 8 meters wide and the minor roads shall be of 4 meters' width.

Open drains with concrete bottom having neat cement finish at top and brick side lining with plastering and neat cement finish shall generally be provided on both sides of the roads. The longitudinal bed slope in these drains shall not be flatter than 1 in 1000. The plant yard shall be provided with gentle slope towards these open drains. where it may not be possible to provide open drains, either RCC covered drains with suitable opening in the covers, or buried RCC pipe drains connected to catch pits will be provided. Main drains shall be designed as a network covering total plant area and ultimately connected to the nearest surface stream outside the Plant Boundary. Attempts will be made to convert construction drains into main drain as far as practicable. Auxiliary/Branch drains shall cover individual grades to terrains, collect storm water and other non- contaminated discharge from plant buildings and then be connected to Main drain at suitable locations. RCC pipe culverts/box culverts will carry drainage under interrupting roads and railway tracks. Scope of drainage shall also include drain trenches carrying waste water from various sources to respective treatment systems within the Plant Boundary. Underground storm water piping shall be limited to required areas where surface drainage ways are not desirable or practicable from other functional point of view. The drains shall generally be of open type except those for wastewaters as described above (i.e. waste water from various sources to respective treatment systems within the Plant Boundary), which shall be covered with RCC pre-cast planks. The storm water drainage shall also cater for discharge of treated waste water (waste water treatment system in other's scope). The drainage system shall be designed for precipitation intensity of 60 mm per hour (maximum hourly intensity of rainfall).

Both the roads and drains are to be constructed in two stages. During the construction stage the water bound macadam roads without any bituminous topping shall be provided. Any damage to these roads during the construction stage shall be finally repaired and pre-mixed bituminous carpet shall be laid before the plant becomes operational. Similarly, during construction stage, the open drains may be kept unlined and water accumulated in the pits excavated for foundations, trenches, tunnels etc. will be pumped into them. The buried pipe drains with catch pits and manholes and lining for the open drains will be constructed on completion of the underground construction work for the plant.

b) **Sanitary Sewerage System**

For sewage treatment, adequate number of septic tanks along with inspection chambers, soak pit will be installed and the effluent shall be discharged into surface drains after suitable treatment in chlorination chamber.

c) **Area Grading:**

Site leveling and grading for the plant area within this phase (As per the Plot Plan) shall be within scope of this contract. Work shall have to be carried out as per grading layout plan approved by the BHEL. All existing drains/channels in the plant and other areas associated with the plant shall be suitably diverted before taking up any construction. These diversions shall be so designed as to ensure effective disposal of water without any accumulation or flooding in adjoining areas.

5.00.00 **LAYOUT**

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and benchmark. If the Contractor uses the grid, benchmark and reference pillar made by others, he shall satisfy himself of the accuracy of the reference marks. If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and benchmark that has been furnished to him by BHEL. In case any discrepancy found, it shall be immediately brought to the notice of BHEL for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts.

The contractor shall construct and maintain pillars for grid, references and benchmarks and maintain them till the completion of the construction. He shall also help BHEL with instruments, materials and labours for checking the detailed layouts and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and BHEL's approval shall not be deemed to imply any warranty in carrying out the works correctly. The Contractor shall take into account the cost of these in quoting their price.

6.00.00 **WORKMANSHIP**

Workmanship shall be of the best possible quality and skilled workmen except for those that normally require unskilled persons shall carry out all work. Experienced and certified welders in proper sequence using necessary jigs and fixtures shall do welding. Fabrication shall be done in shops having proper equipment for accurate edge planning and milling of column shaft ends, base plate surfaces etc., and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye-laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various trades, the Contractor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall have, at no additional cost to BHEL, the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

7.00.00 **TEMPORARY WORK**

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of BHEL, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by any other agency. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work such removal and re-erection, if required, shall be carried out by the Contractor at the direction of BHEL without any delay and any extra cost on this account shall be borne by the Contractor.

8.00.00 **DOCUMENT SUBMISSION**

Design and Construction documents pertaining to all Civil, Structural and Architectural works that are required to be submitted to BHEL/Consultant for their review/approval have been brought out under following clauses. Approval of these documents by the BHEL/Consultant shall not relieve the Contractor of his responsibility for any error and fulfillment of contract requirements.

8.01.00 **Design Document**

Design Document shall comprise Mechanical/Electrical assignment Drawings, design data, design assumptions & references, detailed structural analysis (including computer input/output, if any) & design calculations and design drawings.

Selected or all design calculations and drawings as decided by BHEL shall be submitted and reviewed only after approval of corresponding Mechanical/Electrical/System general arrangement drawings. The contractor shall submit three (3) copies of approved GA drawings along with three (3) copies of design documents, four (4) copies of design drawings for comments/approval of the Owner/Consultants.

The contractor shall submit Six (6) copies of all final design drawings with one reproducible

transparency (RTP), soft copies of all final drawings and four (4) copies of all final design calculations to Owner/Consultants.

8.02.00 **Construction Document**

Based on final design drawings, detailed drawings for construction will be prepared by the Contractor. For reinforced concrete structures and foundations detailed bar bending schedules in approved format shall accompany each detailed drawing. For structural steelwork, the Contractor will prepare detailed fabrication drawings along with bill of materials.

Six (6) copies each of selected or all detailed drawings/ fabrication drawings as decided by BHEL shall be furnished to BHEL/Consultants for their review.

The contractor shall submit six (6) copies of the final construction drawings to BHEL/Consultants. This is apart from the submission in soft copies

Same procedure shall be followed for submission and approval of Construction Documents other than stated above shall include design of temporary works like sheet piling for deep excavation works, slip form method of concreting for high raised structures, dewatering schemes etc. and any other item stated elsewhere in this specification.

8.02.01 As built drawings:

As built drawings shall be prepared by the contractor after completion of construction/erection incorporating necessary changes, if any done during execution. The contractor shall submit two (2) copies along with soft copies of the `As- built' drawings to BHEL/Consultants.

9.00.00 **INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE**

Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to BHEL.

10.00.00 **SEQUENCE OF WORK AND PROGRESS REPORT**

The sequence in which the works are to be carried out shall be as approved by the BHEL/BHEL’s Engineer in accordance with the construction method accepted by BHEL/BHEL’s Engineer and to be followed by the Contractor. A programme of work is to be submitted for the Engineer's review and approval and this has to be periodically updated and modified as per actual progress to enable timely completion.

The Contractor shall regularly submit to the Engineer progress reports for periods of working as specified by the Engineer showing up to date progress on all important items of work.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 04.10: Specific Design Requirement - Civil

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

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1.00.00 **INTRODUCTION**

This section outlines following:

a) Soil characteristics

b) Loads.

c) Design considerations for Reinforced Concrete Structures

d) Design considerations for Foundations

e) Roads.

2.00.00 **SOIL CHARACTERISTICS**

Bearing capacity of soil in the area of the existing units was in the order of 15-20 T / Sq.m at a depth of 2.0 m below ground level and, therefore, no piling was required. The general grading of the land is sloping down towards South - North. The variation in existing grade levels is around 3 meters maximum.

The information provided above are for general guidance only. No claim for any extra payment due to any variation in actual soil condition, level or any other data during execution over that considered during bidding shall be entertained.

For soil characteristics and design parameters to be adopted in final design the contractor shall have to carry out a detailed soil investigation work in all work areas as part of the contract to generate data so required. The cost of such work shall be deemed to have been included in the contractor's quoted price.

3.00.00 **LOADS**

All structures and portions thereof shall conform to the latest revision of relevant Indian Standard specifications and also to the various other technical requirements. For any structure, which carries Indian Railway loading or is situated in the vicinity of railway lines, the design has to conform to the Indian Railway Standard specifications and approval must be obtained from Railway Authority including the clearances etc. All structures shall be designed to sustain within the stress limitation as specified in the code, all dead loads plus assigned live, equipment, wind, seismic or other design loads.

a) **Dead Loads**

Dead load shall include the weight of all structural components and architectural appurtenances incorporated in the structures plus hung loads and any other permanent, externally applied load. This should also include equipment dead load.

b) **Live Loads**

The loads listed hereunder are minimum loads for the areas involved. Special use areas shall be investigated and loading revised upward as necessary. Hung loads shall be based on minimum loading equivalents of 100 Kgs/Sq.m for piping and 50 Kgs/Sq.m for electrical, ventilation and air conditioning. Loadings resulting from concentrations of facilities in specific areas shall be substituted where listed base loading is excluded.

i)	**All Buildings Roof**		
	Metal Sheet roof – Shop area	:	150 kg/sq.m plus hung loads, if any.
	RCC roof - Shop area		500 kg/sq.m for accessible & 150 kg/sq.m for non-accessible plus hung loads, if any
	RCC roof - Non shop area		150 kg/sq.m for accessible & 75 kg/sq.m for non-accessible plus hung loads, if any
	Stairs & Platforms	:	500 kg/sq.m
	Corridors	:	500 kg/sq.m
ii)	**All building floor**		
	Shop area	:	5000 kg/sq.m
	Non shop area	:	1500 kg/sq.m

c) **Equipment Loads**

i) Loadings (both static and dynamic) of major equipment's will be obtained from the manufacturer's certified drawings of the specified equipment to be furnished. Where design of structures supporting minor equipment other than those included above must proceed, the loadings will be estimated from similar jobs or catalog data.

ii) All equipment, tank and piping design loadings will include Hydraulic Testing loads.

iii) Air and gas duct loadings will include weight of insulation, duct attachments, dust accumulation loads, seismic, wind and other loads as applicable.

iv) Crane girders and supporting columns will be designed for vertical and horizontal forces (including impact forces) as developed from the crane weights and wheel loads. Unless otherwise specified, the vertical and horizontal loadings will conform to the applicable sections of the IS specifications.

v) Weight of equipments, ducts, tanks, pipes, conduits etc. supported by structure shall include maximum possible loading conditions i.e. flooded material contents and associated impacts, test loadings, anchorage and constraint effects.

vi) All structural components shall be designed to accommodate anticipated concentrated loads, which will or may be applied during the life of the plant.

vii) Where both concentrated and uniform loads cannot act simultaneously, the structure or component shall be analyzed for both conditions of loading and shall be designed for more critical condition.

d) **Wind Loading**

Wind loading will be in accordance with Indian Standard Code IS-875 for a basic wind speed of 39m/sec up to a height of 10 meters above mean ground level.

e) **Seismic Loading**

The lateral forces will be established in accordance with the recommendations of IS-1893 (Latest edition).

The site falls in Zone-III as identified in the map in IS-1893. Importance factor shall be taken as 1.5 in general.

f) **Temperature Loads**

The structures shall be designed to withstand stresses due to fifty (50) percent of the total temperature variation. The total temperature variation for temperature loading should be taken as two thirds (2/3) of the average annual variation in temperature. The average maximum annual variation for this purpose will be taken as the difference between the mean daily temperature during the coldest month of the year and mean daily maximum temperature during the hottest month of the year.

Expansion and contraction due to changes of temperature of materials of a structure shall be considered and adequate provision shall be made for the effects produced as per provision in the relevant IS codes.

3.01.00 **Stability of Structures**

a) The minimum factors of safety against overturning, sliding and hydrostatic uplift shall be 1.5, 1.5 and 1.25 respectively.

b) Stability of structures will be investigated for loading conditions during construction. Lower factors of safety will be used for construction loading conditions.

c) The factors of safety given in relevant IS codes shall also be taken care of.

4.00.00 **DESIGN OF REINFORCED CONCRETE STRUCTURES**

a) Reinforced Concrete Structures shall be established in accordance with the requirements of IS-456 & IS-875 for all possible combination of loads, e.g. dead load, live load, equipment load, crane loads, wind or seismic loads, soil loads and surcharge loads.

b) The following grades of concrete as per IS-456 shall generally be used.

i) M-25: Concrete Structures –where concrete below grade 25 is not allowed as per IS456, etc.

ii) M-15: Structural Concrete - Standard for pavement around building including that for plinth protection work.

iii) M-10: Mud mat.

iv) M-7.5: Fill Concrete.

c) Reinforcing bars will be as per IS-432 (Grade-I) for Mild steel and as per IS-1786 for High Strength Deformed bars.

d) The design of R.C. structures shall be carried out by limit state or working stress method as per the provisions of IS-456.

e) Concrete tanks/water-retaining structures will be designed in accordance with the recommendation IS-3370 based on consideration of adequate resistance to crackiry as well as adequate strength.

5.00.00 **FOUNDATION DESIGN**

5.01.00 **Foundations**

The design of foundation shall be carried out by Limit State method as per the provisions of IS-456.

Structural concrete for foundation work shall be M-25, unless a higher grade is specified.

5.02.00 **Heavy Equipment Foundations**

Loadings (both static and dynamic) of major equipments are to be obtained from the manufacturer's certified drawings of the specified equipment. Where design of structures supporting minor equipment other than those included above must proceed but the exact load data is not available, the loadings will be estimated from similar jobs or catalog data.

For static and dynamic analysis of machine foundation following data will be furnished by the equipment manufacturer.

a) Loading diagram showing static and dynamic loads and points of application of loads.

b) Operating speed of m/c.

c) Weight of rotating parts, maximum eccentricity of rotating mass from the geometric axis of rotation.

d) Location of C.G. of machines in all three axes.

e) Mass moments of inertia.

f) Allowable amplitude / velocity of vibration at machine bearings points.

g) Temperatures in various areas during operation.

h) Design of foundations for major equipments shall be done in accordance with relevant parts of IS-2974.

6.00.00 **ROADS**

Geometric design of road shall be done in accordance with Indian Road Congress Standard IRC-73. The roads will be designed as flexible pavement consisting of subbase, base course of water bound macadam, bituminous macadam & bituminous wearing course. The ruling gradient for roads in longitudinal direction shall be 1 in 20. Normally roads shall have much flatter gradient. Transverse camber of 1 in 40 shall be provided. Roads for Dozer movement shall be of R.C. construction with anti-abrasion capacity.

A detailed CBR test, shall be carried out as per the procedure outlined in IS-2720 (Part-XVI). CBR test shall be carried out in remolded soil samples under soaked condition.

All roads shall have minimum two (2) metres wide shoulder on either side. Shoulders shall have sufficient load bearing capacity to support loaded trucks. A slope of 1 in 30 shall be provided on shoulders.

Pipe, slab culverts, or RCC box culverts, as suitable, shall be provided at road crossings for drainage, LP pipes, Ash pipes, cable trenches etc. All culverts shall be designed for IRC Class "AA" loading and

checked for class-A loading.

7.00.00 **STORM WATER DRAINAGE**

Drainage

Open RCC rectangle or trapezoidal drains shall be provided for storm water. The thickness of sides & bottom shall be minimum 100 mm or as per design considerations whichever is higher. RCC culverts shall be provided for road and rail crossing, if any. Drains shall be provided on both sides of the roads. Inside surface of the drain will have smooth neat cement finish over screed concrete. Invert of the drain shall be decided in such a way that the water can easily be discharged to the recommended nearest outfall outside the plant boundary. The minimum slope of the drain shall be 1:1000 longitudinally to take care of the silting problems.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 04.20: Specific Design Requirement - Structural

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

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1.00.00 STRUCTURAL STEEL DESIGN

a) Structural steel design will be carried out as per the National Building Code with specific consultation to IS-800 unless noted otherwise.

b) Lateral forces along the length of the building will be resisted by bracings in horizontal and vertical frames. The transverse lateral load will be resisted by stiff jointed frame action. Additional bracing or moment connection will be used to assure stability of the structures.

c) Steel will conform to Grade-A of IS-2062 for Rolled steel members or plates up to 20 mm thickness. For plates above 20 mm thickness and welded construction steel conforming to Grade-B (Killed) of IS-2062 shall be used except for crane girders where Grade-C (IS-2062) steel shall be used.

d) Shop connections will be all welded and field connections will generally be bolted unless specified otherwise. Field bolts, wherever provided shall be high tensile of 20 mm dia. or of higher diameter and of property class 8.8 as per IS-1367 for all major connections. The bolted joints shall be designed for friction type connection and the H.T. bolts shall be tightened to develop the required pretension during their installation. However, the nominal connections in the field like purlins, stairs, wall beams etc. will be done by 16 mm dia. M.S. black bolts conforming to IS-1363 unless specified otherwise.

e) Welding shall be in accordance with the recommendations of IS-816 - Code of Practice for use of metal arc welding for general construction in mild steel and IS-9595 - Recommendation for Metal Arc Welding of Carbon and Carbon Manganese Steels. Built-up members will be fabricated using submerged arc welding procedure. All butt welds in plate girders and columns will be full penetration. All butt welds will be radiographically or ultrasonically tested as per relevant IS codes and standard practice. The bare wire electrodes for submerged arc welding shall conform to IS-7280. The combination of wire and flux shall satisfy requirement of IS-3613.

f) Shop primer paint will be single coat of red oxide zinc- chromate primer conform to IS-2074. The surface preparation will be by manual cleaning with steel wire brush or sand blasting as per the requirements of IS codes.

2.00.00 LOADS

Loads as defined under clause 3.00.00 Section-II will be applicable.

3.00.00 STEEL FRAMED STRUCTURES

Steel Framed Structures will be analyzed for all load combinations as stated hereinafter, definitions of Dead and Live loads for this purpose are:

a) Dead Loads: Weight of building components and all permanent equipment.

b) Live Loads: Assigned design gravity loads used to represent moving loads, maintenance or construction loads with equipment's disassembled.

While designing consideration shall be given to the following load combinations:

i) DL + LL + Equip

ii) DL + LL + Equip + Cb + CtLA + CS

iii) DL + LL + Equip + Cb + CtLB + CS

iv) DL + EL (for DL only)

v) DL + WL1DL + WL2

vi) 0.75 (DL + LL* + Equip + Cb + Ct + EL

(* Appropriate portion of LL which is considered for working out EL shall only be taken)

vii) 0.75 [DL+LL+ Equip + Cb + CtL1 + (CS1+WL1)]

viii) 0.75 [DL+LL+ Equip + Cb + CtL1 + (CS1+WL2)]

Where the above loads are:

DL	=	Dead load of structures, floors, walls etc.
LL	=	General live load on floors
Equip	=	Equipment loads
Cb	=	Crane Bridge
Ct	=	Crane trolley positioned at middle of bridge
CtLA	=	Crane trolley + Load near one row
CtLB	=	Crane trolley + Load near other row
CtL1	=	Crane trolley + Half load lifted at center of bridge
CS	=	Crane surge for full load
CS1	=	Crane surge for half load lifted
WL1	=	Wind load with internal suction of 0.2P, left to right
WL2	=	Wind load with internal suction of 0.2P, right to left
EL	=	Earthquake load

Appropriate allowable increase in permissible stresses as per IS codes, may be taken except where as per above load combinations load factors are used.

The above load combination is based on the assumption that thermal stresses can be demonstrated to be negligible. Otherwise appropriate thermal stress increase shall be included for further worst combination.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 04.30: Specific Design Requirement - Architectural

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
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The architectural services shall cover finishing work of RCC shop-1&2 and PEB (shop-3&4, Tool shop, Loading bay) and all auxiliary buildings included under the specification starting from brick work, partition walls, roof protection, finishing of walls, floors and ceilings, false ceiling as required potable water system, sanitation etc.

2.00.00 **DESIGN REQUIREMENTS**

The Bidder shall develop the architectural layout of all the buildings listed in this document as per the final approved equipment disposition and other layout considerations indicated elsewhere in this specification. These drawings shall need the approval of BHEL before construction. The contractor shall also have to submit perspective views if so desired by BHEL. Approval from statutory authorities, e.g. Factories Inspector, Explosives Inspector, Tariff Advisory Committee etc. shall be the responsibility of the contractor without any obligation of BHEL.

The entire complex shall have an architectural character and style of its own and shall be visually and functionally integrated with the existing landscape. The bidders must visit the site and have a feel of the overall environment, so that a harmonious as well as integrated architectural concept of the proposed phase of development is achieved. Special care must be taken to enhance the visual and technological quality of development by adopting updated technology, materials, finish etc.

Special attention should be given in developing Architectural design of the RCC shop-1&2 and office building. Its architectural design must take care of its visual quality as landmark, aesthetic balance in its composition particularly in façade design, appropriate physical and functional integration. Entrance shall be suitably designed along with a lobby which shall also be aesthetically pleasing.

PEB structures (Shop-3&4, tool shop & loading bay) shall be of structural steel framed with RCC floor and Brick Wall cladding and side sheet cladding.

The other buildings in general shall be R.C.C. framed structure with R.C.C. flat roof and full brick thick wall plastered and painted and where indicated with special finish.

Architectural concepts of structures shall offer its own identity and will be aesthetically blended to give pleasing appearance. Functional needs of each building will be maintained.

2.01.00 **Roof Insulation and Ventilation**

The roof of all RCC buildings shall have suitable water proofing courses. For PEB structures turbo vents shall be provided over roof. For ventilation requirements relevant section of the specification shall be referred.

2.02.00 **Roof Waterproofing**

The roof of all RCC buildings shall have suitable water proofing courses with proper finishing.

2.03.00 **Partition Wall**

All intermediate walls shall be full brick thick wall in 1:6 cement sand mortar. Half brick thick wall in 1:4 cement: sand mortar with 2 nos. 6 mm dia rod in every fourth layer shall be provided for small partition wall. Glazed partition in anodized aluminium frame shall be provided for operator's cubicles for clear view of the operating equipment and in Control room area.

2.04.00 **Plastering**

Exterior & rough side of interior brick wall: 18 mm thick minimum with 1:6 cement-sand mortar in two layers. Where external finish will require rich plastering for special finish plaster shall be of 1:4/1:3.

Interior wall: 12 mm thick with 1:6 cement-sand mortar

Ceiling: 6 mm thick with 1:4 cement-sand mortar except in false ceiling area and cable vault ceilings.

2.05.00 **False Ceiling**

Mineral fibre based acoustic ceiling board in aluminium snap grid suspension system as per manufacturer's specification in office building, x-ray room, NDT room, PPT control room, etc. with cut-out as required for A/C diffuser, electrical fittings, fire detector, etc. False ceiling shall be provided with 25 mm thick insulation of resin bonded mineral wool conforming to IS:8183.

2.06.00 **Doors**

a) Generally hollow metal (steel) flush doors with pressed steel frame shall be provided for plant and utility areas.

b) Solid core Wooden flush doors in teak wood frame shall be used in interior office areas of non-plant facility buildings.

c) Rolling steel shutters shall be used where frequent use is not envisaged and large openings are required. Operation shall be manual/mechanical/ electrical depending on the size of opening.

d) Special areas like control rooms and other special area shall be provided with minimum 15 microns pre-coated i.e coloured anodized aluminium glazed partitions along with double doors with air lock facilities or with single door or without doors or doors without partition as required.

e) Fire rated doors with panic bar shall be provided in areas having fire hazard and also to all fire exists as per TAC requirement.

f) Doors shall be provided at appropriate location to prevent dust ingress from outside.

g) PVC doors shall be provided for toilets.

h) Weather stripping shall be provided to all outside doors as well as air-conditioned areas and all other doors where dust-free environment is required.

2.07.00 **Windows & Ventilators**

In all annex building having AC facility, full glazed windows and ventilators in minimum 15 micron anodized aluminium window frame shall be provided with 4 to 6 mm thick (as per the size of panel) clear float glass and 6 mm thick clear wired glass where required from safety point of view.

In other areas steel windows/ventilators with 4 mm thick clear float glass shall be provided. The window area shall be so decided as to allow adequate natural ventilation and light.

2.08.00 **Landscaping**

Generally the natural contour shall be retained except where modifications needed for drainage or other technical reasons. Rockeries, appropriate trees, shrubs, ground cover, lawns along with landscape furniture,

sculptures, fountains, decorating/ornamental fencing, etc. shall be provided to create a visually pleasant environment. Irrigation facilities shall be provided for all green areas.

The Contractor shall furnish detail drawing schedule for landscaping prepared by experts in the respective discipline. The work shall be taken up duly after approval of BHEL.

2.09.00 **Facilities in Buildings**

Adequate toilet and drinking water facilities shall be provided for personnel working in each building/structures. Each building shall have toilet facilities both for Gents and Ladies. Number of toilet fixtures shall be in respect to occupancy as per National Building Code.

But minimum 1 W.C., 1 washbasin, 1 urinal shall be provided in each toilet.

2.10.00 **Potable Water System and Plumbing**

2.10.01 This system for various buildings shall be connected to the drinking water and service water systems, the schemes for which is indicated elsewhere in this specification.

2.10.02 Water outlets shall be provided for an instantaneous flow rate of approximately 3 Cu.M/Hr.

2.10.03 System will satisfy state and local plumbing codes.

2.10.04 Following I.S. Codes for the system shall be followed:

a) IS-2065: Code of Practice for water supply in buildings.

b) IS-1172: Code of basic requirements for water supply, drainage and sanitation.

c) IS-1200 (Pt. XVI): Laying of water and sewer lines including appurtenant items.

d) IS-1239: Specification for mild steel tubes and mild steel tubulars and other wrought steel pipe fittings. (10 mm to 15 mm nominal diameter). Bidder have to follow relevant IS codes for use of CPVC pipes.

e) IS-3589: Specification for electrically welded steel pipes for water, gas and sewage (220 mm to 2000 mm nominal diameter). Bidder have to follow relevant IS codes for use of CPVC pipes.

2.10.05 Potable water shall be supplied to basins, water closets, urinals, sinks, water coolers, showers and other plumbing fixtures. Soil and waste piping shall drain through traps to the sanitary sewer system.

2.11.00 **Roof Drainage Systems**

2.11.01 The system shall be provided for removal of water from roof surface to avoid damage to the roof structure of all buildings and shall consist of the following:

a) Roof Drain Heads

b) Rain Water Down comers

c) Gully pits

IS-1742 code of practice for building drainage shall be followed for this purpose.

Multiple drains shall be provided for all roof areas.

System will be designed to handle rainfall at a rate of 60 mm per hour and in accordance with stipulations of IS-1742.

Any roof more than 8.0 metres above grade shall have access from outside the building for cleaning of roof drains.

Roof drains will conduct water to storm sewers.

2.12.00 The enclosed **annexure:01** of this section gives specific details of finish items required for various buildings.

2.13.00 During execution of the contract, the contractor shall take approval from BHEL of all building materials and finish items (e.g. floor tiles, doors, and windows, paints etc.) to be used for the contract by submitting samples and/or product literature as appropriate.

2.14.00 Glazing & Glazed Partition

a) 4 mm thick ground glass shall be provided for toilets.

b) Glazing between two A.C. areas shall be with 6 mm thick clear float glass.

c) All glazing shall be in aluminium frame having 15-micron anodization.

2.15.00 Sealant

Silicon/ polysulphide sealant shall be used in all joints exposed to weather. All joints around exterior doors, windows, expansion joints, etc. shall be sealed for proper water-lightness.

2.16.00 Damp Proof Course

50 mm thick 1:1.5:3 concrete with waterproofing admixture.

2.17.00 Plinth Protection

Minimum 750 mm wide R.C.C. plinth protection along building periphery shall be provided with surface drain of required size and slope as per storm water quantity shall be provided.

2.18.00 Painting

Exterior masonry surface: Exterior grade weather proof paint shall be used over plaster in all buildings.

Exterior steel work: Anti-corrosive synthetic enamel paint over primer.

All woodwork: Synthetic paint over a coat of primer.

All internal steel work : Synthetic enamel over a coat of primer.

Interior office spaces, : Acrylic emulsion paint over approved putty.

Fire door : Post Office red shade shall be provided.

2.19.00 Miscellaneous Work

a) Pavements, walkways, etc. : 50 mm thick anti-skid interlocking concrete pavers.

b) M.S. grill : With 6 mm thick 25 mm wide M.S. flats of approved pattern shall be provided as per security requirements.

c) R.C.C. stair : For R.C.C. stair hand railing with 20 mm square M.S. bar balustrades with suitable M.S. flats & anodized aluminium handrails.

d) Anti-termite treatment shall be given to columns pits, foundations, trenches, below floor as per IS:6313.

e) Suitable arrangement of floor trap shall be provided in floor where water may come from equipment.

f) Doors and windows rolling shutter of all buildings shall have sun-shed either recessed in the wall or projected out. Projection of sun-shed shall be 750 mm for door and 450 mm for windows with 300 mm projection on either side of the openings.

2.20.00 Chain Link Fencing

1.80 M high fencing over 250 thick 200 high toe wall with M.S. angle post embedded in cement concrete block and 1.80 M high PVC coated G.I. chain link fencing of minimum 8 gauge (including PVC coating).

3.00.00 INTERIOR FINISH SCHEDULE FOR PLANT BUILDING

Sl No	**BUILDING /AREA**	**FLOORING/SKIRTING/ DADO**	**WALL**	**CEILING**
1	Office areas, Control Room and other important areas.	10 mm thick non-skid fully vitrified tiles of approved make of minimum size 400 mm x 400 mm over IPS floor (overall 50 mm thick) laid in pattern.	Acrylic emulsion paint over putty.	Acoustic mineral fibre board ceiling on aluminium grid system. Acrylic emulsion paint over putty in areas without false ceiling.
2	Shop – 4 – Chemical milling area	Minimum 20 mm thick acid and alkali resistant tile set in and jointed with epoxy mortar (overall 50 mm thick) along with 1500 mm high dado of same tile.	Chemical resistant paint.	Chemical resistant paint.
3	AHU Rooms, & all other service areas	50 mm thick heavy duty cement concrete floor with metallic hardener.	Cement paint.	Cement paint.

4	Toilet and other wet areas	Minimum 10 mm thick non-skid vitrified tile, of approved make of minimum size 400 mm x 400mm (overall 50 mm thick) with glazed ceramic tile of same make dado topped with 50mm wide matching molded ceramic trims. Dado shall be 1800 mm high from finish floor level.	Acrylic emulsion paint over putty.	Acrylic emulsion paint over putty.
5	All other general areas	Overall 50 mm thick heavy duty concrete floor with metallic hardener.	Cement paint.	Cement paint.

4.00.00 GENERAL DESIGN DATA FOR ARCHITECTURAL WORKS

Toilets in general shall have white porcelain fixtures, low down cisterns, automatic flushing systems for urinals etc. Toilets for handicapped persons shall have adequate grab bars, barrier-free access and appropriate fittings and fixtures.

5.00.00 STATUTORY RULES

a) Vendor shall comply with all applicable statutory rules pertaining to Factories Act as applicable for Tamilnadu State, Rules of Tariff Advisory Committee (TAC), Water Act for pollution control etc.

b) Provision of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkway, minimum 500 mm wide, along the crane girder at crane girder level on both sides, comfortable approach to EOT crane cabin, fire escape, locker room for workmen, pantry, toilets, rest rooms etc.

c) Provision for fire proof doors, number of staircases, fire separation walls, encasing of structural members (in fire prone areas) etc. shall be made according to the recommendation of Tariff Advisory Committee.

d) Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 05.00: Specific Technical Requirement – Roof Decking

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

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File 05.00: Specific Technical Requirement – Roof Decking

1.00.00 Scope

This section of the specification covers the supply, fabrication and erection of profiled light gauge Metal Decks (coated and painted) as roof decking to shop-1&2 building.

2.00.00 Material

2.01.01 Roof of shop – 1&2 consists of permanently colour coated (on exposed face) galvanized M.S. trough metal sheet decking plate of approved colour over roof purlins for In-situ roof slab as per IS: 14246 and conform to class 3. Thickness of deck plate shall be minimum 0.8mm and minimum trough depth of 44 mm and centre to centre of the valley shall be 130mm with minimum yield strength of 250 Mpa. Silicon modified polyester paint shall be used for permanent coating over galvanized surface with minimum rate of galvanization 275 gm/sqm. DFT of permanent colour coating shall be 20 microns. It shall serve as permanent shuttering for cast-in-situ roof slab. It should have adequate strength to support weight of green concrete and imposed load during construction. The thickness of the deck plate shall however be designed suitably according to the spacing of roof purlins.

3.00.00 INSTALLATION

The Contractor shall furnish all labour, equipment and materials as required for the design, fabrication, coating, erection and fixing of the decking over purlins, painting and for the complete performance of the work in accordance with the construction drawings and as described herein.

The description, which follows, gives a general indication of the nature and extent of the work but is not necessarily exhaustive and does not purport to cover all the details/operations which will be necessary in order to carry out the work.

3.01.00 Detailed Design of Roof Decking

The Contractor, in conjunction with the manufacturer, shall be responsible for the detailing of the profiled decking, fittings and fixtures and shall submit with his tender particulars of the proposed manufacturer and of the particular product proposed for use. The detailing is to be based on typical details furnished in the approved drawing. The Contractor shall submit to BHEL, two copies of the general arrangement and detailed working drawings for the proposed design, together with all calculations necessary to verify the adequacy and completeness of the design & detailing of decking sheets, fixtures, flashings and trims. After approval he shall supply further six copies.

The BHEL will verify the correct interpretation of his requirements but may not necessarily check the design and details, and the Contractor shall be entirely responsible for the accuracy of the drawings and the correctness of the design and the suitability of the details. Manufacture of roof decking sheets shall not commence until the necessary approval of BHEL has been obtained.

3.02.00 Erection & Fixing

3.02.01 Sequence of Manufacture/Erection

Cutting Schedules, delivery to site and stacking arrangements in store shall ensure that sheets are erected in a sequence which follows that for the manufacture. The decking sheets shall be erected using an arrangement of sheets and joints to conform with the requirements of this specification. Decking erection for each elevation or feature shall commence at one end only and proceed towards the other end, in order to ensure tight fitting laps.

3.02.02 Position and Location of Laps

Side and end laps of roof decking sheets shall be located and positioned in such a manner as to provide the maximum weather protection taking into account the direction of the prevailing wind.

The lines formed by horizontal laps and fixing shall where possible, be continuous and coincide with the edges of large openings in the roof.

3.02.03 Alignment of Sheets and Fixings

All roof decking sheets shall be fixed plumb and level with all fixings evenly spaced and accurately lined. All dirt and grease shall be removed from the surfaces of the sheets as the work proceeds.

3.02.04 Site Cutting

Approval must be obtained before the roof decking sheets are cut at site. Generally cutting of sheets to length will not be permitted, only special cutting and trimming for small openings shall allowed. Where possible, site cut edges shall be concealed at laps.

3.02.05 Damaged Sheets

Distorted, blemished or water stained sheets and any other fittings shall not be used.

3.02.06 Laps

End laps and side laps to roof decking sheets shall be sufficiently large to ensure that the decking complies with the weather tightness and other requirements of this specification. The length of each decking sheet shall be adjusted so that the end laps shall bear on the purlins. In no case, end laps shall not be less than 150 mm and side laps shall not be less than 53 mm.

3.02.07 End Lap Fixings

End lap fixings shall be located at least 25 mm from the end of each sheet.

3.02.08 Side Lap Fixings

The spacing of side lap fixings shall ensure compliance with this specification regarding tightness. The spacing of these fixing screws shall not exceed 500mm. The fixing shall be located in the bottom flat of the corrugation.

3.02.09 Holes

Holes in MS decking sheets shall be punched. In case holes are drilled holes, it is to be ensured that the holes do not go oversize due to the small thickness of the sheeting. All drilling scarp shall be removed from the surfaces of decking, supporting steel work, purlins etc.

3.02.10 Location and Spacing of Fixings

Fixings shall be accurately located in position in the centre of the corrugations to ensure that the heads of bolts, nuts and washers bear squarely down on the surface of the sheeting and are not located at the edge or on the joints in supporting purlins.

3.02.11 Fixings

The bidder shall submit with his tender details of the proposed method for securing the roofing sheets to the metal purlins. The roof decking sheets are to be fixed to the roof purlins with hex washer head white zinc plated heat treated carbon steel self drilling / self tapping screws of minimum thread diameter of 5.6mm. These self drilling screws shall be drilled through the roofing sheets and purlins supporting the roofing sheets. These purlins shall be suitably spaced as per the requirement of roofing sheets and the roofing sheets shall not sag more than span/250 for the loads likely to be imposed during concreting and in future. The self-drilling screws are to be spaced at a maximum distance of 390mm centre to centre along the length of the purlins and top chord of truss. The screws are to be located preferably in the valley only and shall be installed in accordance with the manufacturer's recommendations using tools approved by the manufacturer which do not damage the coating of the decking sheets.

3.03.00 Protection during Construction

Precautions shall be taken during the erection of the roof decking to ensure that partially erected decking are protected during inclement weather and damage at all times.

3.04.00 Damage

Any damage to coating & primer during transportation is to redone with the similar type of coating as per the manufacturer's specification at no extra cost to BHEL.

4.00.00 Acceptance Criteria

The installation shall present a neat appearance and shall be checked for water tightness. The following shall be checked:

a) Side and end laps

b) Absence of damage in the sheeting.

c) Conformity of fixings with the approved design.

5.00.00 IS Codes

All work shall be carried out as per this specification and shall conform to the latest revision and/or replacements of the following or any other Indian Standard (IS) Codes, unless specified otherwise. In case any particular aspect of work is not specifically covered by Indian Standard Codes, any other standard practice, as may be specified by the Engineer, shall be followed.

IS : 513 - Specification for cold rolled carbon steel sheets.

IS : 3618 - Specification for phosphate treatment of iron and steel for protection against corrosion.

IS : 4431 - Specification for carbon & carbon manganese free cutting steel.

IS : 1573 - Electroplated Coatings of zinc on iron and steel.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 06.10: FQP – Civil - Construction / Erection

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

Quality plan for

Civil Works - Construction / Erection

FMT-QP-01 REV-00

Prepared by		Approved by	
Document no.		QPE - CVL – 01 - 00	
Original date of issue		xx/xx/2022	
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FMT-QP-02 REV-00

	CONTENTS	DOC. NO. : QPE - CVL – 01 - 00
		REV. NO. : R-00
		SHEET : 1 / 1 SHEETS

Sl. No.	Description	No. of Sheets
1.	Status of Amendments	1
2.	Authorisation for Different Categories of Check	1
3.	Statement of Checks For Construction / Erection	11
4.	Log sheet L-00 To L-00	1

FMT-QP-03 REV-00

	STATUS OF AMENDMENTS	DOC. NO. : QPE - CVL – 01 - 00
		REV. NO. : R-00
		SHEET : 1 / 1 SHEETS

Sl. No.	Reference of Sheets Amended	Amendment No. & Date	Remarks

FMT-QP-04 REV-00

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

Classification of Checks		Inspection Agency	Clearing Agency
Symbol	**Description**		
A	Critical	Task Performer & QAE-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & QAE-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	QAE-BHEL	Quality Assurance Engineer of BHEL
	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

Note:

- Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
- QAE is also authorised to carry out surveillance in “C” category of checks at his discretion.
- In case of non-conformity, before accepting, clearing agency shall ensure dispositioning and the same shall be reflected in Log sheets/protocols.

FMT-QP-05 REV-00

	STATEMENT OF CHECKS FOR CIVIL - CONSTRUCTION / ERECTION	DOC. NO. : QPE - CVL – 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 11 SHEETS

System :	Civil - Construction / Erection.
Sub-System :	……. (Type of work)
Area :	……. (Building / Structure identification ref.)

Classification of Checks		**Checking Authority**	**Accepting Authority**
Symbol	**Description**		
A	Critical	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

FMT-QP-06 REV-00

BHEL	**STATEMENT OF CHECKS**	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil - Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 02 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
01	**COARSE AGGREGATE**					
	a) Moisture content: (Once per stack of 100 m3 or part thereof except during monsoon when this has to be done every day before starting the work.	Oven, frying pan, etc. as per IS 2386	B	IS 2386, IS 456 & IS 383	Site register / Log book	
	b) Specific gravity, density, voids absorption (Once per 9 week or change of source whichever is earlier. This test will also be carried out while establishing design mix and the result to be intimated.	As per IS 2386	B	-do-	-do-	
	c) Sieve analysis: (One sample per 100 m3 / change of source whichever is earlier. Results should conform to design mix subject to variation within limit as per relevant IS)	Sieves & perforated container	A	-do-	-do-	
	d) Mechanical properties like impact, abrasion and crushing value strength. (To be done twice per source. One at the starting, another in the middle).	As per IS 2386	B	-do-	-do-	
	e) Deleterious materials. (To be done twice per source. One at the starting, another in the middle)	-do-	B	IS 383 & IS 2386-II	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 03 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
	f) Soundness (Twice per source. One at the starting, another in the middle).	As per IS 2386	B	IS 383 & IS 2386-V	Site register / Log book	
	g) Acid and alkali reactivity (Twice per source. One at the starting, another in the middle).	-do-	B	IS 2386-VII & IS 383	-do-	
	h) Flakiness & petrographic examination including visual inspection. (Twice per source. One at the starting, another in the middle).	-do-	B	IS 2386-I & VIII & IS 383	-do-	
	i) Bulk density (One per stack of 100 m3 or part thereof or change of source whichever is earlier).	-do-	B	IS 2386 & IS 383	-do-	

	STATEMENT OF CHECKS					DOC. NO. : QPE - CVL – 01 - 00 REV.NO. : R 00
System : Civil – Construction / Erection		**Sub-System :** As Below		**Area :** (Building / Structure identification ref.)		SHEET : 04 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
02	**FINE AGGREGATE**					
	a) Bulkage, moisture content (To be done every day before starting the work)	As per IS 2386	B	IS 2386- III IS 383	Site register / Log book	
	b) Sieve analysis (Once for 100 m3 / change of source whichever is earlier.	Set of sieves	A	IS 2386- I IS 383	-do-	
	c) Particle size and shape (Once per 100 m3 or part thereof. To be repeated if source is changed.	-do-	B	-do-	-do-	
	d) Deleterious materials (Same as for course aggregate)	As per IS 2386	B	S 2386- II IS 383	-do-	
	e) Soundness (Same as for course aggregate)	-do-	B	IS 2386- V & IS 383	-do-	
	f) Acid and alkali reactivity. (Once per source)	Same as course agg	B	IS 2386- VII & IS 383	-do-	
	g) Mortar soaking properties. (Once per source)	As per IS 2386 VI	B	IS 2386 VI	-do-	

	STATEMENT OF CHECKS				DOC. NO. : QPE - CVL – 01 - 00
					REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)			SHEET : 05 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
	h) Petrographic examination including visual inspection. (Once per source)	Same as coarse agg.	B	IS 2386 VIII IS 383	Site register / Log book	
	i) Specific gravity, density, voids absorption and bulking. (Once in 9 weeks / change of source whichever is earlier)	-do-	B	-do-	-do-	
	j) Check slit, clay content and organic impurities. (Once per source)	-do-	B	IS 2386 II & IS383	-do-	
03	**REINFORCEMENT STEEL**					
	a) Manufacturing test certificate for physical and chemical properties for each consignment for review approval.		A	IS-1852 / IS1786 / Appd specn. & MTC	-do-	
	b) Tolerance (At random)		C	IS-1852 / IS1786	-do-	
	c) Freedom from cracks, surface flaws, lamination and rough jagged and imperfect edges. (At random)		C	-do-	-do-	
04	**STAGING**					
	Durability, strength and soundness of staging, joints adequacy of its foundations and specific level. (for each member before and after placement of concrete)		A	IS-1852 / IS 1786 / As per specification	Site register / Log book	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 06 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
05	**SHUTTERING**					
	a) Warping, broken or damaged edges (At random)		B	Contract specification	Site register / Log book	
	b) Checking of joints to avoid undue loss of liquid to prevent the absorption of water from concrete (At random)		B	-do-	-do-	
	c) Dimensions length and breadth (Each member and before they lift)		B	Contract spec.	-do-	
	d) Shape alignment longitudinal (Each member and before they lift)		B	-do-	-do-	
	e) Diagonal bracings (Each member and before they lift)		B	-do-	-do-	
	f) Level and height (Each member and before they lift)		B	-do-	-do-	
	g) Plumb line, unevenness of any surface (Each member and before they lift)		B	-do-	-do-	
	h) Insufficient loose connections (at random)		B	-do-	-do-	
	i) Cleaning and oiling (Daily)		C	-do-	-do-	
	j) Tightness (leakage) (Random)	No loss of liquid from joints	C	-do-	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 07 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
06	PLACEMENT OF REINFORCEMENT STEEL					
	a) Check for bar bending schedule with necessary laps, spacers and chairs for all concreting before start of work.		B	Approved Drawing	Site register / Pour Card	
	b) Check cutting tolerances for bars as per drawing.		B	-do-	-do-	
	c) Check all the bent bars are as per approved bar bending schedule with such tolerances so that final cover in reinforcement is not reduced by more than 2 mm or increased by more than 10 mm.		B	Approved drawing / Approved BBS	-do-	
	d) Check all joints and crossing of bars are tied properly with right gauge and annealed wire. (Random)		B	-do-	-do-	
	e) Check any of the bars selected for use shall be free from cracks, surface flaws, laminations and roughed, jagged and imperfect edge. (At random)		B B	-do- -do-	-do- -do-	
	f) Check for proper cover, distance and spacing of bars, spacers and chairs after the reinforcement cage has been put inside the formwork		B	-do-	-do-	
	g) Lapping of bars.		B	IS 456 & appd. dwg.	-do-	
	h) Check tolerance of foundation block / block for steel structure after reinforcement.		B	-do-	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 08 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format of Record	Remarks
07	EARTH WORK					
	a) Nature of soil rock		B		Site register / Log book	
	b) Initial ground level dimensions of excavated pit, final pit / bed level		B		-do-	
	c) Side slope during excavation (Random)		B		-do-	
	d) Back filling moisture content and dry density test and other tests as per contract spec. (One sample per 1500 m3 or part thereof per job of back filling per source).		B	IS 2720 & contract spec.	-do-	
08	BRICKS					
	a) Soundness (One for each stack of 3000 or part thereof)		C	IS 3495, IS 1077 & IS 2691	-do-	
	b) Colour (One for each stack)		B	-do-	-do-	
	c) Compressive strength (One for each stack of 3000 bricks or part thereof)	CTM	A	IS 3495-I, IS 1077 & IS 2691	-do-	
	d) Water absorption (One for each stack of 3000 bricks or part thereof)	As per IS 3495-I	A	-do-	-do-	
	e) Efflorescence	As per IS 3495-III	A	-do-	-do-	
	f) Visual and dimensions: (At random)		B	IS 1077 & Contract Spec.	-do-	
	g) Warpage (One for each stack of 3000 bricks or part thereof). Bricks should be free from cracks, flaws and nodules of free lime.	Straight edge & scale	B	-do-	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 09 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
09	CEMENT					
	a) Review of manufacturers test certificate for each consignment.		A	IS 269	Site register / Log book	
	b) Initial and final setting time (One sample per 100 MT or part thereof)		A	IS 269	-do-	
	c) Fineness (One set of sample per 100 MT or part thereof)		A	IS 4031, 1489 & 269	-do-	
	d) Soundness, specific gravity, compressive strength (One set of sample per 100 MT or part thereof)		A	IS-4031	-do-	
10	CONCRETING					
	a) Weigh batching (One batch per day).		A	IS 456, Approved	-do-	
	b) Compacting.		A	Design Mix & Contract Spec.	-do-	
11	CONCRETE					
	a) Workability – slump test and compaction factor test (One sample every 1 hrs from every mixing plant)	Slump Cone	B	IS 456 & IS 1199	-do-	
	b) Crushing strength (One set of 6 cubes of 15 cm size for 25 M3 of concrete or part thereof for each grade of concrete per 8 hrs of work or part thereof mass concrete 3 specimen shall be tested at 7 days and remaining at 28 days.	Cube Crush Machine	A	IS 456, IS 516, IS 1199 & Contract spec.	-do-	
	c) Water cement ratio and cement content (At random at the time of batching)		B	IS 456, IS 3025 & Approved Design Mix.	-do-	
	d) Check of type and location of embedment.		B	Approved Drawing	-do-	
	e) Release for concreting.		B	Pour Card	Pour Card	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 10 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
12	WATER					
	a) Test for neutralisation of water by using indicator and test for limits of solids (once a month for each source)	As per IS 3025	B	IS 3025 & IS 456	Site register / Log book	
	b) Test for PH value (once a month for each source). Water to be supplied by BHEL.	-do-	B	IS 456	-do-	
13	SOIL					
	a) Grains size analysis, liquid limit and plastic limit, proctor density test (One per 1500 M3 or change of strata/soil Minimum 2 samples)		A	IS 2720 & Contract specification	-do-	
	b) Field compaction test for central filling (At every pit)		A	-do-	-do-	
14	GROUT					
	a) Grouting pressure (at random)		B	Approved drawing	-do-	
	b) Composition of grout (Each lot / batch)		B	Manufacturer Specification	-do-	
	c) Compressive strength (Each lot / batch)		A	-do-	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - CVL – 01 - 00
		REV.NO. : R 00
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	SHEET : 11 / 11 SHEETS

Sl. No.	Characteristics	Instrument	Class	Reference Document	Format Of Record	Remarks
15	Inspection and testing of PCC / RCC structures					
	a) Visual and dimensional of finished structures.		A	Contract specification	Site register / Log book	
	b) Load test and core test		A	IS 456	-do-	
	c) Ultrasonic testing of top deck and column of ST foundation		A	IS 13311-I	-do-	
	(In case test results of concrete cube test are not satisfactory, Load and Core test shall be carried out as required. In case test results of load test & core test are not satisfactory or wherever load test & core test are not feasible, further ultrasonic test to access the quality of concrete shall be carried out at mutual decision.)					

FMT-QP-07 REV-00

	RECORD OF QUALITY CHECKS	DOC. NO. : QPE - CVL - 01 - 00
		REV.NO. : R 00
		SHEET : ….. / ….. SHEETS
System : Civil – Construction / Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	LOG SHEETNO. : L-00

Sheet No. of QPI	Check No.	Results Achieved ok / not ok	Drawing / Document Reference	Format of Record	Checked By Sign. & Date	Accepted By Sign. & Date	Remarks

Note : Any protocol made is to be numbered & mentioned in “Format of Record” column.

Engineering, Procurement & Construction (EPC) of Civil, Structural & Architectural Work of Aero Space Equipment Manufacturing Plant Civil Package

Tender Document No – BAP:CP&S/ISRO/2022-23

File 06.20: FQP - Structural – Fabrication & Erection

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
Boiler Auxiliaries Plant
Indira Gandhi Industrial Complex,
Ranipet-632406, (Tamil Nadu), India.

Quality plan for

Structural – Fabrication & Erection

FMT-QP-01 REV-00

Prepared by		Approved by	
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FMT-QP-02 REV-00

	CONTENTS	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 1 / 1 SHEETS

Sl. No.	Description	No. of Sheets
1.	Status of Amendments	1
2.	Authorisation for Different Categories of Check	1
3.	Statement of Checks for Material Receipt & Storage	2
4.	Statement of Checks for Fabrication	4
5.	Statement of Checks for Erection	3
6.	Documents Referred in Quality Plan	1
7.	Annexure - I	1
8.	Record of Quality Checks	1
9.	Log sheet L-00 To L-08	10

FMT-QP-03 REV-00

बी एच ई एल BHEL	STATUS OF AMENDMENTS	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 1 / 1 SHEETS

Sl. No.	**Reference of Sheets Amended**	**Amendment No. & Date**	**Remarks**

FMT-QP-04 REV-00

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

Classification of Checks		Inspection Agency	Clearing Agency
Symbol	**Description**		
A	Critical	Task Performer & QAE-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & QAE-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	QAE-BHEL	Quality Assurance Engineer of BHEL
	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

Note:

- Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
- QAE is also authorised to carry out surveillance in “C” category of checks at his discretion.
- In case of non-conformity, before accepting, clearing agency shall ensure dispositioning and the same shall be reflected in Log sheets/protocols.

FMT-QP-05 REV-00

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 02 SHEETS

System :	Structural - Fabrication & Erection.
Sub-System :	Material Receipt & Storage.
Area :	Stock Yard.

Classification of Checks		**Checking Authority**	**Accepting Authority**
Symbol	**Description**		
A	Critical	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

NOTES:

1. For checks where log sheets are not called for, suitable records should be maintained in the form of log sheets / protocols.

2. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.

3. Fabrication / Erection drawings shall be approved as per contract.

4. For HSFG bolt tightening, relevant latest standards shall be followed.

5. Ref. documents:

   - Technical Specification for Structural Steel as per contract
   - QA Manual
   - Welding Manual
   - NDE Manual
   - H.T. Manual
   - AWS D1.1

FMT-QP-08 REV-00

BHEL	**STATEMENT OF CHECKS**	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Material Receipt & Storage	**Area :** Stock Yard / SHEET : 02 / 02 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
01	Manufacturing test certificate for physical and chemical properties for each consignment for review approval.		A	MTC, Con. Spec.	100%	Log book/ Store Register	
02	Freedom from cracks, surface flaws, lamination and rough jagged and imperfect edges.	Visual	B		Random	-do-	
03	Storage / excess/ damage/ distortion of the components if any. NOTE: Format for material indent to be finalised at site.	Visual	C	Test certi. & Fab Drg./ Con. Spec.	100%	-do-	
04	Storage of raw material and components.	Visual	C	Contract Specification		-do-	
05	Periodic preservation of the raw material & components.	Visual	C	Contract Specification/ Storage & Preservation Manual	100%	-do-	

FMT-QP-05 REV-00

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 04 SHEETS

System :	Structural - Fabrication & Erection.
Sub-System :	Fabrication.
Area :	…… (Building / Structure identification ref.)

Classification of Checks		**Checking Authority**	**Accepting Authority**
Symbol	**Description**		
A	Critical	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

NOTES:

1. For checks where log sheets are not called for, suitable records should be maintained in the form of log sheets / protocols.

2. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.

3. Fabrication / Erection drawings shall be approved as per contract.

4. For HSFG bolt tightening, relevant latest standards shall be followed.

5. Ref. documents:

   - Technical Specification for Structural Steel as per contract
   - QA Manual
   - Welding Manual
   - NDE Manual
   - H.T. Manual
   - AWS D1.1

FMT-QP-08 REV-00

BHEL	**STATEMENT OF CHECKS**	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Fabrication	**Area :** (Structure identification ref.) SHEET : 02 / 04 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
01	Check availability of following documents / facilities. Approved fabrication drawings, WPS, EWS, all reference documents, formats and logbook	Visual	A				
02	Verify raw material for free from cracks, lamination, pitting, distortion, dent, kinks and imperfect edge.	Visual	B	Contract Specification	100%	SP-04-F01	
03	Check for bend, out of straightness and twist, if any. Note : Straightening, if allowed shall be done in straightening machine at ambient temperature.	Tape & Scale	C	Contract Specification, IS808, IS2062 IS800,		SP-04-F01	
04	Check for cutting, bending and grinding.	Tape & Scale	B	Approved drawing	100%		
05	Welders qualification as per Approved WPS and ASME Section IX.		A	Welding Man./ ASME Sec 9	100%		
06	Fit-up and welding.	Scale	B	Fab drg., Welding Man & WPS	100%		
07	NDE of weld joints	NDT Facility as required	A	Contract Specification & Annexure I	100%		

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Fabrication	**Area :** (Structure identification ref.)	SHEET : 03 / 04 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
08	Visual and dimensional examination of weld joints	Scale	B	Contract Specification	100%	Log Book	
09	Mechanical testing of production test coupons. a) Fillet welds: a1) Macro ETCH examination on production test coupons on main fillet welds – Random check. a2) Quantum of check – one joint per column / built up beam / crane girder (Site FQA may reduce the frequency for this test after getting consistently satisfactory results on initial 10 tests). b) Butt welds: b1) Mechanical testing of production test coupons (Plates). b2) Quantum of check same as (a2) above.	UTM	A	-do-		-do-	
10	Camber, sweep and total length of individual columns.	Tape & Scale	B	Fab. drawing	100%	L-01	
11	Dimensional checks on individual members.	Tape & Scale	B	Fab. drawing	100%	Log Book	
12	Check layout of gantry assy.	Tape & Scale	B	Erc. drawing	100%		
13	Check the following of gantry assy.	Tape & Scale	B	Erc. drawing	100%	L-02	
13.1	Camber of top and bottom member.	-do-	B	-do-	100%		
13.2	Horizontal level	Dumpy level	B	-do-	100%		
13.3	Total length of assembled gantry	Tape & Scale	B	-do-	100%		

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Fabrication	**Area :** (Structure identification ref.)	SHEET : 04 / 04 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
14	Check the assembled trestles.	Tape & Scale	B	Fab. drawing	100%		
15	Check the assembled roof trusses on gantry structure.	Tape & Scale	B	Fab. drawing	100%		
16	Check silos / hopper layout and clear for assembly.	Tape	B	Fab. drawing	100%		
17	Painting of components (primary coat).		C	Contract Spec, IS2074 & IS1477	100%		
17.1	Check for dry film thickness (25 micron).	ELCO Meter	A	-do-	100%	Logbook	
18	Centre line marking, elevation marking (with top as reference) identification of components with erection mark.	Tape & water tube	C	Fab. & Erc. Drg., App marking plan	100%	Logbook	
19	Controlled assembly of column parts.		A	Assy. Drg. / Contract spec	100%		

FMT-QP-05 REV-00

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 03 SHEETS

System :	Structural - Fabrication & Erection.
Sub-System :	Erection.
Area :	…… (Building / Structure identification ref.)

Classification of Checks		**Checking Authority**	**Accepting Authority**
Symbol	**Description**		
A	Critical	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
B	Major	Task Performer & EIC-Civil-BHEL	HOS-Civil-BHEL
C	Minor	Task Performer	EIC-Civil-BHEL

Legend	HOS-Civil-BHEL	Head of Section - Civil - BHEL
	EIC-Civil-BHEL	Engineer in Charge – Civil - BHEL

NOTES:

6. For checks where log sheets are not called for, suitable records should be maintained in the form of log sheets / protocols.

7. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.

8. Fabrication / Erection drawings shall be approved as per contract.

9. For HSFG bolt tightening, relevant latest standards shall be followed.

10. Ref. documents:

    - Technical Specification for Structural Steel as per contract
    - QA Manual
    - Welding Manual
    - NDE Manual
    - H.T. Manual
    - AWS D1.1

FMT-QP-08 REV-00

BHEL	**STATEMENT OF CHECKS**	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Erection	**Area :** (Structure identification ref.) SHEET : 02 / 03 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
01	Check the top level foundation on pedestals with respect to permanent bench mark.	Water tube & Scale	B	Foundn drg / Tech Spec	100%	L-04	
02	Check the centre to centre distance of column foundation pedestals with respect to the ref. axis.	Tape	B	-do-	100%	L-05	
03	Check the diagonals between column foundation pedestals.	Tape	B	-do-	100%	L-06	
04	Check the pitch distance of foundation bolts on both axis and diagonals.	Tape	C	-do-	100%	L-07	
05	Dimensional checks of foundation with respect to ref. axis	Tape	B	Fab. & Erc. Drg	100%	Logbook	
06	Check the shear keys of column have enough grouting gap below them	Tape	C	-do-	100%	-do-	
07	Locking of all packer plates by tack welding		C	Fab. & Erc. Drg. & Contract spec	100%	-do-	
07.1	Welders' qualifications		A	WPS / Contract Spec	100%	-do-	

	STATEMENT OF CHECKS	DOC. NO. : QPE - STR - 01 - 00
		REV.NO. : R 00
System : Structural - Fabrication & Erection	**Sub-System :** Erection	**Area :** (Structure identification ref.)	SHEET : 03 / 03 SHEETS

Sl. No	Characteristics	Type of Check	Class	Reference Document/ Acceptance Standard	Quantum / Frequency of Check	Format of Record	Remarks
08	NDE of site welds	NDT facility as required	A	Fab. & Erc. Drg. & Contract Tech spec. Anx-I		-do-	
08.1	Visual and dimensional check of welds	Scale & Visual	C	Annexure-I / Welding Man.	100%	Logbook	
08.2	Production test coupon and material testing.	UTM	A	-do-	100%	Logbook	
09	Verticality of column after erection of members connecting adjacent columns and other dimensions.	Plumb Bob / Theodolite	A	Relevant Erc drg / Ann-I	100%	L-08	
10	Check the following during the erection of gantries trestles and roof trusses.	Tape & Scale	B	Fab. & Erc drg / Contract Tech Spec	100 %	Logbook	
10.1	Alignment of HT holes between gantries and trestles.		C	-do-	100%	Logbook	
10.2	Alignment of gantries for erection of roof trusses.	Tape	B	-do-	100%	Logbook	
10.3	Tightening of bolts	Torque wrench	B	-do-	100%	Logbook	
11	Check the fixing of stainless steel lining and welding.		A	-do-	100%	Logbook	
12	Grouting of column base and trestle.		B	-do-	100%	Logbook	

FMT-QP-09 REV-00

BHEL	Documents Referred in Quality Plan	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 01 SHEETS

Sl. No	Reference Document	Issuing Authority
01	Drawings	Bidder Scope
02	WPS	As per relevant latest standards
03	Welding Manual	
04	NDE Manual	
05	IS 817, IS 7215, IS 12843, IS 1852, IS 2062	Bureau of Indian Standards (BIS)
06	AWS D 1.1	
07	ASME : Sec IX	
08	ASTM A 435	
09	Other codes relevant to raw material, consumables and works.	

FMT-QP-10 REV-00

BHEL	Annexure - I	DOC. NO. : QPE - STR - 01 - 00
		REV. NO. : R-00
		SHEET : 01 / 01 SHEETS

(A)	**NDT REQUIREMENT**		
01	PRE HEATING	ELECTRODE – E6013 WITH STEEL IS 2061	ELECTRODE E 6013 WITH STEEL IS 2062
	(a) UP TO 20 MM INCL.	NONE	NONE
	(b) >20 MM TO 40 MM INCL.	20 DEG. C	20 DEG. C
	(c) >40 MM TO 63 MM INCL.	NOT ALLOWED	66 DEG. C
02	**POST WELD HEAT TREATMENT**		
	BUTT WELDS WITH PLATES THICKER THAN 50 MM REQUIRE POST WELD HEAT TREATMENT AS PER CONTRACT SPECIFICATIONS / AWS D1.1		
03	**WELD TEST REQUIREMENTS**		
	3.1 **FILLET WELD** 3.1.1 DP TEST 10% AT RANDOM ON FILLET WELD JOINTS. 3.2 **BUTT WELDS** 3.2.1 100 % ULTRASONIC TEST / RADIOGRAPHY TEST 3.2.2 ONE X-RAY EVERY 50 MT 3.2.3 DPT ON ROOT RUN AFTER BACK GAUGING AS PER CONTRACT SPEC. 3.2.4 100 % VISUAL INSPECTION PROCEDURE & ACCEPTANCE NORMS FOR ABOVE NDT'S SHALL BE AS PER CONTRACT SPECIFICATIONS / AWS D1.1		
(B)	FABRICATION AND ERECTION TOLERANCES WILL BE AS PER CONTRACT SPECIFICATION AND IS 1852 & IS 7215		

FMT-QP-07 REV-00

	RECORD OF QUALITY CHECKS	DOC. NO. : QPE - CVL - 01 - 00
		REV.NO. : R 00
		SHEET : ….. / ….. SHEETS
System : Structural - Fabrication & Erection	**Sub-System :** As Below	**Area :** (Building / Structure identification ref.)	LOG SHEET NO. : L-00

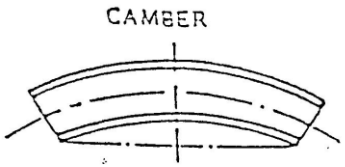
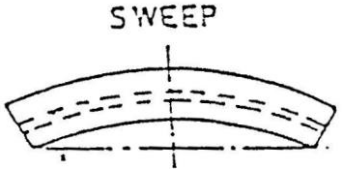
Sheet No. of QPI	Check No.	Results Achieved ok / not ok	Drawing / Document Reference	Format of Record	Checked By Sign. & Date	Accepted By Sign. & Date	Remarks

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

FMT-QP-11 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
TRIAL ASSEMBLY OF COLUMN PIECES			LOG SHEET NO. : L-01

COLUMN NO. :

	Assembled Piece Tolerance 1 Mm / M Max. 15 Mm	Elevation Level From Bottom									
	Assembled Piece Tolerance 1 Mm / M Max. 15 Mm	Elevation Level From Bottom									

Note: Measure at Every 5 Meter Level. (Fix Piano Wire To Full Length Of Column) Measure The Reading And Only Deviation In "+" Or "-" Values

	J1	J2	J3	J4	J5	J6
Match Mark						

TOTAL LENGTH: As Per Drg. MEASURED : DIFFERENCE :
TOLERANCE : ± 15 Mm

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

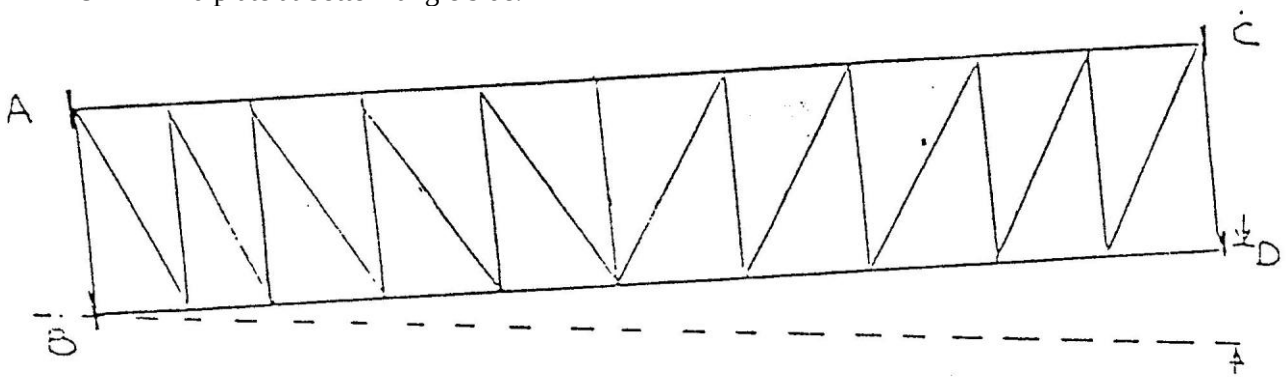
FMT-QP-009 REV. 00

FMT-QP-11 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
ROOF TRUSS PRE – ASSEMBLY			LOG SHEET NO. : L-02

A & C – End plate at top angle side.

B & D – End plate at bottom angle side.



SLOPE at "D"

Slope actual	
As Per Drawing	

CAMBER AND SWEEP

LOCATION						
CHAMBER						
SWEEP						

Match Mark: Indicate OK if it is correct and if any deviation, inform through SAR.

Location			
Match Mark			

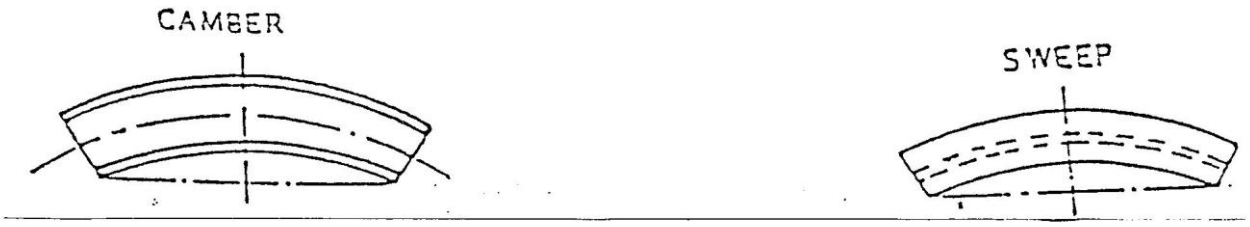
TOTAL LENGTH

As Per Drawing	Measured	Difference	Tolerance
			± 5 mm

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-12 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
CAMBER, SWEEP AND LENGTH OF COLUMN PIECES			LOG SHEET NO. : L-03



Individual Piece Tolerance: 1mm / m. Max. 10 mm

Column No.	Camber			Sweep			Length
Piece No.	T	M	B	T	M	B	

T – Top of the Piece M – Middle of the Piece B – Bottom of the Piece

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-13 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
FOUNDATION - TOP OF PEDESTALS			LOG SHEET NO. : L-04

Elevation of top pedestal as per drawing …… mm.

All dimensions are in mm.

Column No.	Top Elevation measurement	Deviation from drawing value	Column No.	Top Elevation measurement	Deviation from drawing value

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-14 REV-00

	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
FOUNDATION - COLUMN PEDESTALS SPACING			LOG SHEET NO. : L-05

All dimensions are in mm.

Column No.		Spacing	
From	To	Drawing	Actual

Column No.		Spacing	
From	To	Drawing	Actual

TOLERANCE: +15 mm max. First to last pedestal spacing.

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-15 REV-00

	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
FOUNDATION - DIAGONAL BETWEEN COLUMN PEDESTALS			LOG SHEET NO. : L-06
			All dimensions are in mm.

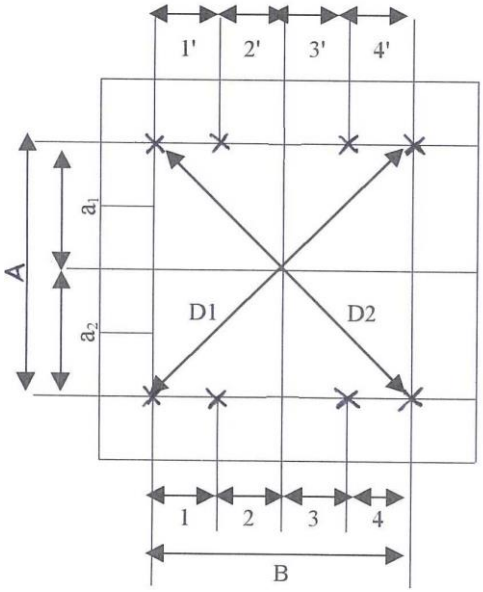
Column No.		Diagonal-D1	Column No.		Diagonal-D2	Difference between D1 & D2
From	To		From	To		

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

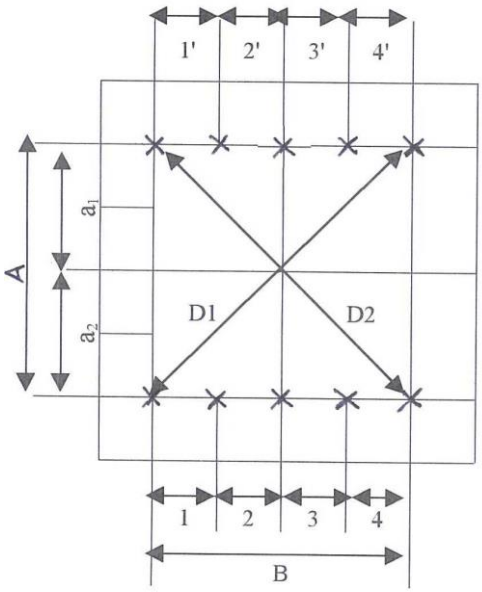
FMT-QP-16 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 03 SHEETS
PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS			LOG SHEET NO. : L-07

Type – I



Type - II



Type - I

Column No.	A	B	a_1	a_2	1	2	3	4	1'	2'	3'	4'	D1	D2
As per Drawing														

Type - II

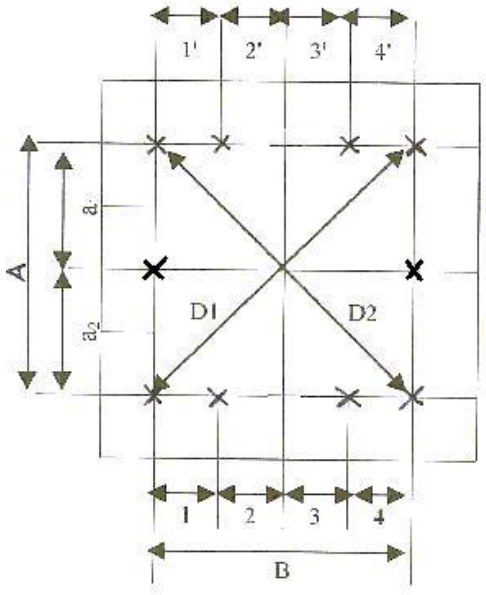
Column No.	A	B	a_1	a_2	1	2	3	4	1'	2'	3'	4'	D1	D2
As per Drawing														

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

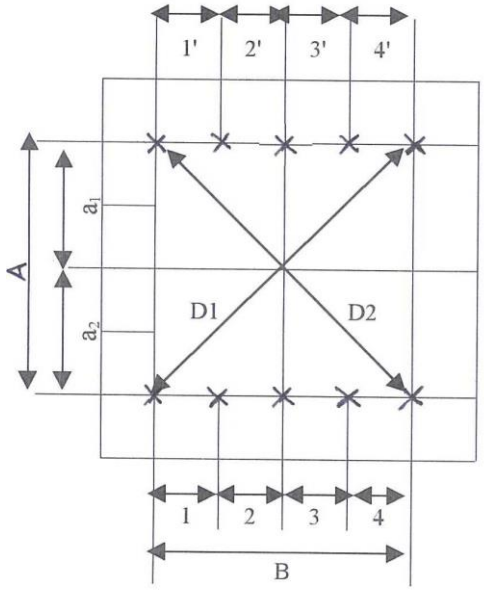
FMT-QP-16 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 02 / 03 SHEETS
PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS			LOG SHEET NO. : L-07

Type – III



Type - IV



Type - III

Column No.	A	B	a_1	a_2	1	2	3	4	1'	2'	3'	4'	D1	D2
As per Drawing														

Type - IV

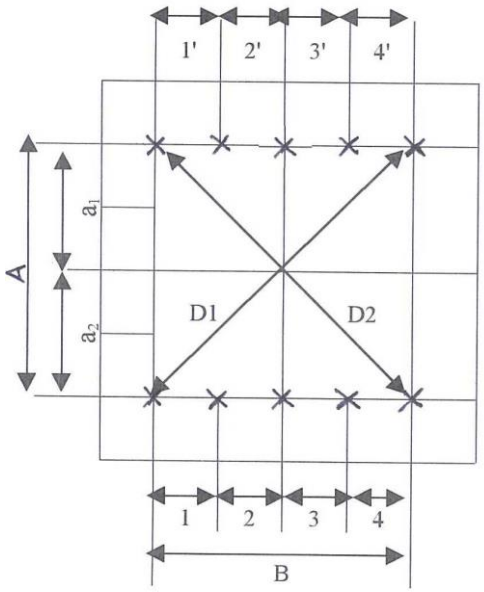
Column No.	A	B	a_1	a_2	a_3	a_4	1	2	3	4	1'	2'	3'	4'	D1	D2
As per Drawing																

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-16 REV-00

BHEL	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 03 / 03 SHEETS
PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS			LOG SHEET NO. : L-07

Type - IV



Type - IV

Column No.	A	B	a_1	a_2	a_3	a_4	b_1	b_2	b_3	b_4	d_1	d_2
As per Drawing												

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

FMT-QP-17 REV-00

	Instrument Reg. No.		DOC. NO. : QPE - CVL - 01 - 00
	Date of Inspection		REV.NO. : R 00
	Drawing / Document Ref.		SHEET : 01 / 01 SHEETS
COLUMN VERTICALITY MEASUREMENT			LOG SHEET NO. : L-08

(Note: To be checked with theodolite and cross checked with plumb bob.)

All dimensions are in mm.

Column No.	Inclined to wards				Column No.	Inclined towards			
Location	Left	Right	Front	Rear	Location	Left	Right	Front	Rear

(Tolerance 1 mm / Meter Max. 35 mm)

	Name	Signature	Date
Checked By			
Accepted By			
Rating			

Annexure 01 Structure Wise Brief Scope of Work

Clean Room Shop-1

No	Item Description	Brief Scope of Work
1	Size	~L=80m(c/c),W=35m(c/c), Ht.of Bottom of EOT = 12.15m. Bidder to decide Roof Height considering False Ceiling & Structural Framing under RCC Roof.
2	Type of building	RCC Framed structure with RCC roof over deck slab with Structural Girder. Refer attached tentative sketch: BHE-BAP-C10-2084 rev-P25 for opening & other details.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
5	Cladding	Brickwork as per specification- from FFL to roof level - 230mm thk in CM 1:6
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6
7	Roof	150mm thk RCC roof over metal Deck sheet with Structural Girders. Water proofing treatment required over roof. One side slope of 300mm at 35m wide building is required.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to provide required opening as per attached tentative sketch: BHE-BAP-C10-2084 rev-P25. Size and number of opening are tentative and the same shall be confirmed during engineering stage.
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage,
13	Wall Panel	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
14	Internal Partition if any	
15	False ceiling	
16	Cable Tray	
17	Cable rack	
18	Cable trench	
19	EOT details	10MT capacity. Other details shall be provided during engineering.
20	Cat walk-way for EOT access	To be provided by bidder for regular maintenance & operations
21	Equipment layout & foundations inside shop	As per requirements of user department. Details will be given during engineering stage,
22	Cat walk-way for Electrical & AC duct above false ceiling	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
23	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
24	Painting (External)	Bidder to decide as per technical specification
25	Painting (internal)	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
26	Rain water down take pipe	110mm pvc pipe 6kg pressure
27	Toilet (Ladies / Gents)	With all fitting & fixtures, anti-skid tiles, door, window, ventilator, exhaust etc. all complete. (all materials shall be of approved make by Engineer-in-charge)
28	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
29	Rain water Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
30	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
31	Laying of Earthing Mat around building & other protection system	

AC Shop-2

No	Item Description	Brief Scope of Work
1	Size	~80m (c/c) x 25m (c/c) x Ht.of Bottom of EOT= 9m. Bidder to decide Roof Height considering False Ceiling & Structural Framing under RCC Roof.
2	Type of building	RCC Framed structure with RCC roof over deck slab with Structural Girder. Refer attached tentative sketch: BHE-BAP-C10-2084 rev-P25 for opening & other details.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
5	Cladding	Brickwork as per specification- from FFL to roof level - 230mm thk in CM 1:6
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6
7	Roof	150mm thk RCC roof over metal Deck sheet with Structural Girders. Water proofing treatment required over roof. One side slope of 300mm at 35m wide building is required.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to provide required opening as per attached tentative sketch: BHE-BAP-C10-2084 rev-P25. Size and number of opening are tentative and the same shall be confirmed during engineering stage.
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage,
13	Wall Panel	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
14	Internal Partition if any	
15	False ceiling	
16	Cable Tray	
17	Cable rack	
18	Cable trench	
19	EOT details	10MT capacity. Other details shall be provided during engineering.
20	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
21	Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage,
22	Cat walk-way for Electrical & AC duct above false ceiling	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
23	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
24	Painting (External)	Bidder to decide as per technical specification
25	Painting (internal)	Not in the scope of civil works. It is in a separate contract for Clean Room facilities.
26	Rain water down take pipe	110mm pvc pipe 6kg pressure
27	Toilet (Ladies / Gents)	With all fitting & fixtures, anti-skid tiles, door, window, ventilator, exhaust etc. all complete. (all materials shall be of approved make by Engineer-in-charge)
28	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
29	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
30	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
31	Laying of Earthing Mat around building & other protection system	

Shop-3

No	Item Description	Brief Scope of Work
1	Size	~90m (c/c) x 25m (c/c) x 9m (Bottom of EOT). Bidder to decide Roof Height considering EOT level.
2	Type of building	Up to Plinth : RCC Framed structure. Above plinth : PEB Structural Steel.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification.
5	Cladding	Brickwork as per specification- from FFL to 4m level - 230mm thk in CM 1:6
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6
7	Roof	Sheet roof with turbo vent facility along with roof access & safety rails. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. Proper rain water collection system to be included.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to decide considering functional requirement
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Partition if any	As per requirements of user department. Details will be given during engineering stage.
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Cable trench	As per requirements of user department. Details will be given during engineering stage,
17	EOT details	10MT capacity. Other details shall be provided during engineering.
18	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
19	Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage,
20	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
21	Painting (External)	Bidder to decide as per technical specification
22	Painting (internal)	Bidder to decide as per technical specification
23	Rain water down take pipe	110mm pvc pipe 6kg pressure
24	Toilet (Ladies / Gents)	With all fitting & fixtures, anti-skid tiles, door, window, ventilator, exhaust etc. all complete. (all materials shall be of approved make by Engineer-in-charge)
25	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground.
26	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
27	Drain inside Shop	As per requirements of user department. Details will be given during engineering stage,
28	Any specific requirement of Foundation/Vat/Rack for Furnace, Raw Material Storage or other equipment	As per requirements of user department. Details will be given during engineering stage,
29	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
30	Laying of Earthing Mat around building & other protection system	

Shop-4

No	Item Description	Brief Scope of Work
1	Size	~100m (c/c) x 25m (c/c) x 9m (Bottom of EOT) Bidder to decide Roof Height considering EOT level.
2	Type of building	Up to Plinth : RCC Framed structure. Above plinth : PEB Structural Steel
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Acid resistance tile flooring on acidic working area. Balance area shall be of IPS flooring.
5	Cladding	Brickwork as per specification- from FFL to 4m level - 230mm thk in CM 1:6
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6
7	Roof	Sheet roof with turbo vent facility along with roof access & safety rails. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. Proper rain water collection system to be included.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to decide considering functional requirement
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Partition if any	As per requirements of user department. Details will be given during engineering stage.
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Cable trench	As per requirements of user department. Details will be given during engineering stage,
17	EOT details	10MT capacity. Other details shall be provided during engineering.
18	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
19	Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage,
20	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
21	Painting (External)	Bidder to decide as per technical specification
22	Painting (internal)	Bidder to decide as per technical specification
23	Rain water down take pipe	110mm pvc pipe 6kg pressure
24	Toilet (Ladies / Gents)	With all fitting & fixtures, anti-skid tiles, door, window, ventilator, exhaust etc. all complete. (all materials shall be of approved make by Engineer-in-charge)
25	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground.
26	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
27	Drain inside Shop	As per requirements of user department. Details will be given during engineering stage,
28	Any specific requirement of Foundation/Vat for Chemical Milling & Anodizing or other equipment	As per requirements of user department. Details will be given during engineering stage,
29	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
30	Laying of Earthing Mat around building & other protection system	

Annexure 01 Structure Wise Brief Scope of Work

Tool Shop

No	Item Description	Brief Scope of Work
1	Size	~51m (c/c) x 15m (c/c) x 9m (Bottom of EOT) Bidder to decide Roof Height considering EOT level.
2	Type of building	This Shop is located between Shop-1&2 having following common structure(s):RCC Column & Side Cladding Up to Plinth : RCC Framed structure. Above plinth : PEB Structural Steel
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Cladding	This shop comes in-between Shop 1 & 2 having following common structure(s): RCC Column & Side Cladding. Balance cladding of non-common area will be Sheeting. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. (if required - Brick work as per specification - from FFL to 4m level - 230mm tk in CM 1:6. Above 4m height sheet cladding)
6	Plastering (inner / external)	(if required - External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6)
7	Roof	Sheet roof with turbo vent facility along with roof access & safety rails. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. Proper rain water collection system to be included.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to decide considering functional requirement
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Partition if any	
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Cable trench	As per requirements of user department. Details will be given during engineering stage,
17	EOT details	10MT capacity. Other details shall be provided during engineering.
18	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
19	Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage.
20	Floor mounted track for job movement if any	
21	Painting (External)	Bidder to decide as per technical specification
22	Painting (internal)	Bidder to decide as per technical specification
23	Rain water down take pipe	110mm pvc pipe 6kg pressure
24	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground.
25	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
26	Drain inside Shop	As per requirements of user department. Details will be given during engineering stage,
27	Any specific requirement of Rack/platform for Tool or other equipment	As per requirements of user department. Details will be given during engineering stage,
28	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
29	Laying of Earthing Mat around building & other protection system	

Annexure 01 Structure Wise Brief Scope of Work

Loading Bay

No	Item Description	Brief Scope of Work
1	Size	~20m (c/c) x 13m (c/c) x 9m (Bottom of EOT)
2	Type of building	This Shop is located between Shop-2&3 having following structure(s): Shop-2 RCC Column & Side Cladding & shop-3 PEB column & side cladding. Up to Plinth : RCC Framed structure. Above plinth : PEB Structural Steel
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Cladding	This shop comes in-between Shop 2 & 3 having following structure(s): Shop-2 RCC Column & Side Cladding & shop-3 PEB column & side cladding. Balance cladding of non-common area up to minimum bottom of EOT will be Sheeting. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. (If required Brick work as per specification - 230mm tk in CM 1:6.)
6	Plastering (inner / external)	if required : External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6
7	Roof	Sheet roof with turbo vent facility along with roof access & safety rails. Polycarbonate Sheet to be provided for natural illumination. Sheet should be of reputed brand & prior approval need to be taken before procurement. Proper rain water collection system to be included.
8	Column spacing	7.5m c/c - minimum
9	Door	Bidder to decide considering functional requirement
10	Window	
11	Rolling shutter	
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Partition if any	As per requirements of user department. Details will be given during engineering stage.
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Cable trench	As per requirements of user department. Details will be given during engineering stage,
17	EOT details	10MT capacity. Other details shall be provided during engineering.
18	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
19	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
20	Painting (External)	Bidder to decide as per technical specification
21	Painting (internal)	Bidder to decide as per technical specification
22	Rain water down take pipe	110mm pvc pipe 6kg pressure
23	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground.
24	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
25	Any specific requirement of Rack/platform for loading & unloading of equipment	As per requirements of user department. Details will be given during engineering stage,
26	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
27	Laying of Earthing Mat around building & other protection system	

Pressure Proof Test (PPT) Area with Embankment - ????

No	Item Description	Brief Scope of Work
1	Size	~10.50m (c/c) x 12m (c/c) x Ht.of Bottom of EOT= 9m Designer to decide Roof Height considering EOT level.
2	Type of building	RCC Framed structure with RCC roof.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Cladding	Brickwork as per specification- from FFL to roof level - 230mm thk in CM 1:6
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	150mm thk RCC roof. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	5m c/c - minimum (Entrance opening for finished job (5m dia) also to be considered)
9	Door	Bidder to decide considering functional requirement
10	Window	
11	Rolling shutter	
12	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
13	Cable rack	
14	Cable trench	As per requirements of user department. Details will be given during engineering stage,
15	EOT details	10MT capacity. Other details shall be provided during engineering.
16	Cat walk-way & Cage Ladder for EOT access	To be provided by bidder for regular maintenance & operations
17	Any specific requirement of platform for testing of finished job	As per requirements of user department. Details will be given during engineering stage,
18	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
19	Painting (External)	Bidder to decide as per technical specification
20	Painting (internal)	Bidder to decide as per technical specification
21	Rain water down take pipe	110mm pvc pipe 6kg pressure
22	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
23	Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
24	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
25	Laying of Earthing Mat around building & other protection system	
26	Embankment size	~L=135m, Base width=12m, Top width= 1m, Ht= 6m. Made-up of RCC/RR core wall, inner filter shell, outer shell, compacted earth finished with surface protection layer (Brick/stone pitching), proper edge protection wall.
27	Peripheral drain for Embankment	To prevent erosion of embankment proper drain to be provided in internal & external area around embankment.
28	Embankment surface finish	Boulder pitching as per technical specification

Non-Destructive Test (NDT) Room

No	Item Description	Brief Scope of Work
1	Size	~L=14m(c/c),W=15m(c/c), Ht.of Bottom of roof = 7m.
2	Type of building	RCC Framed structure with RCC roof.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
5	Wall	As per the requirement of NDT facility.
6	Plastering (inner / external)	As per the requirement of NDT facility.
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	As per the requirement of NDT facility.
10	Window if nay	As per the requirement of NDT facility.
11	Rolling shutter	As per the requirement of NDT facility.
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage,
13	False ceiling	Height & Type to be decided by bidder wrt NDT facility requirement.
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
17	Painting (External)	Bidder to decide as per technical specification
18	Painting (internal)	As per the requirement of NDT facility.
19	Rain water down take pipe	110mm pvc pipe 6kg pressure
20	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
21	Laying of Earthing Mat around building & other protection system	

X-Ray Room

No	Item Description	Brief Scope of Work
1	Size	~L=15m(c/c),W=15m(c/c), Ht.of Bottom of roof = 7m.
2	Type of building	RCC Framed structure with RCC roof.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
5	Wall	As per the requirement of X-Ray room facility.
6	Plastering (inner / external)	As per the requirement of X-Ray room facility.
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Doors	As per the requirement of X-Ray room facility.
10	Window if any	As per the requirement of X-Ray room facility.
11	Rolling shutter	As per the requirement of X-Ray room facility.
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage,
13	Internal Partition	
14	False ceiling	Height & Type to be decided by bidder wrt NDT facility requirement.
15	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
16	Cable rack	
17	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage,
18	Painting (External)	Bidder to decide as per technical specification
19	Painting (internal)	As per the requirement of X-Ray room facility.
20	Rain water down take pipe	110mm pvc pipe 6kg pressure
21	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
22	Laying of Earthing Mat around building & other protection system	

Air Handling Unit (AHU)-1

No	Item Description	Brief Scope of Work
1	Size	~12m (c/c) x 15m (c/c) x 5m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
12	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
13	Cable rack	
14	Cable trench	As per requirements of user department. Details will be given during engineering stage,
15	Painting (External)	Bidder to decide considering functional requirement
16	Painting (internal)	Bidder to decide considering functional requirement
17	Rain water down take pipe	110mm pvc pipe 6kg pressure
18	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
19	Laying of Earthing Mat around building & other protection system	
20	If required : Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage,

Air Handling Unit (AHU)-2

No	Item Description	Brief Scope of Work
1	Size	~12m (c/c) x 12.50m (c/c) x 5m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
12	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
13	Cable rack	
14	Cable trench	As per requirements of user department. Details will be given during engineering stage,
15	Painting (External)	Bidder to decide considering functional requirement
16	Painting (internal)	Bidder to decide considering functional requirement
17	Rain water down take pipe	110mm pvc pipe 6kg pressure
18	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
19	Laying of Earthing Mat around building & other protection system	
20	If required : Equipment layout & foundation	As per requirements of user department. Details will be given during engineering stage,

PPT control room

No	Item Description	Brief Scope of Work
1	Size	~12m (c/c) x 12.50m (c/c) x 5m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
12	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
13	Cable rack	
14	Cable trench	As per requirements of user department. Details will be given during engineering stage,
15	False ceiling	Height & Type to be decided by bidder wrt NDT facility requirement.
16	Painting (External)	Bidder to decide considering functional requirement
17	Painting (internal)	Bidder to decide considering functional requirement
18	Rain water down take pipe	110mm pvc pipe 6kg pressure
19	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
20	Laying of Earthing Mat around building & other protection system	

Painting Booth

No	Item Description	Brief Scope of Work
1	Size	~13m (c/c) x 15m (c/c) x 7m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Rolling Shutter	Bidder to decide considering functional requirement
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
14	Cable rack	
15	Cable trench	As per requirements of user department. Details will be given during engineering stage.
16	Painting (External)	Bidder to decide considering functional requirement
17	Painting (internal)	Bidder to decide considering functional requirement
18	Rain water down take pipe	110mm pvc pipe 6kg pressure
19	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
20	Rain water Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
21	Floor mounted track for job movement if any	As per requirements of user department. Details will be given during engineering stage.
22	Any specific requirement of Rack/platform for painting stage arrangements	As per requirements of user department. Details will be given during engineering stage.
23	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
24	Laying of Earthing Mat around building & other protection system	

Annexure 01 Structure Wise Brief Scope of Work

Gas Bank

No	Item Description	Brief Scope of Work
1	Size	~12m (c/c) x 13.50m (c/c) x 4m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Rolling Shutter	Bidder to decide considering functional requirement
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
14	Cable rack	
15	Cable trench	As per requirements of user department. Details will be given during engineering stage.
16	Painting (External)	Bidder to decide considering functional requirement
17	Painting (internal)	Bidder to decide considering functional requirement
18	Rain water down take pipe	110mm pvc pipe 6kg pressure
19	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
20	Rain water Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
21	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
22	Laying of Earthing Mat around building & other protection system	

Switch Gear Room

No	Item Description	Brief Scope of Work
1	Size	~20m (c/c) x 15m (c/c) x 5m (Bottom of Roof)
2	Type of building	RCC Framed structure.
3	Type of Floor	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
4	Floor Finishing	IPS flooring as per specification
5	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
6	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
7	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
8	Column spacing	As per the design requirement.
9	Door	Bidder to decide considering functional requirement
10	Window	Bidder to decide considering functional requirement
11	Rolling Shutter	Bidder to decide considering functional requirement
12	Additional opening if any	As per requirements of user department. Details will be given during engineering stage.
13	False ceiling	Ht. & Type to be decided by consultant considering functional requirement
14	Cable Tray	Not in the scope of civil works. It is in a separate contract for Electrical works..
15	Cable rack	
16	Cable trench	As per requirements of user department. Details will be given during engineering stage.
17	Painting (External)	Bidder to decide considering functional requirement
18	Painting (internal)	Bidder to decide considering functional requirement
19	Rain water down take pipe	110mm pvc pipe 6kg pressure
20	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
21	Rain water Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
22	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
23	Laying of Earthing Mat around building & other protection system	

Annexure 01 Structure Wise Brief Scope of Work

Office Room

No	Item Description	Brief Scope of Work
1	Size	~30m (c/c) x 10m (c/c) x 10m (5m+5m) (Bottom of Roof) - Two storey
2	Type of building	RCC Framed structure - Two storey building. RCC STAIRCASE UPTO ROOF
3	Flooring	RCC floor. Bidder to be decided floor thickness based on loading details mentioned in design requirements.
	Floor Finishing	Tile (vitrified glazed ceramic-600mmx600mm) flooring as per the technical specification.
4	Wall	Brick work - from FFL to RCC roof - 230mm tk in CM 1:6.
5	Plastering (inner / external)	External:18mm in CM 1:6 in two layers, Internal: 12mm in CM 1:6 Ceiling: 6mm thk in CM 1:4
6	Roof	RCC roof with parapet. Thickness of roof as per the design requirement. Water proofing treatment required over roof. SLOPE AS PER IS CODE
7	Column spacing	As per the design requirement.
8	Door	Bidder to decide considering functional requirement
9	Window	Bidder to decide considering functional requirement
10	False ceiling	Ht. & Type to be decided by bidder considering functional requirement. Cut-out for AC/Ventilation ducting & Illumination is in bidder scope
11	Toilet (Ladies / Gents)	With all fitting & fixtures, anti-skid tiles, door, window, ventilator, exhaust etc. all complete. (all materials shall be of approved make by Engineer-in-charge)
12	Painting (External)	Consultant to decide considering functional requirement
16	Painting (internal)	Consultant to decide considering functional requirement
17	Rain water down take pipe	110mm pvc pipe 6kg pressure
18	Plinth protection all-round	75mm thk PCC(M10) on flat brick soling over compacted ground at required area.
19	Rain water Collection pits with required inspection chamber	450mm x 450mm x450mm (Half BW with plastering in CM 1:6 with PCC(M10) & 110mm pvc pipe 6kg pressure
20	Earth Pit	Not in the scope of civil works. It is in a separate contract for Electrical works.
21	Laying of Earthing Mat around building & other protection system	

GENERAL CONDITIONS OF CONTRACT
FOR
LUMP SUM, ITEM RATE AND PERCENTAGE CONTRACT

Bharat Heavy Electricals Limited

BOILER AUXILIARIES PLANT

RANIPET

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CHAPTER -1

1.In these General Conditions of Contract, the following terms shall have the meaning hereby assigned to them, except where the context otherwise requires:-

a) The "Contract" means, the documents forming the tender and acceptance thereof, together with all the documents referred to therein including general and special conditions to contract. All these documents as applicable taken together shall be deemed to form one contract and shall be complementary to one another.

b) The "work" means, the work described in the tender documents in individual work-orders as may be issued from time to time to the contractor by the Officer-In-charge within the power conferred upon him including all notified or additional items of works and obligations to be carried out as required for the performance of contract.

c) The "contractor" means, the individual Firm or Company whether incorporated or not, undertaking the work and shall include the legal personal representatives of such individuals or the persons composing the firm or Company or the successors of the firm or company and the permitted assigns of such individual or firm or Company.

d) "The Officer-In charge" means, the Officer deputed by the DGM/CP&S to supervise the work or part of the work.

e) "Approved" and "Directed" means, the approval or direction of DGM/CP&S, or person deputed by him for the particular purposes.

f) "BHARAT HEAVY ELECTRICALS LIMITED" (herein after referred to as BHEL) shall mean the Board of Directors, Chairman, Executive Director, General Manager or other Administrative Officer of the said Company including DGM/CP&S authorized to invite tenders and enter into contract for works on behalf of the Company.

g) The "Contract sum" means, the sum accepted or the sum calculated in accordance with the prices accepted in tender and / or the contract rates as payable to the contractor for the execution of the work during the currency of the contract.

h) A "week" means, Seven Days, without regard to the number of hours worked or not worked in any day in that week.

i) A "day" means, the day of 24 hours (TWENTY FOUR) irrespective of the number of hours worked or not worked in that day.

j) A "working day" means, any day other than that prescribed by the NEGOTIABLE INSTRUMENTS ACT as being a Holiday, and consists of the number of hours of labour as commonly recognized by good employers in the trade in the district where the work is carried out or as laid down in the BHEL regulations.

k) In the case of Lump-sum Contracts **'**CONTRACTOR's PERCENTAGE' means the percentage offered by the Contractor as addition / deduction from the cost of building, or other works listed in Schedule "A" to provide a Lump-sum quotation for performance of the contract inclusive of all extra costs, profit, establishment charges, carriage, insurance etc., complete.

l) In the case of Percentage rate contracts “Contractor's Percentage" shall, if the context so permits mean the uniform percentage tendered by the Contractor and accepted by the Accepting Officer, and the expression **'CONTRACT RATE**' shall likewise mean the rates in the BHEL Schedule of Rate applicable as on date as adjusted by the said Contractor's percentage, if any.

m. **'EMERGENCY WORKS'** means any urgent measures which in the opinion of the Engineer-in-Charge, become necessary during the progress of the work to obviate any risk of accident or failure which become necessary for security.

n. **'PROVISIONAL SUM'** or "Provisional Lump-sum" means a Lump-sum included by the BHEL in the tender documents and represents the estimated value of work for which details are not available at the time of inviting the tender.

o **'PROVISONAL ITEMS'** means items for which approximate quantities have been included in the tender documents.

p. **'DAY WORK'** means an item of work requiring the employment of labour with, or without materials as the case may be which in the opinion of the Engineer-in-charge, is not capable of being evaluated by the accepted methods of measurement or assessment and is paid for on the basis of the actual labour and materials utilized on the particular item of work referred to.

q. The **'DATE OF CONTRACT'** shall mean the date /dates on which the parties to the contract have signed the contract agreement.

r. **MAINTENANCE PERIOD / GUARANTEE PERIOD** shall mean the period during which the contractor shall remain liable for satisfactory performance of the work under the contract, repair or replacement of any part of the work performed under the contract.

s. '**COST'** shall mean and include any liability, expenditure, overhead costs whether on the site or off the site incurred by BHEL.

The contractor shall be deemed to have carefully examined all the documents to his satisfaction. If he shall have no doubt as to the manner of the contract document, he shall obtain the details / clarification from **the Company** before signing the contract.

MANNER OF EXECUTION OF CONTRACT:

The contract shall be deemed to have come into force from the date of Letter of Intent unless otherwise provided in the Letter of Intent. Unless and until the contract agreement is executed, the Letter of Intent read in conjunction with the tender documents will constitute a binding contract.

CHAPTER - II

SCOPE OF CONTRACT

2. Heading to Contract:

The heading to these conditions shall not affect the interpretation thereof.

3. Contract Documents:

The Accepting Officer shall furnish to the Contractor on demand "FREE OF COST" three copies of signed Drawings and one copy of the signed agreement comprising of preamble to agreement, General and Special Specification, Schedule A,B,C & D etc., (but excluding General Conditions of Contract and Drawings) and three copies of all further drawing issued the progress of work.

However, for any additional copies of the agreement or drawings required by the Contractor, the same will be supplied on payment of the specified cost. The Contractor shall keep one copy of all the Drawings and the Specifications on the site and the Engineer-in-Charge or his representative shall be at all reasonable times to have access to them. None of these documents shall be used by the contractor for any purpose other than that of this contract.

3a. Secrecy

The Contractor shall take necessary steps to ensure that all persons employed by them on any work in connection with this contract have noted that the Indian Officials Secret Act 1923 (XIX of 1923) & any Company's guidelines issued from time to time applies to them fully and shall continue so to apply even after the execution of such work under this contract. All classified documents furnished to the contractor shall be returned to the Engineer-in-charge on the completion of works or the earlier determination of the Contract.

4. Works to be carried out

The Contract shall, except as provided under Schedules 'B' and 'C' include all labour materials, tools, plant, equipment, and transport which may be required in preparation for and in the entire execution and full completion of the work. Schedule 'A' shall be deemed to have been prepared in accordance with good practice and recognized principles and unless otherwise stated, the descriptions given therein shall be held to include waste on materials, carriage, cartage, lead, hoisting, setting and fixing in position and all other labour necessary for the entire execution and full completion aforesaid. Any error in description or quantity in Schedule 'A' or any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the work comprised therein according to the Drawings and Specifications, or from any of his obligations under the Contract.

The insertion of the name of any firm of suppliers in the Tender Documents is for the purpose of obtaining a particular class or quality of materials or workmanship but the articles or materials specified may be obtained from any other firm subject to prior written approval of the Engineer-in-Charge.

In the case of a discrepancy between schedule 'A' and the specification and / or the Drawings, the Accepting Officer shall be the sole deciding authority as to which shall prevail and his decision shall be final and conclusive. If neither drawings nor specifications contain any mention of minor details of construction, which is in the opinion of the Accepting Officer, whose decision shall be final and conclusive, are reasonable and obviously and fairly intended for the satisfactory completion of the work, such details shall be provided by the Contractor without any extra cost as if they were specially mentioned and shall be deemed to be included in the contract.

The Contractor will be deemed to have satisfied himself as to the nature of the site, local facilities of access and all matters affecting the execution and completion of the work. No extra charges consequent on any mis-understanding in these respects or otherwise will be allowed.

5. Provisional Items

The full amount of provisional Lump-sums and the value annexed to each provisional item inserted in the Tender Documents shall be deducted from the contract sum and the value of work ordered and executed there under shall be ascertained by measurement of valuation as for deviations.

No work under these items is to be begin without instructions in writing from the Engineer -in-charge.

The extent of quantities or items described as "Provisional" shall not be held to guarantee or limit the amount and description of the work to be executed by the Contractor either in respect of the items concerned or the work as a whole.

No addition or deduction shall be made by the Contractor to the amount of the provisional Lump-sum as included in the tender documents.

6. Deviations

The contractor shall not make any alteration in addition to or omission from the work as described in the tender documents except in pursuance of the written instructions of the Engineer-in-charge. No such deviation from the work described in the tender documents shall be valid unless the same has been specifically confirmed and accepted by the Accepting Officer in writing and incorporated in the contract.

The Accepting Officer may deviate either by way of addition or deduction, from the work so described, provided that the contract sum be not thereby varied on the whole by not more than percentage set out in the tender documents. The value of all additions and deductions will be added to or, deducted from the contract sum, whenever the Accepting Officer intends to exercise such a right, his intentions shall specify the deviations which are to be made, the lump-sum assessment or the proposed basis of payment, the extra time allowed if any, and the date for completion of the entire contract.

Any objection to the Contractor to any matter concerning the order shall be communicated by him in writing to the Engineer-in-charge within seven days from the date of such order, but under no circumstances shall the work *be* stopped (unless so ordered by the Engineer-in-charge in writing) owing to differences or controversy that may arise from such an objection. In the absence such communication of objection by the contractor, he will be deemed to have accepted the order and the conditions stated therein, in the event of the contractor failing to agree with the Engineer-in-charge regarding the terms of the proposed deviation, the objection shall be referred to the Head of Civil Engineering Department whose decision shall be final, conclusive and binding on the contractor.

7. Time

Notwithstanding anything to the contrary, including, but not limited to, provisions relating to extension of time and compensation/or delay, time is and shall be **the essence of the contract** and is specified in the tender documents or in each individual Work Order. Time shall continue to be the essence of the contract even in respect of extension(s) that may be granted as per the terms of the Contract.

As soon as possible after the contract is let or any substantial Work Order is placed and before work order is to begin, the Engineer-in-charge and the Contractor shall
Agree to a Time and progress Chart. The Chart shall be prepared in direct relation to the time stated in the tender documents or the Work Order for the completion of the individual items thereof and the contract or order as a whole. It shall indicate the forecast of the dates for the commencement of the various trade processes or sequence of the work and shall be amended as may be required by agreement between the Engineer-in-charge and the Contractor within the limitation of the time imposed in the tender, document or order.

In the absence of any specific Time and Progress chart to be agreed to between the Contractor and Engineer-in-charge the contractor shall ensure and maintain uninterrupted progress of the work such that the entire work shall be completed within the time imposed in the Tender documents or Order and that the proportion of the work completed up to any time in relation to the entire work to be under the Contract or Order shall not be less than the proportion that the time elapsed bears to the total time of completion provided in the Tender documents or Order.

The Contractor shall suspend the execution of the work, or any part or parts thereof whenever call upon in writing by the Engineer-in-charge to do so, and shall not resume work thereon until so directed in writing by the Engineer-in-charge. The Contractor will be allowed an extension of time for completion not less than the period of suspension. However, no other claim in this respect for compensation or otherwise, however will be admitted. Provided the cause for suspension is not attributable to any default of the contractor's part to proceed with or fulfill the contractual obligations. This may also be extended to allow for alteration of work made by the deviation order.

8. Stores and Materials

8.1 Materials to be supplied by the Contractor

The Contractor shall at his own cost and expense provide all materials required for the work other than those listed in Schedule-B which are to be supplied by Bharat Heavy Electricals Ltd.

All materials to be provided by the Contractor shall be brand new and in conformity with the specifications laid down in the contract and the Contractor shall if requested by the Engineer-in-charge furnish proof, to the satisfaction of the Engineer-in-change, that the materials so comply.

The Contractor shall at his own cost and expense and without delay, supply to the Engineer-in-charge samples of materials proposed to be used in the works. The Engineer-in-charge shall within seven days of supply of samples or within such further period as he may require and intimate to the Contractor in writing, inform, the Contractor whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-charge for his approval fresh samples complying with the specification laid down in the contract.

The Engineer-in-charge shall have full powers to requires removal of any or all of the materials brought to site by the Contractor which are not brand new and not in accordance with the contract specifications or do not confirm in character or quality to samples approved by him. In case of default on the part of the Contractor in removing rejected materials, the Engineer-in-charge shall be at liberty to have them removed by other means at the Contractor's expense and risk. The Engineer-in-charge shall have full power to require other proper materials to be substituted for rejected materials and in the event of the contractor refusing to comply, he may cause the same to be procured by other means. All costs, charges and expenses which may attend such substitution shall be borne by the contractor. All charges on account of Octroi, terminal or sales tax and other duties on materials obtained for the work from any source (excluding materials supplied by BHEL) shall be borne by the Contractor.

The Engineer-in-charge shall be entitled to have tests carried out as specified in the Contract for any materials supplied by the Contractor other than those for which, as stated above, satisfactory proof has already been furnished, at the cost of the Contractor and the Contractor shall provide at his expense all facilities which the Engineer-in-charge may require for the purpose.

8.2 Materials to be supplied by BHEL

Materials which BHEL are prepared to supply are shown in Schedule-B which also stipulates place of issue and rate(s) to be charged in respect thereof. Soon after acceptance of the tender the Contractor shall agree in writing with the Engineer-in-charge *on* a phased programme of his requirements with regard to deliver of materials.

In the event of delay in supply of any Stores and materials mentioned in Schedule-B the contractor shall be entitled to reasonable extension of time as provided for under condition-9 but no claim for compensation or damage on any ground whatsoever shall be entertained by BHEL.

For the materials listed in Schedule-B the contractor shall give a reasonable notice in writing of his requirement to the Engineer-in-charge in accordance with the phased programme.

AII materials issued to the Contractor by BHEL for incorporation or fixing in the works shall on completion or on foreclosure of the works and before submission of bills, be returned by the Contractor at his expense, at the place of issue, after making due allowance for actual consumption reasonable wear and tear and / or waste. If the Contractor is required to deliver such materials at a place other than the place less the transportation charges which would have been incurred by the Contractor had such materials been delivered at the place of issue, shall be borne by BHEL.

The Contractor shall bear the cost of loading, transporting to site, unloading storing under covered area as necessary, assembling and joining the several parts together as necessary and incorporating or fixing materials in the work including all preparatory work of whatever description as may be required and of dosing preparing, loading and returning empty cases or containers to the place of issue.

If, in the opinion of the Engineer-in-charge (which shall be final and conclusive) any stores supplied by BHEL have either during currency of the work or after completion of the work whilst under the custody, of the contractor, becomes damaged to such an extend that they cannot be usefully utilized, either in the same work or in other works, the Engineer-in-charge shall not accept the stores and will recover the cost at the rates specified in the contract. The contractor shall not be entitled to any claim whatsoever on this account.

The Engineer-in-charge shall have access to the stores where materials issued by BHEL as per schedule -B of the contract is stored to ensure the balance stock of materials on hand after taking into consideration the materials used on the work is as per the issue and usage. If there be any discrepancy, the cost towards the same will be recovered at the **double recovery rate** indicated for the material concerned. This is without prejudice to and in addition to the overall reconciliation of materials to be made at the completion of work.

If on completion of works, the Contractor fails to return surplus materials out of those supplied by BHEL then, in addition to any other liability, which the Contractor would incur, the Engineer-in-charge may, by written notice to the Contractor, request him to pay within a fortnight of receipt of the notice for such un-returned surplus materials given in sub para-4.

The Contractor shall have to build a weather-proof shed for the storage of Cement (required for 15 days consumption of the work).

8.3 General

Materials required for the works, whether brought by the Contractor or supplied by BHEL shall be stored by the Contractor only at places approved by the Engineer-in-charge. Storage and safe custody of materials shall be at the risk, cost and the responsibility of the Contractor.

Officials concerned with contract shall be entitled at any time to inspect and examine any materials intended to be used in or in the works either on the site or at factory or workshop or other places where such materials are assembled, fabricated or manufactured or at any place(s) where these are lying or from which these are being obtained and the Contractor shall give such facilities as may be required for such inspection and examination.

All materials brought to the site shall not be removed off the site without the prior written approval of the Engineer-in-charge. But whenever the works are finally completed and advance if any, in respect of any such materials is fully recovered the Contractor shall at his own expense forthwith remove from the site all surplus materials out of originally supplied by him and upon such removal the same shall revert in and became the property of the Contractor

Should the Engineer-in-charge consider at any time during the construction or reconstruction prior to the expiry of the MAINTENANCE PERIOD that the stores or materials provided by the Contractor are unsound or of a quality inferior to that contracted for or otherwise not in accordance with Contract (in respect where of the decision of the Engineer-in-charge shall be final and conclusive) the contractor shall on demand in, writing from the Engineer-in-charge specifying the Stores or materials complained of not withstanding that the same may have been inadvertently passed, certified and paid for, forthwith remove the Stores or materials so specified and provide other proper and suitable stores or materials at his own expense, to the entire satisfaction of the Engineer-in-charge and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in his demand aforesaid the Engineer-in-charge may replace with others the Stores or materials complained of at the risk and expense in all respects of the Contractor. The liability of the Contractor under this condition shall not extend beyond the maintenance period aforesaid except as regards Stores or materials which the Engineer-in-charge shall have previously given notice to the Contractor to replace.

9. Delay and Extension of Time:

If, in the opinion of Engineer-in-charge the work is delayed:

i) by reason of abnormally bad weather, OR

ii) by reason of serious loss or damage by fire OR

iii) by reason of Civil commotion local combination of workmen, strike or lockout, affecting any of the trades employed on the work, OR

iv) by delay on the part of the agency or tradesman engaged by BHEL in executing work not forming part of this Contract OR

v) by reason of any other cause which in the absolute discretion of the Engineer-in-charge is (when he is the Accepting Officer of the Contract), beyond the Contractor's reasonable control, then in such cases the Accepting Officer, on the recommendation of the Engineer-in-charge or higher authority may make fair and reasonable extension in the completion dates of the individual items of work of the Contract as a whole. Such extension which will be communicated to the Contractor by the Engineer-in-charge in writing shall be final and binding on the Contractor. No other claim in this respect for compensation or otherwise howsoever is admissible. Upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-charge but shall nevertheless use constantly his best endeavor to prevent or make good the delay and shall do all that may reasonably be required to the satisfaction of the Engineer-in-charge to proceed with the work.

10. Patent Rights

The Contractor shall fully indemnity BHEL or the agent, servant, employee of BHEL against any action, claim or proceeding relating to infringement or the use of any patent or design *or* any alleged patent of design rights, and shall pay any royalties which may be payable in respect of any article / or part thereof included in the Contractor. In the event of any claim, being made or action brought against BHEL or any agent, or servant or employee of BHEL in respect of the matters aforesaid: the Contractor shall immediately be notified thereof for taking necessary action provided that payment of indemnity shall not apply when such infringement has taken place in complying with the specific directions issued by the **BHEL** but the Contractors shall pay any royalties payable in respect of any such use.

11. Tax & Duties

BHEL will deduct all tax & duties for TDS of GST & IT

12. Royalties

Royalties fixed from time to time as per prevalent local rules will be recovered for materials, which the Contractor may be allowed to remove from quarries situated on land which is in charge of the BHEL authorities.

13. Plant & Equipment:

The Contractor shall at his own expense, supply all tools, plant and equipment (Herein after referred to as T&P) required for the execution of the contract.

14. Assignment of Transfer of Contract

The Contractor shall not without the prior written approval of the BHEL, assign or transfer the contract or any part thereof, or any share, or interest thereon to any other persons. No sum of money which may become payable under the contract shall be payable to any person, other than the contractor unless the prior written approval of the BHEL to the assignment or transfer of such money is given.

a. Sub-Contract
The Contractor shall not sub-let any portion of the contract without the prior written approval of the BHEL.

15. Compliance to Regulations and Bye-Laws

The Contractor shall confirm to the provisions of any statute relating to the work and regulations and Bye-Laws of any local authority. The Contractor shall be bound to give all notices required by statute regulations or By-Laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

CHAPTER -III

PERFORMANCE OF THE CONTRACT

16. Security deposit

a) The rate of Security Deposit (SD) will be 5% of the contract value.

b) 50% of the required Security Deposit, including the EMD, shall be collected before start of the work from the Contractor. Balance of the Security Deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected.

c) The security deposit may be furnished in any one of the following forms:

1) Local cheques of scheduled banks, subject to realization.

2) Pay order / Demand draft / Electronic fund transfer in favour of BHEL,

3) Bank guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.

4) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/c BHEL, duly discharged on the back and lieu marked by the bank in favor of BHEL.

5) Securities available from Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed / hypothecated / pledged in favour of BHEL and discharged on the back).

EMD of the successful tenderer can be converted and adjusted against the security deposit.
The security deposit shall not carry any interest.

(Note: Acceptance of security deposit against Serial No.4 & 5 above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However BHEL will not be liable or responsible in any manner for the collection of Interest or renewal of the documents or in any other matter connected therewith.)

Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract.

Security Deposit shall not carry any interest.

17. Orders Under the Contract

All orders, notices etc. to be given under the contract shall be in writing, type-script or printed and if sent by registered post to the address given in the tender of the Contract, shall be deemed to have been served on the date, when in the ordinary course they would have been delivered to him. The Contractor shall carry out without delay all orders given to him.

18. Admission to Site

The contractor shall not enter on (other than for inspection purposes) or take possession of the site unless permitted to do so by the Engineer-in-charge. The portions of the site to be occupied by the Contractor will be clearly defined and marked on the site plan, and the contractor will not be allowed to extend his operations beyond these areas The Contractor shall provide if necessary or required at the site, temporary access thereto and shall alter, modify and maintain the same as required from time to time. He shall clear away the access route when no longer required restoring th**e** area to its original condition.

The Engineer-in-Charge shall have power to execute other works (whether or not connected with the work, in the contract agreement) at the site contemporaneously with the execution of the original work and contractor shall give reasonable facilities for this purpose.

BHEL reserves the right of taking *over,* at any time, any portion of .the site which they may require and the contractor shall at his own expense clear such portion forthwith. No photographs of the site or of the work or any part there of shall be taken or published or otherwise circulated without the prior approval of the Engineer-in-charge.

No such approval shall however exempt the Contractor from complying with any statutory provision in regard to the taking and publication of such photographs.

BHEL Officials connected with the Contract shall have the right of entry to the site at all times.

Engineer-in-change shall have the power to exclude from the site any person whose admission there to may, in his opinion is undesirable for any reason whatsoever.

The Contract shall be governed by the security regulations of BHEL including the entry or exit timings as may be in force from time to time. The Contractor should follow these regulations strictly and no claims for any additional payment whatsoever will be entertained in this regard under any circumstances.

19. Contractor's Supervision

The Contractor shall either himself supervise the execution of the contract or shall appoint a competent agent acceptable to the DGM/CP&S to act in his stead.

Orders given to the Contractor's agent shall be considered to have the same force as if they have been given to the Contractor himself.

The Contractor or his accredited agent shall attend when required without making any claim for doing so, either the office of the DGM / Civil Projects & Services or the OFFICER-INCHARGE, to receive instructions.

The DGM/CP&S shall have full powers and without assigning any reason, require the Contractor to immediately cease to employ in connection with this contract, any agent, servant or employee where continued employment is, in his opinion undesirable. The Contractor shall not be allowed any compensation on this account.

20. Labour Laws

The Contractor shall remain liable for the payment of all wages and other statutory payments to his employees under the payment of Wages Act 1936, Workmen's Compensation Act 1923, Minimum Wages Act 1948, ESI Act 1948 and EPF & Miscellaneous Provisions Act, 1952 or any other Act or enactment, relating thereto and rules framed, thereunder from time to time.

21. Safety Rules

The Contractor shall comply with all safety rules of BHEL and deploy qualified safety Officer in full time at site works.

22. Water, Power, Compressor Air

The Contractor shall allow in his Tender and provide at his cost all water, power, compressed air required for the work or his employees on the work, together with all pipes and fittings or other means that may be necessary or required to ensure a proper and ample supply of water etc for all purposes connected with the work.

In the event of a provision existing in the Tender documents for supply of water, power and compressed air on payment by Bharat Heavy Electricals Limited, the same will be supplied from the BHEL supply system or other sources. at any points fixed by the Engineer-in-charge on the site of work, the contractor shall make necessary arrangement for lifting, pumping, carrying or Conveying the the same as .'required at his own cost. **The levy of charges to be borne by the contractor in such case shall be specifically mentioned in the tender documents.**

In the case of work to be carried at BHEL customer's site, the terms and conditions on the provision of power, water and compressed air will be subjected to BHEL contract with customer and tender conditions.

23.Temporary workshops, Stores Etc.,

The Contract shall, during the progress of the work provide, erect and maintain at his own expense all necessary temporary workshops. Offices etc., required for the proper and efficient execution of the work. The planning, and erection of these buildings shall have the approval of the Engineer-in-charge and the Contractor shall at times keep them tidy and in a clean and sanitary condition to the entire satisfaction of the Engineer- in -charge.

On completion of the work all such temporary building shall be cleared away and the site restored and left in a dean and tidy condition to the entire satisfaction of the Engineer - in - charge.

24.Tools and Plant on site

All tools, plant and equipment brought to. the site shall not be removed from the site without the prior written approval or the Engineer-in-charge. When the work is finally completed or the contract is determined for reasons other than the default of the contractor he shall, forth with remove from the site all tool plant, equipment etc.. (other than those as may have been provided by BHEL)

25. Statements of Hire Charges

A monthly detailed statement of the hire charge incurred in respect of BHEL tools, plant, equipments etc. shall be given to the Contractor by the Engineer-in-charge.

26. Precautions Against Risks

The Contractor shall be responsible for providing at his own expense for all precautions to prevent loss or damage from any and all risks and to minimize the amount of any such loss or damage and for the necessary steps to be taken for the said purpose.

27. Notices and Fees

The Contractor shall give all notices required by any Statutory provision or by the regulations and for bye-laws of any Iocal / or of any same are or will be connected. The contractor shall pay and indemnify BHEL against any statutory fees and charges payable under such Acts, Regulation and / or bye-laws in respect of the work and shall make and supply all drawings and plans required in connection with any such notice.

28. Setting out of the works and Protective and Maintaining signals and works

The Engineer-in-charge shall supply dimensioned drawings, levels and other information necessary to enable the contractor to set out the work, the contractor shall at his own expense set accurately according to the drawings and figured dimension thereon, all the work comprised in the contract and any extras or additions there to and shall be solely responsible for their being so set out and executed.

All bench marks, pegs, signals on the surface alignment stones, milestones and all similar marks whether put in by BHEL Authorities for the purpose of checking the Contractor's work or in the nature of permanent survey marks will during the tenure of the contract, be under the care of the Contractor who shall at his own expense take all proper and reasonable precautions and care to preserve and maintain them in their true position. In the event of these marks being disturbed or obliterated by accident or due to any other cause whatsoever, the same may, if deemed necessary be replaced by the Engineer-in-charge at the Contractor's expense and the cost thereof be deducted from any money then or thereafter becoming due to the Contractor

Where requested by the Contractor, the level marks, centre line and chain age pegs corresponding to those shown on the Drawing will be pointed out to the Contractor on the ground but all bench marks or chain age pegs additional to those shown on the Drawing will be set out by BHEL authorities.

29. Site Drainage

All water that may accumulate on the site during the progress of the work, or in trenches and excavations shall be removed to the entire satisfaction of the Engineer-in-charge and at Contractor's expense.

30. Excavation, Relics, etc.

Materials of any kind obtained from excavation on the site shall remain the property of BHEL and shall be disposed off as Engineer-in-charge directions.

All gold, silver, oil and other minerals of any description and all precious stones coins treasures, relice, antiquities and other similar items which may be found in or. upon the site shall be the property of Bharat Heavy Electrical Limited and the contractors shall duly preserve the same to the satisfaction of the BHEL and shall from time to time deliver the same to such person or persons as the BHEL may appoint to receive the same.

31. Foundations

The Contractor shall not lay any, foundations until the excavations for the same have been examined and approved in writing by the Engineer - in-charge.

32. Covering in work

The Contractor shall give reasonable notice in writing to the Engineer - in-charge whenever any work is to be permanently covered up or concealed, whether by earth or other means so that it can finally be inspected or measured, if necessary. In default of so doing, the Contractor shall if required by the Engineer-in-charge un-cover such work at his own expense.

33. Approval of Works by Stages

All work embracing more than one process shall be subject to examination and approval at each stage thereof and the Contractor shall give due notice in writing to the Engineer-in-charge when each stage is ready. In default of such notice being received, the Engineer-in-charge shall be entitled to approve the quality and extent thereof at any time he may choose and in the event of any dispute, the decision of the Engineer-in-change thereon shall be final conclusive.

34. Execution of the work

The work shall be executed in a workman like manner and to the satisfaction in all respects of the Engineer-in-charge.

The Engineer-in-charge will communicate or confirm his instructions to the Contractor in respect of the execution of the works in a "**Work Site Order Book**" maintained at his office and the Contractor shall visit this office daily and shall confirm receipt of such instruction by signing the relevant entries in this book. Such entries will rank as order to notices in writing the intent and meaning of these conditions.

35. Day Work

No ‘day – work’ shall be performed without the prior written instructions of the Accepting Officer.

The Contractor shall give to the Engineer-in-charge reasonable notice of the start of any work ordered to be executed by day-work and shall deliver to the Engineer-in-charge within two days of the end of each pay week a return in duplicate giving full detailed accounts of labour and materials for the pay week. One copy of each of these returns, if found correct will be certified by the Engineer-in-charge and returned to the Contractor and must be produced at the time of adjustment of accounts.

An Invoice in duplicate signed by the Contractor or his agent shall be sent with each delivery of materials for day-work and the Contractor will be furnished with receipt signed by the Engineer-in-charge specifying the description, quantities, weight or measurement (as the case may be) of the articles approved, reference will made in this receipt in the return aforesaid and the Contractor's Bill.

In the case of Lump sum Contracts, the rates to be charged and the percentage addition for profit and establishment charges etc. will be agreed upon between the Accepting Officer and the Contractor prior to the execution of the work.

36. Inspection of the Work

BHEL Officers concerned with the contract shall have power at any time to inspect and examine any part of the work and the Contractor shall give such facilities as may be required to be given for such inspection and examination.

Should Engineer-in-charge consider, at any time during the expiry of the maintenance period, that any work has been executed with unsound, imperfect or unskilled workmanship or of a quality inferior to that contracted for or not otherwise in accordance with the contract (in respect}. Where of the decision of the Engineer-in-charge shall by final and conclusive the contractor shall, on demand in writing from the Engineer-in-charge specifying the fault not withstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or removed and reconstruct the work so specified in whole or in part a& the case may require at his own expense to the entire satisfaction of the Engineer-in-charge and in the event of his failing to do so within a period lo be specified by the Engineer-in-charge in his demand as aforesaid, the Engineer-in-charge whose decision shall be final and binding may carry out the work by other means at the risk and expense in all respects of the Contractor. However, the liability of the Contractor under this condition shall not extend beyond the maintenance period except as regards workmanship which the Engineer-in-charge shall have previously given notice to the Contractor to rectify.

37. Responsibility for Building

In the event of any building or part of any building being handed over to the' Contractor for the execution of work there to under the provisions of the Contract he shall give a written receipt for all fixtures, glass etc., and he shall be required to make good at his own expense all damages resulting from the cause whatsoever while in his charge and on completion of the work to deliver the said building or part thereof in a clean state complete in every particular to the entire satisfaction of the. Engineer-in-charge.

38. Insurance

The contractor shall, within one month after the date of acceptance of the contract, insure the work on **"all risks" basis** against loss and damage by fire, tempest, floods, earthquake, riots, strike and against damage by aircraft with an insurance office approved by the accepting officer, from the date of acceptance of work or actual commencement of work whichever is earlier. Such insurance shall be effected in the name of BHEL and shall be for the full value of the contract sum. The contractor shall lodge with BHEL the policies and receipts of the premiums for such insurance and shall maintain such policies in force until the entire completion of the work as certified by the Engineer-in-charge. The cover shall also include whenever necessary the risks of testing including breakdown or explosion or plant and machinery undergoing testing, trial and commissioning operations. The insurance shall also specifically cover removal of debris cost. The sum Insured shall represent the estimated full value of the contract work inclusive of value of free supply materials by BHEL, transport charges, customs dues, express freight, overtime charges, cost of erection, value of constructional plants and machinery; removal of the debris and excavation of costs. Where the contract includes a maintenance period, the Insurance cover shall specifically include the Contractor's liabilities during the maintenance period. The insurance shall also be extended to cover third party personal injury and property damage for a sum to be specified by BHEL.

If the contractor fails to comply with the terms of this condition, the accepting officer may insure the work and may deduct the amount of premiums from any money that may become payable to the contractor or may at his discretion refuse payment of any advance payment to the contractor until the contractor shall have complied with the terms of this condition.

Such insurance whether effected by the Accepting officer or the Contractor shall not be a limit or bar to the liability and obligation of the contractor to complete the entire work in all respects as certified by the Engineer-in-charge.
In case of such a loss or damage as aforesaid, the money payable under any such insurance shall be received and may be retained by BHEL until the work is finally completed and shall then be credited to the contractor in the final statement of accounts in the event of the contract not having been previously cancelled under these conditions, after taking into account the delay in completion, settlement to his workers for damages, damage to BHEL's property etc.

39. Damage & Loss to Private Property & Injury to Workmen

The Contractor shall at his own expense reinstate and make good to the satisfaction of the DGM/CP&S and pay compensation for any injury, loss or damage occurred to any property or rights whatever including property and rights of BHEL (or agents) servants or employee of BHEL, the injury loss or damage arising out of or in any way in connection with the execution or purported execution of the contract and further the contractor shall indemnify, the BHEL against all claims enforceable against BHEL (or any agent, servant or employee of BHEL) or which would be so enforceable against BHEL where BHEL is a private person, in respect of any such injury (including injury resulting in death) loss or damage to any person whomsoever or property including all claims which may arise under the Workmen's Compensation Act or otherwise.

40. Completion:

The works shall completed to the entire satisfaction of the Engineer - in -charge and in accordance with the Contractor's forecast of Time and progress where operative, and all unused stores and materials, tools, plants equipment, temporary Building and things shall be removed from the site and work cleared of rubbish and all waste materials and leveled up clean and tidy to the satisfaction of the Engineer-in-charge at the Contractor's expense and/or before the Schedule date of completion.

The BHEL shall have power to take over from the Contractor from time to time such sections of the Work as have been completed to the satisfaction of the Engineer-in-charge. I n such an event, the contractor is not entitled for any extension of time or any other compensation for executing the balance work In case the Contractor fails to remove any of his properties, assets or fails to clear the rubbish and waste materials within 30 days of the completion of the contract, it is lawful for the contracted, that is BHEL to take such action as it deems fit to clear, dispose of such properties, assets or such waste materials and charge the Contractor any expenses Incurred thereon.

The Engineer-in-charge shall certify to the Contractor the date on which the work is completed and the state thereof.

The Engineer-in-charge shall also certify to the Contractor the state of the work at the end of maintenance period, where applicable.

41. Compensation for delay

If the Contractor fails to maintain the required progress in terms of condition 7 or to complete the work and clear the site on or before the contracted or extended period of completion, he shall, without prejudice to any other right or remedy of the BHEL on account of such breach pay as agreed compensation an amount calculated as stipulated below or such smaller amount as may be fixed by the BHEL on the contract value of the work for every week that the progress remains below that specified in condition 7 or that the work remains incomplete.

This will also be applicable to items or groups of items for which separate period of completion has been specified.

For the purpose term "Contract Value" shall be the value at contract rates of the work or ordered,

a) Completion period (as originally stipulated) not exceeding 6 months	at 1 percent per week
b} Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 Years	at ½ percent per week
c) Completion period (as originally stipulated) exceeding 2 years	at ¼% percent per week

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed the under noted percentage of the contract value or of the item or group of items of work for which a separate period of completion is given

a) Completion period *(as* originally stipulated) not exceeding 6 months	10 percent
b) Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 Years	7½ percent
c) Completion period (as originally stipulated) exceeding 2 years	5 percent

The amount of compensation may be adjusted or set-off against any sum payable to the contractor under this or any other contract with the BHEL.

Over run charges: Notwithstanding anything contrary. BHEL shall not be liable over run charges for any reason whatsoever.

42. Laws Governing the Contract

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

43. Cancellation of Contract for Corrupt Acts

BHEL, whose decision shall be final and conclusive, shall without prejudice to any other right or remedy which shall have accrued shall accrue thereafter to BHEL cancel the contract in any of the following cases and the Contractor shall be liable to make payment to BHEL for any loss or damage resulting from any such cancellation to the same extend as provided in the case of cancellation for default.

If the Contractor shall: -

a) Offer or give or agree to give to any person in BHEL service any gift or consideration of any kind, as an inducement or reward for doing or for bearing to do or for having done or for borne to do any act, in relation to the obtaining or execution of this or any other contract for BHEL service,

OR

b) enter in to a contract with BHEL in connection with which commission has been paid or agreed to be paid by him or with his knowledge, unless the particulars of any such commission and the terms of payment thereof have previously been disclosed in writing to BHEL,

OR

c) Obtain a contract with BHEL as a result of ring tendering or by non-bonafide methods of competitive tendering, without first disclosing the fact in writing to BHEL.

44. Risk Purchase Clause

If the contractor fails to carry out the specified works as per the contract scope of work within the timeframe as directed by DGM/CP&S or his authorized officials and continues in that state after a reasonable notice from DGM/CP&S or his authorized officials, BHEL reserves the right to have the work done by any means at the Contractor's risk and expenses provided always that in the event of the cost of the work so done (as certified by DGM/CP&S which is final and conclusive) being less than the contract cost, the advantage shall accrue to the BHEL and if the cost exceeds the money due to Contractor under the contract, the Contractor shall either pay the excess amount ordered by DGM/CP&S or the same shall be recovered from the Contractor by other means.

45. Cancellation of Contract for Insolvency Assignment of Transfer of Sub-Letting of Contract

BHEL, without prejudice to any other right or remedy, which shall have accrued or shall accrue thereafter to BHEL, shall cancel the contract in any of the following cases:

If the Contractor,

a) being an individual or if a firm any partner thereof shall at any time be adjudged bankrupt or have a receiving order for administration of his estate, made against him or shall take any proceedings for liquidation or composition under any bankruptcy Act or assignment of his effects of composition or arrangement for the benefit of his creditors or purport to do so, or if any application made under any Bankruptcy Act for the time being in force for the sequestration of his estate or if a trust deed be granted by him on behalf of his creditors

OR

b) being a Company, shall pass a resolution or the Court shall make an order for the liquidation of its affairs, or a receiver or Manager on-behalf of the debenture holders shall be appointed or circumstances shall arise which entitle the Court or debenture holders to appoint a receiver or Manager,

OR

c) Assigns, Transfers, Sub-lets or attempts to assign, transfer or sub-let any portion of the work without the prior written approval of the BHEL.

d) Whenever BHEL exercise the authority to cancel the contract under this conditions, BHEL may have the work done by any means at the Contractor's risks and expenses provided always that in the event of the cost of the work so done (as certified by DGM/CP&S which is final and conclusive) being less than the contract cost, the advantage shall accrue to the BHEL and if the cost exceeds the money due to Contractor under the contract, the Contractor shall either pay the excess amount ordered by DGM/CP&S or the same shall be recovered from the Contractor by other means.

e) In case BHEL carries-out the work under the provisions of this condition the cost to be taken into account in determining the excess cost to be charged to the Contractor under this condition shall consist of the cost of the materials, hire charges of tools and plants and/or labour provided by the BHEL with an addition of such percentage to cover superintendence and establishment charges as may be decided by the DGM/CP&S whose decision shall be final and conclusive.

46. Cancellation of Contract in Part or Full for Contractor's Default

If the Contractor:

a) makes default in carrying out the work as directed and continues in that state after a reasonable notice from DGM/CP&S or his authorized representative;

b) fails to comply with any of the Terms and Conditions of the contract or after reasonable notice in writing with orders properly issued thereunder;

c) BHEL, may without prejudice to any other right or remedy which shall have accrued or shall accrue thereafter to BHEL CANCEL the contract as whole or in part thereof or only such work order or items of work in default from the contract. Whenever BHEL exercise the authority to cancel the contract as whole or part under this condition BHEL may complete the work at the contractor's risk and cost (as certified by DGM/Stores which is final and conclusive) being less than the contract cost, the advantage shall accrue to the BHEL. If the cost exceeds the moneys due to the Contractor under this contract the Contractor shall either pay the excess amount ordered by DGM/CP&S or the same shall be recovered from the Contractor by other means. In case the BHEL carries out the work or any part thereof under the provisions of the conditions the cost to be taken into account in determining the excess cost to be charged to the Contractor under this condition shall consist of the cost of the materials, hire charges of tools and plant and/or labour provided by the BHEL with an addition of such percentage to cover the superintendence and establishment charges as may be decided by the DGM/CP&S whose decision shall be final and conclusive.

47. Termination of Contract on Death of contractor

Without prejudice to any of the rights or remedies under this contract, if the Contractor dies, or if the firm is dissolved or the company is liquidated BHEL shall have the option of terminating the contract without compensation to the Contractor.

48. Special powers of Determination

If at any time after the award of contract, BHEL shall for any reason whatsoever not require whole or any part of the work to be carried out the DGM/CP&S shall give notice in writing of the fact to the Contractor who shall have no claim to any payment of compensation or otherwise howsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of the fore-closing of the work.

He shall be paid at contract rates for the full amount of the executed including such additional works, e, g. clearing of site, etc., as may be rendered necessary by the said foreclosing**. *He shall also be allowed a reasonable payment (as* decided by the Accepting office)** for any expenses sustained on account of labour and 'materials collected but which could not be utilized on the work, as verified by the Engineer-in-charge. Neither shall the contractor have any claim for compensation on account of any alterations have been made fn the original specifications, drawings, designs and instructions, involving any curtailment of the work as original contemplated.

“If any employee / labourer working in the contract is found involved in corruption activities, the contract will be terminated and the contractor will be banned for applying for any future contract for 3 years.”

CHAPTER - IV

VALUATION AND PAYMENT

49. Records and Measurements

All items having a financial value shall be entered in the BHEL Measurement Book (MB)so that a complete record is obtained of all works performed under the contract. Buildings, etc., priced in schedule 'A' as a unit Lump-sum will be entered by number at the unit Lump-sum.

Work carried out for agreed Lump-sum will be described and similarly recorded

Lump-sum omissions will be entered for deduction. Measurement shall be restricted to that required to ascertain the financial liability of BHEL "under the contract"

Work, which fails to be measured in detail shall be measured physically, without reference to any local custom that may obtain excepting where it may otherwise be directed in the tender documents. The measurements **shall be taken jointly** by any person duly authorized on the part of the BHEL and-by the contractor.

The engineer -in-charge shall give reasonable notice in writing to the contractor the date of appointment of measurement.

The contractor shall without, extra charge, provide assistance with appliance and other things necessary for-measurement.

The contractor shall bear all the cost of measurements of his work.

Measurements shall be entered in the BHEL measurement book and signed and dated by both parties each day at the site, on completion of measurement. If the contractor objects to any of the measurements recorded on behalf of the BHEL, a note to that effect to be made in the BHEL measurement book or against the item or items objected to; and such note shall be signed and dated by both the parties' engaged in taking the measurement.

If as a result of such objection, it becomes necessary to re-measure the work wholly or impart the expense of such measurement shall be borne by the party requiring the measurement.

Measurement to be re-taken provided that a net error is found by this re measurement to amount to less than 5% (Five percent) of the value as-recorded by the first measurement .But where the net errors amount to 5% and over of the said value then the cost is to be borne by the other party. In any case if the net value of errors found exceeded to Rs. 500 the expense or re-measurement is said to be borne by th other party. If the contractor's representative fails to attend when required, the Engineer-in-charge shall have power to proceed by himself to take measurement and in that case those measurements shall be considered as accepted by the contractor as final. The contractor shall, once in every month submit to the engineer-in-charge with a copy to the Accepting officer details, of his claims for the work done by him up to and including the previous month, which are covered by his contract agreement in any of the following respects.

a) Deviation from the items and specifications provided in the contract documents.

b) Extra Items / Items of work,

c) Quantities in excess of those provided in the contract schedule.

d) Items in respect of which rates have not been settled. He should, in addition furnish a clear certificate to the effect **that** the claims submitted by him as aforesaid cover all his claims and that no further claims shall be raised by him in respect of work done up to and including the period under report.

Except where any general to detailed description of the work in quantities expressly shows to contrary, schedule of quantities shall be deemed to have been prepared and measurements shall be taken in accordance with the procedure set forth in the schedule of rates specification not withstanding any provision in the relevant standard method of measurement or any general or local custom. In the case of items which are not covered by the schedule of rates / specification, measurement shalll be taken in accordance with relevant standard method of measurement issued by the Indian Standard institution or as per Standard engineering practice,

50. Valuation of Deviations

Rates for deviated items of work will be fixed as follows:

1. For any item of work required to be carried out after the contract has been awarded and which is not covered by Contractor's Schedule but is covered by B.H.E.L schedule of Rates the payable for such a fresh item will be derived from B.H.E.L. Schedule by the method of proportion as follows:

a) In the same proportion to the BHEL Schedule of rates as the tendered rate for the nearest analogous item of work in contractor's schedule bears to rate for the particular analogous item of work in BHEL schedule of rates. However in case of nearest analogous item of work in contract schedule forms part of individual chapter of the BHEL schedule of rates the above proportion will be worked out only for such items which are found both in contract schedule and BHEL Schedule of rates as group of items under the chapter.

b) If a single appropriate analogous item of work is not available in both schedule (contractor's and BHEL schedule) then the method of proportion will be applied to the nearest analogous group items available in both the schedule referred to i,e., in the same proportion as the total tendered cost of that particular group of item (the sum of the products of the tendered rates and the quantities for which orders are placed) bears to the total cost of the same items and quantities and BHEL Schedule of Rates.

c) If even an appropriate analogous group of items is not available in contractor's schedule and BHEL Schedule, then the methods of proportion will be applied to all those items of the whole work, which are available in both the schedule and for which orders have been placed on the contractor i. e., in the same proportion as the total cost of all these items of work (the work of the products of the tendered rates and the quantities for which order are placed) bears to the total cost of the same items and quantities all the BHEL schedule of rates.

The selection of analogous items or analogous group of items referred to above shall be done by the Engineer-in-charge. Where the rates for deviated items or new items of work car be derived by the selection of different analogous items or analogous group of items, the lowest of all such derived rates shall be taken as the correct rate.

In the case of the contracts for which the Engineer-in-charge is the Accepting officer ail disputes regarding the settlement of rates of deviated or new items or work shall be referred to the Head of Civil Engineering Department whose decision shall be final and conclusive as the case may be.

II. If any work not covered by any of the foregoing is ordered of the contractor, the basis of payment shall be decided by the Accepting Officer whose decision shall be final and conclusive and binding en the parties.

51. Reimbursement / Refund on Variation in Price, Materials

If after submission of the tender and / or during the progress of the works, the price of any material (not being a material supplied from the BHEL store in accordance with the conditions of the contract) is increased or decreased by an Act of Legislature (central or state)and / or any notification there under or on account of new duties or levies such as Octroi or on account of increase or decrease in such duties affecting the price of materials required for incorporation in the works and made from materials of which the price has increased or decreased as aforesaid and the contractor has thereupon to pay in respect of such material or item, a price which is higher or lower than the price of that material or item as prevailing immediacy before the passing of such act or levying, increasing / decreasing of such duty, then BHEL shall increase in price or the duly reimbursed to the contractor the increase in price *at* additional or increased duty paid by the contractor and in case of decrease in price the BHEL shall be entitled to a refund of the reduction in the price or the reduction in duty. **This will be applicable only for material, which are directly incorporated on the work**, the contractor shall however indicate the assumption he has made while submitting the tender. However no reimbursement or refund shall be made if the increase / decrease is not more than + 10% of the said price, and if so the reimbursement or refund shall be made only / on the excess over + 10% provided always that any such increase shall not be payable if, in the opinion of the Accepting officer (whose decision shall be final and conclusive) the increase is attributable to the delay in the execution of the contract with the control of the contractor or that any such Increase has become operative after the contracted/ or extended dated of completion of the works or items of work in question.

The Contractor shall, for the purpose of this condition, keep such books of account and other document as are necessary to show the amount of any increase claimed or any reduction available and shall allow inspection of the same by any duly authorized representative of the BHEL and further shall at the request of the Engineer-in-charge furnish for verification such other information as the Engineer-in-charge may require.

The Contractor shall within a reasonable time of his becoming, aware of any alteration in the prices of any such materials give notice thereof in writing to-the Engineer-in-charge stating that the rate is submitted in pursuance to this condition together with all information relating thereto which he may be in a position to supply.

Except for the variation in prices as aforesaid, the contract price shall remain fixed during the tenure of the contract, unless specifically provided for in the special conditions of the contract.

52. Advance on account

No payment shall be made for work estimated to cost less than Rupees ONE THOUSAND till after the whole of the work shall have been completed and a certificate of completion given by the Competent authority.

In the case of work estimated to cost more than Rupees FIVE THOUSAND the contractor may at intervals of not less than one month or as otherwise provided for in the Contract documents, counting from the date on which order to commence work is given by Engineer-in-charge submit claims on BHEL forms for payment of advances on account of work done and of materials delivered in connection with the Contract.

The Contractor shall be paid in respect of such claims to the extent approved and passed by the Engineer-in-charge subject to a maximum of 90% of the value of the work actually executed to the satisfaction of the Engineer-in-charge. The certificate of the Engineer-in-charge regarding such approval and passing of the sums so payable shall be final and conclusive against the contractor.

Notes:

"After the full amount of Security Deposit is made up through the 10% deduction from On account bills, 100% payment of all subsequent bills may be made to the contractor, subject to statutory deductions

The Contractor may also be paid during the progress of the work 75% of the value of any materials which are in the opinion *of* the Engineer-in-charge in accordance with the Contract, and are actually required for incorporation in the work and which have reasonably been brought to the site in connection there with and are adequately stored and or protected against damage by weather or other, causes, but which have not at the time of payment of the advance been incorporated the work on furnishing a formal **hypothecation deed**. Payment of such advances, however shall be purely at the discretion of the Accepting Officer provided always that payment shall not be made under these periodical certificate in respect of perishable materials like lime, cement, timer, sand, kankar, etc.

Any sums, due from the Contractor on account of Tools and Plant, stores or any other items provided by BHEL shall be deducted from the respective advances. The Engineer-in-charge shall from time *to* time certify the sums payable to the Contractor after retaining the reserves.

Any certificate relating to work done or materials delivered may be modified *or* corrected by any subsequent interim certificate or by the final certificate of the Engineer-in-charge supporting an advance payment shall itself be conclusive evidence that any work or materials it relates are in accordance with the contract. All such intermediate payments shall be regarded as advance against the final payment only and shall not be considered an admission of the performance of the contract or any part thereof in any respect or the accruing of any claim whatsoever.

Such intermediate payment shall not conclude, determine or affect in any way the powers of the Engineer-in-charge as to the final settlement and adjustment of the account or otherwise or in any way vary or affect the contract.

53. Final Bill

As soon as possible after the completion of the work to the satisfaction of the Engineer-in-charge, the contractor shall forward a certified final account on BHEL forms, in duplicate.

It shall be accompanied by all abstracts, vouchers, etc, in support there of add shall be prepared in the manner prescribed by the Engineer-in-charge.

No claims will be entertained after the receipt of the final bill.

The Final bill is to be submitted within 90 days of completion of work or within the time period extended by the Officer –In-Charge. No claim of any nature will be entertained thereafter.
The Contractor shall be entitled to be paid the final sum less the value of payments already made on account, subject to certification of the final bill by the Engineer-in-charge. Any sums due from the Contractor on account of Tool and Plant, Stores or any other items provided by BHEL not yet recovered from the contractor shall be deducted from the final sum aforesaid.
No charge shall be allowed to the Contractor on account of the preparation of the final bill.

54. Submission of Bills by Contractor

The Contractor at the end of each month shall submit a bill in triplicate detailing the various items of work done during the month supported by the requisitions issued from time to time. The Contractor shall, once in every month, submit to the DGM/CP&S separately details of his claims for the work done by him up to and including the previous month which are not covered by his contract agreement in any of the following respects:

a) Deviation from the items provided in the contract documents.

b) Extra items / new items of work.

c) Items in-respect of which rates have not been settled. He should in addition furnish a clear certificate to the effect that the claims submitted by him as aforesaid cover all his claims and that no further claims shall be raised by him in respect of the work done up to and including the period under report.

55. Payment of Bills

All payments to be made to the Contractor, under this contract shall be by "CHEQUE" crossed "A/C PAYEE ONLY" OR by NEFT / RTGS payment within a reasonable time after the certification of bills by DGM/CP&S.

56. Recovery from Contractor

Whenever under the contract, any sum of money, shall be recoverable from or payable by the Contractors, the same may be deducted from or any sum then due or which at any time thereafter may become due to Contractor under the contract or under any other contract with BHEL or from his Security Deposit or he shall pay the claim on demand.

57. Post Technical Audit of Work and Bills

BHEL reserves the right to carry out the post-payment Audit and technical examination of the work and final bill including all supporting vouchers, abstracts etc., and enforce recovery of any sum becoming due as a result thereof in the manner provided in the presiding sub-paragraphs. However, no such recovery shall be enforced after three years of passing the final bill.

58. Refund of Security Deposit

The Security Deposit mentioned in condition 16 above may be refunded to the Contractor after a period of one month on termination or expiry of the contract provided always that the Contractor shall first have been paid the last and final bill and have rendered a "NO DEMAND CERTIFICATE".

59. Force Majeure Clause

If, at any time during the continuance of this Contract the performance in whole or in part by either party of any obligations under this Contract shall be prevented or delayed by reason of any War, Hostile acts of the public enemy Civil Commotion, Epidemics, or Acts of God (Floods, Storm/Cyclone, Hurricane, Earth Quake etc.) then provided notice of happening of any such event is given by either party to other within 7 days from the date of occurrence therefor neither party shall by reason of such event be entitled to terminate this Contract nor shall either party have any claim for damages against the other in respect of such non-performance and delay in performance under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist. If the performance in whole or part of any obligation under this Contract is prevented or delayed by reason of any such event, claims for extension of time shall be granted for periods considered reasonable by the DGM/CP&S subject to prompt notification by the contractor. However, Force Majeure shall not include the following circumstances:

a. mechanical breakdown of equipments of the Contractor of whatsoever kind not resulting itself from an event of Force Majeure;
b. Financial distress of Contractor or its subcontractor, lack of funds or the inability of the Contractor to make payments in the manner specified herein;
c. inclement weather;
d. any event or circumstance that makes performance by the Contractor merely uneconomic or commercially impracticable including without limitation due to recession, depression, inflation, deflation, tax rate or law changes, exchange rate fluctuations, or changes in prices;
e. any act or omission or default on the part of a subcontractor or a vendor that is not itself attributable to an event of Force Majeure (as defined herein); and
f. the imposition of sanctions by any governmental authority due primarily to the failure of the Contractor to comply with any Applicable Laws.

60. Conciliation

The Parties agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract or the Memorandum of Understanding (delete whichever is inapplicable), which the Parties are unable to settle mutually), arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.
Notes:
1.No serving or a retired employee of BHEL/ Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
2.Any other person{s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.
The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and the rules as provided at http://www.bhel.com/pdf/Brief_Procedure_under_BHEL_Conciliation_Scheme-06-10-18.pdf
("Conciliation Rules").
The Conciliation Rules together with it's Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC.
The Contractor agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Conciliation Rules to this GCC from time to time and confirms that it shall be bound by such amended or modified provisions of the Conciliation Rules with effect from the date as intimated by BHEL to it.

61. Arbitration

All disputes between the parties to the contract, arising out-of or relating to the contract, other than those for which the decision of the DGM/CP&S or Accepting Officer or any other person is by the contract expressed to be final and conclusive shall after written notice by either party to the contract to the other party be referred to the Arbitration by a sole Arbitrator to be appointed by the Unit Head of BHEL Ranipet.

Unless the parties otherwise agree, such reference shall not take place until after the completion, alleged completion or abandonment of the work or the determination of the contract.

The place of Arbitration shall be Ranipet. The venue of Arbitration may be at such a place or places as may be fixed by the Arbitrator in his sole discretion. The award of the Arbitrator shall be final, conclusive and binding on both parties to the contract.

The Contractor agrees that no claim for interest or damages will be entertained or be payable by BHEL in respect of any money or balances or amounts of whatsoever nature which may be lying with BHEL owing to any disputes or differences between the parties irrespective of whether the same is decided by any authority to be paid or returned to the Contractor

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

62. Jurisdiction of Court

Subject to the provisions of the contract relating to arbitration, for the purpose of Court proceeding, if any, same shall be in the Court having jurisdiction over Ranipet - 632 406. (Vellore District, Tamilnadu).

63.Signing of Contract

Each contract document shall be signed by the Contractor with his usual signature. Contract by partnership of Hindu Joint Family firm, may be signed in the FIRM'S name by one of the Partners or the Karta or Manager as the case may be or by any other duly authorized representative followed by the name and designation of the persons so signing. Contracts by a Company shall be signed with the name of the Company by a person authorized in this behalf and a power of attorney or other satisfactory proof showing that the persons signing the Contract documents on behalf of the Company is duly authorized to do so, shall accompany the contract.

All statutory requirements under Minimum Wages Act,1948, Factories Act 1948, Workmen Compensation Act 1923,Employees Provident Fund and Miscellaneous Provisions Act, 1952,Payment of Gratuity Act 1972, Employee State Insurance Act 1948, Contract Labour (R&A) Act 1970, Payment of Bonus Act 1965, Income Tax Act, Goods and Services Tax Act and all other applicable Acts shall be complied with by the Contractor.

Contractor shall comply with all statutory requirements, rules, regulations, notifications in relation to employment of his employees issued from time to time by the concerned authorities.

Contractor shall indemnify BHEL against all claims and losses under various Labour Laws, statutes or any civil or criminal law in connection with employees deployed by him.

Contractor wherever applicable shall maintain proper records prescribed by the concerned statutory authorities and provides a copy of the same to BHEL.

Contractor shall furnish proper returns to the concerned statutory authorities and provide a copy of the same to BHEL.

Without prejudice to any other right of BHEL, BHEL shall have the right to recover any money which in the sole opinion of BHEL is due from the Contractor from any money due to the Contractor under this Contract or any other contract or from the Security Deposit furnished by the Contractor under this Contract or any other contract.

No interest shall be payable by BHEL on Earnest Money or Security Deposit, if applicable, or any money due to the Contractor by BHEL

For every month, the Contractor shall prepare and submit bills in the succeeding the month within one week from the date of certification of quantity by user department.

Any billing related to query, clarification, document requirement, etc., shall be resolved in one go by the Contractor within one week from the date of intimation.

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64. Health, Safety & Environment Policy

In BHEL, Health, Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with, community and environment. BHEL believes in zero tolerance for unsafe work/non-conference to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulation and BHEL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce / Recycle / Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination / substitution / reduction / control.
- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and selection of plants, technologies and services.
- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, contractors and suppliers on HSE issues.
- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- Communicating this policy within BHEL and making it available to interested parties.

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Annexure – V

TERMS AND CONDITIONS REGARDING COMPLIANCE WITH VARIOUS LABOUR LAWS BY THE CONTRACTORS FOR BHEL

1. The contractor shall employ labour in sufficient numbers to maintain the required date of progress and of quality to ensure workmanship to the degree specified in the contract and to the satisfaction of the Engineer – in – charge.

2. The Contractor shall pay to labour employed by him, wages not less than Minimum wages, as per Tamil Nadu Minimum Wages Act.

3. The Contractor shall in respect of labour employed by him, comply with contractor's labour Regulations in regard to all matters provided therein.

4. The Contractor shall apply to the ESI Authorities, get himself registered with them and obtain a code Number. He shall pay the remittances under his Code Number only.

5. The Contractor shall be liable to his contribution and the employee's contribution towards PF as per Provident Fund Rules and Regulations, in respect of all labour employed by him for the execution of the contract. The Contractor shall apply to the PF Authorities, get himself registered and obtain a code number from them. He shall pay the remittances towards PF under his code number only.

6. The Engineer-in-charge shall, on a report having been made by an Inspecting Officer as defined in the Contract Labour Act, have the power to deduct from the moneys due to the contractor any sum required or estimated to be required, for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of workers, non-payment of wages or of deductions made a from his or their wages which are not justified by the terms of the Contract of non-observance of the said Contractor's Labour Regulations.

7. The Contractor shall indemnify BHEL against any payment to be made under and for observance of the Regulations aforesaid without prejudice to his right to claim indemnity from his sub-contractors.

8. In the event of the Contractor committing a default or breach of any of the provisions of the aforesaid contract Labour Act, as amended from time to time or furnishing any information or submitting or filling any form / Register / Slip under the provisions of these Regulations which is materially incorrect, then, on the report of the Inspecting Officers as defined in the Contract Labour Regulations, the Contractor shall without prejudice to any other liability pay to BHEL a sum not exceeding Rs. 50/- as liquidated damages for every default, breach, or furnishing, making, submitting, filling materially incorrect statements as may be fixed by the Engineer-in-charge and in the event of the contractor's default continuing in this respect, the liquidated damages may be enhanced to Rs. 50/- per day for each day of default subject to a maximum percent of the estimated cost of works put to tender. The Contractor shall defend the case by himself any action brought in by such Government Agencies for non-compliance of any Labour Regulations and / or reimburse the expenses incurred by BHEL in this regard.

9. The Engineer-in-charge shall deduct such amount from bills or security deposit of the Contractor and credit the same to the welfare fund constituted under Regulations. The decisions of the Engineer-in-charge in this respect shall be final and binding.

10. The contractor shall not employ in connection with the work any person who has not completed 18 years of age.

11. The contractor shall in respect of labour employed by him should comply with or cause to be complied with the following statutory provisions and rules and in regard to all matters provided therein.

    (a) The contract labour (Regulation and abolition Act 1970) and the related Tamilnadu Rules.

    (b) The minimum wages Act1948 and the related Tamilnadu Rules.

    (c) The payment of wages act 1936 and the related Tamilnadu Rules.

    (d) The Factories Act 1948 and the related Tamilnadu Rules.

    (e) The Employees Provident Fund and Miscellaneous Provisions Act 1952.

    (f) The Employees State Insurance Act 1948.

    (g) The workmen's Compensation Act 1923.

    (h) The Industrial Dispute Act 1947.

    (i) Payment of Bonus Act and any other law or modifications to the above or there to the Rules made thereunder from time to time.

12. **REGISTRATION AND LICENSING**:

Every contractor shall register his/her name with the welfare section of BHEL before taking up the work awarded to him/her by giving the following information and getting a code number:

(a) The name of the contractor.
(b) Nature of contract work.
(c) Period of work.
(d) Number of maximum labour employed by him on any one day.
(e) License No. and date (applicable in case of contractors employing 20 or more worker)
(f) Whether enrolled for PF, ESI etc., and enrolment no. (contractor shall obtain their own PF code)

This information is called for the purpose of informing the inspector of Factories wherever they call for information regarding contracts.

13. The contractor employing 20 or more workmen is required to obtain license from the authorities (The Deputy Chief Inspector of Factories/Assistant Commissioner of Labour as the case may be). This license shall be amended and/or renewed wherever there is an increase in the workmen employed by him/her or in the event of contract being extended or renewed. The contractor shall inform the license number to the BHEL management before taking up the work.

14. The contractor (Licensed or unlicensed) shall promptly furnish every information and document required by BHEL authorities for the purpose of fulfilling their obligations as principal employer and/or occupier of the factory and shall render all necessary assistance for the same.

15. Notice of commencement of work to be submitted to ALC / Chennai before start of work in Form (VII).

16. The contractor shall get the contract labourers engaged by him/her insured under workmen's compensation policy.

17. The contractor shall ensure that all his workmen are covered under the Employees State Insurance Act and produce the registration number/enrolment number to the welfare section before executing the contract.

18. The contractor shall also ensure that all his/her workmen are covered under Employees Provident Fund and Misc. Provisions Act 1952.

19. <u>WAGES</u>

The tenderer has to ensure payment of Minimum Wages as per Tamil Nadu State Minimum Wages as applicable under law from time to time (Normally the revision will be with effect from 1st April of every year) for the employment in General Engineering & Fabrication Industry. In addition, the contractor has to pay BHEL Ad-hoc payment to the workers deployed in the work.

Description	For Unskilled Worker (Rs.)	For Semi skilled Worker (Fresh ITI) (Rs.)	Skilled Worker (ITI Holder with 3 years' Experience / Diploma Holder / BE Holder) (Rs.)
Basic Pay as on 01.04.2020	7,650 pm	7,950 pm	8,205 pm
Dearness allowance as on 01.04.2020	5,209 pm	5,209 pm	5,209 pm
BHEL Adhoc (2000 + 1200) per month	3,200 pm	3,700 pm	4,100 pm
Total wage per month	16,059 pm	16,859 pm	17,514 pm

Also the labourers shall be paid a minimum bonus as per the payment of Bonus Act 1965. The Contractor shall have to remit EPF & ESI contributions at the rates applicable under law to the authorities concerned for the total wages paid. The Statutory requirements like PF, ESI & OT will be applicable for BHEL Adhoc amount also. i.e. Wages of Rs.16059 / Rs.16859 / Rs. 17514 for USW / SSW / SW respectively.

20. Any increase in the minimum wages notified under TN Minimum Wages for the contract period will be borne by the contractor.

21. The Contractor shall fix wage periods in respect of which wages shall be payable. No wage period shall exceed one month.

22.The Contractor shall ensure payment of wages to the contract labour employed by him within three days from the end of wage period in case the wage period is one week or a fortnight and in all other cases before 10th day of the following month.

23. Payment to Contract workers shall be made through bank only.

24. A notice showing the wage period and the place and time of disbursement of wages shall be displayed at the work and a copy to be sent to the Welfare Department by the Contractor under acknowledgement.

25.Notices showing the rate of wages, weekly rest days, hours of work, wage period, date of payment

of wages, names and addresses of the Inspector having jurisdiction, the date of unpaid wages shall be displayed in Tamil and English in conspicuous places at the establishment and work at work site by the Contractor. The Contractor shall inform the BHEL Management every month the details of contract labour engaged for contract in this following form:

a. Serial Number.
b. Location.
c. Period of work.
d. No. of days worked.
e. No. of man worked.
f. Wages paid to workers.

The above statement shall be furnished to BHEL Management at the end of every month.

REGISTERS AND RECORDS AND COLLECTION OF STATISTICS

26.The following documents / formats under Contract Labour (Regulation & Abolition) Act 1970 and Central Rules thereunder shall be maintained by each contractor.

1. Form A – Employee Register
2. Form B – Wage Register
3. Form C – Register of Loan / Advance / Fine / Damage / Loss.
4. Form D – Register of Attendance.
5. Form E – Register of Leave / Rest / Compensatory off.
6. Employment Card
7. One-month notice of all the contract workmen before completion of work.

27.The Contractor shall display the abstract of the Contract Labour (Regulation & Abolition) Act and the Rules thereunder both in English and Tamil.

28. Annual Return to be submitted through Shram Suvidha Portal.

29.The Contractor shall submit the returns required under the Contract Labour (Regulation and Abolition) Act 1970 periodically to BHEL Management.

30.All the above registers and records shall be preserved in original for a period of three years. All the registers, records and notice maintained under the Act and rules shall be produced on demand by Inspector or any authority under the Act.

WORKING HOURS AND WORKING CONDITIONS

31.No worker shall be required or allowed to work on Sunday unless he has or will have a holiday on anyone of the three days before or after the said say.

32.The Contractor shall inform BHEL Management in the prescribed form details of the contract workers scheduled to work on Sunday, the way of rest and also indicate the substituted holiday in lieu thereof. This shall be intimated two days in advance before his workmen and booked for work Sunday.

33.The contract labour working for more than nine hours in any day or for more than 48 hours in any week shall be paid wages at the rate of twice the ordinary rate of twice the ordinary rate of wages in accordance with the provisions of Sections 59 of the Factories Act 1948.

34.The Contractor shall provide all safety devices and personal protective equipment to his workmen

at his own cost and shall ensure that his workmen wear / use such devices or equipment provided to them while doing the work and there should not be any relaxation on this.

35.The Contractor shall give four paid National Holidays to his workers, viz., 26th January, 1st May 15th August and 2nd October.

36.The Contractor shall ensure that his workmen vacate the premises after the shift is over.

37.The contractor shall give leave with wages to his/her workmen who have worked for a period of 240 days or more in the factory premises during a calendar year. This leave shall be allowed during the subsequent calendar year at the rate of one day for every 20 days or work performed by the worker during the previous calendar year. The worker whose service commences on a day other than the first of January shall be entitled to leave with wages at the above rate (one day for every 20 days or work) only if he had worked for a minimum of 2/3 of the total number of days in the reminder of the calendar year. This leave will be admissible only during the subsequent calendar year.

38.No woman worker shall be required or allowed to work in the Factory except between the hours of 6.00 A.M. and 7.00 P.M.

39.The Contractor shall comply with the provisions relating to Welfare and Health facilities as provided in the Contractor Labour (Regulation and Abolition) Act 1970 read with the Tamil Nadu Contract Labour Rules 1975.

NOTICE OF ACCIDENTS

40.Notwithstanding anything contrary to this, in the event of accident the contractor shall be required to fill injury report and submit the Engineer in charge immediately and ensure the compliances of ESI / workmen's compensation Act, Factories Act and Rules made there under. He shall also maintain a register of accident as per the Act.

41.The Contractor shall get the contract labour engaged by him insured under Workmen's Compensation policy from general should be for the entire period of Contract. The Contract shall comply with the provisions of the Workmen's Compensation Act 1923. (This should be read in conjunction with the provisions of ESI Act).

COVERAGE UNDER THE ESI ACT / PF AND MISCELLANEOUS PROVISIONS ACT

42.The contractor shall ensure that all his workmen are covered under the Employee's State Insurance Act and producer to BHEL such Registration Number / Enrolment Number before executing the contract work.

43.The Contractor shall regularly pay the amount of contribution. i.e., employer's contributions as well as employee's contribution pursuance of the above scheme in time. Contributions recovered from employee and contribution made by the contractor may be rounded to the higher multiples of five paise.

44.The Contractor shall take note of any amendment that may be brought forth in the above contribution rate and act accordingly.

45.The contractor shall ensure that his workmen are covered under the EPF & Miscellaneous Provisions Act 1952 and accordingly produce to the BHEL Management the registration / enrolment number before awarding of contract work. As per the existing provisions every worker shall be entitled and required to become a member of the fund. The employee's contribution will be recovered by the contractor from the wages of his workmen and the contractor should pay equal contribution. The contractor is also liable to pay any administrative charges in this behalf that may be decided

from time to time. It will be the responsibility of the contractor to ensure such contribution payable in respect of workmen employed through sub-contractors also.

46.The Contractor shall take note of any amendment in the rate of contribution payable under the scheme from time to time.

47.The Contractor shall with seven days of the close of every month submit to BHEL a statement showing the amount of contribution payable / paid for employees engaged by him or through him and shall also furnish to BHEL such information as Principal Employer is required to furnish under the provisions of the ESI Act and PF as well as the schemes made thereunder to the authorities concerned.

48.Whenever any sum of money is found to be recoverable from or payable by the contractor under the above Act, the sum shall be deducted from any sum that may be due or which at any time thereafter may become due to the Contractor under this contract or under any other contract or from his security deposit, the contractor shall immediately thereafter such further sums as may be required to replenish the shortage caused by such recoveries in amount of security deposit.

49.The Contractor shall abide by all the labour and other laws applicable to contract labour / worker under this contract and shall at all times keep BHEL indemnified against all loses, claims, prosecutions under any law.

50.In case of non-compliance of any of the provisions of the Acts and in case BHEL having complied with the same BHEL will be entitled to recover the same from the contractor / sub-contractor.

51 MODEL RULES FOR LABOUR WELFARE

The Contractor shall, at his own expense, comply with or cause to be complied with Model Rules for Labour Welfare as appended to these conditions or rules framed by Government from time to time, for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the works. In case the Contractor fails to make arrangements as aforesaid, the Engineer-in-charge shall be entitled to do so and recover the cost there from the contractor.

52 POLICE VERIFICATION

The Contractor shall obtain police verification of all his contract workers and submit the same to BHEL at the commencement of work. The Contractor shall not deploy any contract worker without such police verification.

ANNEXURE VI: GENERAL SAFETY PRECAUTION TO BE FOLLOWED AT WORK SITE DURING EXECUTION TO BE TAKEN BY THE CONTRACTORS

The Contractor must inspect the area of work to decide the safety precautions necessary for executing this contract. The following safety measures should be strictly adhered to during execution of works at sites.

1. Whenever people work at height more than six feet, platform shall be provided or the workers shall wear safety belt to avoid fall from the height.

2. Wherever any area declared as dangerous, the workers shall not be allowed to work till a written clearance is obtained from appropriate authorities.

3. No material of any kind shall be dropped or allowed to be dropped from any height.

4. Defective ladders shall not be used at all.

5. All excavations must be barricaded and red lamps must be provided.

6. No work should be taken up of execution inside shop floor / factory premises, without obtaining necessary work permit.

7. Providing helmet for high level work

8. All personal protective equipment conforms to standard specification as per the details given in the code of conduct.

9. The necessary safety equipment's such as gloves, boots, helmets etc. must be issued to the workmen and strictly to be used while carrying out the work.

10. Providing dust or fume respirator in places where dust and fume concentration exist.

11. Providing goggles and welding screens.

12. Providing acid and alkali – proof rubber gloves for handling acid and alkali and chemical which are corrosive.

13. Providing rubber gloves for working on electrical works.

14. All temporary electrical connections shall be properly earthed, insulated and periodically checked.

15. Inflammable materials shall not be stored near places where the sparks are likely to occur.

16. The gas cylinders must be always handled on trolleys or kept tied down when not in use. They should never be rolled as Roller for conveying.

17. Cylinders should not be used without Regulators

18. If the contractor's workmen are found to be violating the safety precautions, punitive action will be taken by withholding a sum of Rs.500/- to Rs.1000/- from the contractor's bill for each

violation.

19. The working area shall be kept clean and free from all obstructions.

20. Ensuring proper lashing of the components while being transported in vehicles.

21. The vehicles must have side supports or have body to support the materials conveyed.

22. The materials should not to be allowed to extend or overflow the sides of the vehicles.

23. Materials should not be allowed to overhang from the rear edge of the body of the vehicle.

24. Driver of the vehicle must possess valid license.

25. Vehicle must not be overloaded beyond the prescribed limits.

26. Red flags and lights for parts projecting from the body of vehicle must be provided.

27. The speed restrictions within the factory premises must be strictly adhered to.

28. The contractor should maintain a register regarding the driver license particulars.

29. The contractor should arrange WORKMEN COMPENSATION / INSURANCE POLICY covered for all his/her workmen. A copy of the policy has to be submitted before commencement of work.

30. All safety precautions are to be taken by the contractor at his cost.

31. These safety measures shall be deemed to form an integral part of the Work Order/ Agreement.

All Contractors including their sub-contractors, agents and labour engaged on the work are required to scrupulously adhere to the safety regulations, safety precautions and measurers. Any violation thereof will invite punitive action being taken against them. Also contractors with frequent violations of safety regulations will not be entrusted with further work in this organization.

Contractor shall provide thick hat, safety glass with side shield, full face shield, ear plug set, face mask, nose mask, protective & chemical resistant gloves, safety shoe, gum boots, safety belt, rain coat, chemical resistant protective clothing to the workers wherever necessary / as per instruction of Engineer in charge within the quoted rates.

SAFETY CODE

RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL AND ENVIRONMENT

1. Before commencing the work, the contractor is required to submit a “SAFETY PLAN” to the authorized BHEL official. The ‘safety plan’ shall indicate, in detail, the measure that would be taken by the contractor to ensure safety of men, equipment, material and environment during execution of work. The plan shall take care to satisfy all requirements specified hereunder.

   The contractor shall submit safety plan along with his offer. During negotiations before placing of work order and during execution of the contract, BHEL shall have right to review and suggest modification in the safety plan. The contractor shall abide by BHEL’s decision in this respect.

2. The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per direction of BHEL, or its authorized officials, to prevent loss to human lives, injuries to personnel engaged, and damage to property and environment.

3. The contractor shall provide to its work force and ensure the use of the following personal protective equipment as found necessary and as directed by the authorized BHEL officials:-

(i) Safety helmets conforming to IS-2925: 1984.
(ii) Safety Belts conforming to IS-3521:1983
(iii) Safety Shoes conforming to IS-1989:1978.
(iv) Eye and Face protection devices conforming to IS-8520:1977. And IS-8940:1978.
(v) Hand and body protection devices conforming to

    1. IS-2573:1975 (2) IS-6994:1973 (3) IS-8807:1978 (4) IS-8519:1977.

4. All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, safety nets, ladders, equipment etc. used by the contractor shall be of safe design and construction. These shall be tested and certificate of fitness obtained, before putting them to use and from time to time as instructed by authorized BHEL official who shall have the right to ban the use of any item.

5. All the electrical equipment, connections and wiring for constructions, power, its Distribution and use shall conform to the requirement of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carry out the all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed.

6. The contractor shall not use any hand – lamp energized by electric power with supply voltage of more than 24 Volts. For work in confined spaces, lighting shall be arranged with power source of not more than 24 Volts.

7. The contractor shall adopt all fire safety measures as laid down in the “Code for Fire Safety at Construction sites” issued by the safety department of BHEL and as per the directions of the authorized BHEL official. A copy of the above referred “Code for Fire Safety at Construction sites” shall be made available by BHEL to the contractor for reference, on demand by the contractor, during tendering stage itself.

8. Where it becomes necessary to provide and/or store Petroleum Products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and / or storage in accordance with the rules and regulations laid down in the relevant government acts, such as Petroleum Act, Petroleum and Carbides of Calcium Manual of the Chief Controller of Explosives, Govt. of India etc., Prior approval of the authorized BHEL official at the site shall also be taken by the contractor in all such matters.

9. The contractor shall arrange at his cost (wherever not specified), appropriate illumination at all work spots for safe working when natural daylight may not be adequate for clear visibility.

10. The contractor shall be held responsible for any violation of statutory regulations local, state or central and BHEL instructions, that may endanger safety of men, equipment, material and

environment in his scope of work or another contractor's or agency's. Cost of damages if any, to life and property arising out of such violation of statutory regulations and BHEL instructions, shall be borne by the contractor.

11. In case of fatal or disabling injury/accident to any person at construction / work sites due to lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

12. In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover cost of such damages from payments due to the contactor after holding an appropriate enquiry.

13. In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from payments due to the contractor, after notifying the contractor suitably and giving him opportunity to present his case.

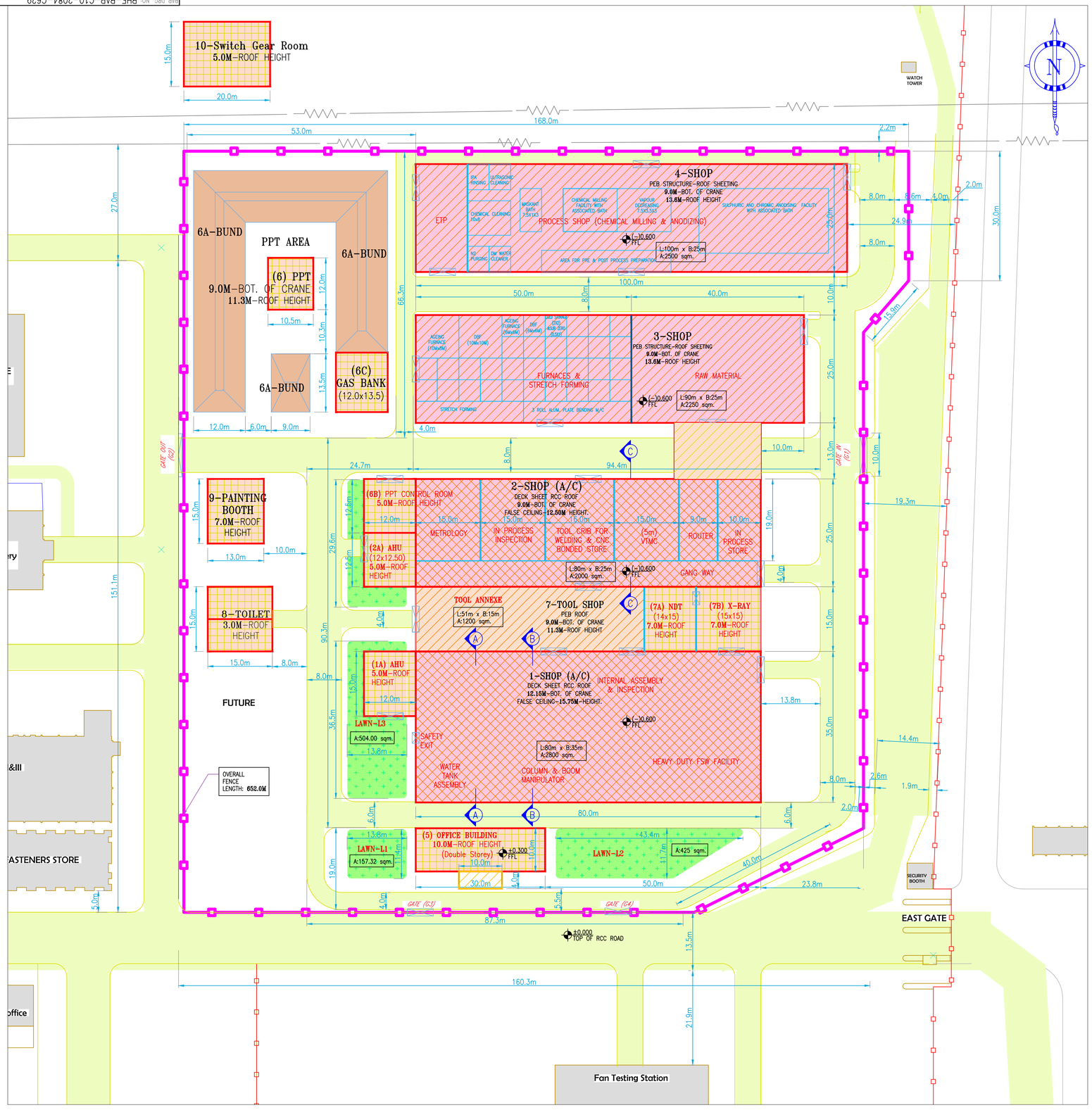
14. If the contractor fails to improve the standards of safety in its operation, to the satisfaction of BHEL, after being given a reasonable opportunity to do so and / or / if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor, after giving a notice of not less than seven days, indicating the steps that would be taken by BHEL.

15. The contractor shall submit report of all accidents, fires and property damage, dangerous occurrence to the authorized BHEL official immediately after such occurrence, but in any case not later than twelve hours of the occurrence. Such reports shall be furnished in the manner prescribed by the contractor to the authorized BHEL official from time to time as prescribed.

16. Before commencing the work, the contractor shall appoint/nominate a responsible office to supervise implementation of all safety measures and liaison with his counterpart of BHEL.

17. If the Safety record of the contractor is to the satisfaction of Safety Department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job.

BAP DRG. NO: BHE-BAP-C10-2084-C629



BUILDING, ROADS & LAWN AREA DETAILS

S. No	DISCRIPTIONS	ID.No	LENGTH	BREADTH	AREA	Bot. of Crane Ht.	False Ceiling Ht.	Roof Ht.	REMARKS.
A	**BUILDING AREA A/C**		(M)	(M)	(SQM)	(M)	(M)	(M)	
1	1-SHOP A/C	1	80.00	35.00	2800.00	12.15	15.75	–	A-DECK SLAB
2	AHU FOR SHOP-1	1A	15.00	12.00	180.00	–	–	5.00	C-RCC
3	DRY FIT AREA	–	–	–	0	–	–	–	DELETED
4	2-SHOP A/C	2	80.00	25.00	2000.00	9.00	12.50	–	A-DECK SLAB
5	AHU FOR SHOP-2	2A	12.00	12.50	150.00	–	–	5.00	C-RCC
				TOTAL:	**5130.00**				
B	**BUILDING AREA NON A/C**								
6	LOADING BAY	2B	20.00	13.00	260.00	9.00	–	11.30	B-PEB
7	3-SHOP	3	90.00	25.00	2250.00	9.00	–	13.60	B-PEB
8	4-SHOP	4	100.00	25.00	2500.00	9.00	–	13.60	B-PEB(10M EXTN.)
9	RCC OFFICE BUILDING	5	30.00	10.00	600.00	–	–	4.00	C-RCC-2 STOREY
10	TOOL SHOP	7	51.00	15.00	765.00	9.00	–	11.30	B-PEB
11	NDT	7A	14.00	15.00	210.00	–	–	7.00	C-RCC
12	X-RAY	7B	15.00	15.00	225.00	–	–	7.00	C-RCC
13	PPT AREA	6	12.00	10.50	126.00	9.00	–	11.30	C-RCC
14	PPT CONTROL ROOM	6B	12.50	12.00	150.00	–	–	5.00	C-RCC
15	GAS BANK	6C	13.50	12.00	162.00	–	–	4.00	C-RCC
16	RCC TOILET BLOCK	8	15.00	15.00	225.00	–	–	3.00	C-RCC
17	PAINTING BOOTH	9	15.00	13.00	195.00	–	–	7.00	C-RCC
18	SWITCH GEAR ROOM	10	20.00	15.00	300.00	–	–	4.00	C-RCC
				TOTAL:	**7968.00**	**13098.00**	SQM		
19	**PPT EMBANKMENT**	6A	135.00	12.00	**1620.00**				D-EMBANKMENT
D	**ROADS AREA**								
20	8M WIDE ROAD	R1	441.70	8.00	3533.60				E-ROAD
21	6M WIDE ROAD	R2	110.50	6.00	663.00				E-ROAD
22	4M WIDE ROAD	R3	229.90	4.00	919.60				E-ROAD
				TOTAL:	**5116.20**				
C	**LAWN AREA**								
23	LAWN (L1)	L1	13.80	11.40	157.32				F-LAWN
24	LAWN (L2)	L2	43.40	11.70	425.00				F-LAWN
25	LAWN (L3)	L3	13.80	36.50	503.70				F-LAWN
26	LAWN (L4)	L4	13.8	29.6	408.48				F-LAWN
				TOTAL:	**1494.50**				
27	FENCING LENGTH(CHAIN LINK)	F1	652	RM	**652.00**				G-FENCE

	AREA SUMMARY	TYPE			AREA (SQM)	TOTAL AREA			REMARKS
1	RCC&DECK SLAB ROOF	A			4800.00	13098.00	SQM		ID.NO:1+2+1B
2	PEB STRUCTURE	B			5775.00				ID.NO:3+4+7+2B
3	RCC BUILDING	C			2523.00				ID.NO:1A+2A+5 6,6B,6C&8to10
4	EMBANKMENT	D			1620.00				ID.NO:6A
5	ROADS	E			5116.20				ID.NO:R1toR3
6	LAWN	F			1494.50				ID.NO:L1toL4
7	FENCING	G			652.00				ID.NO:F1

e-StamP
BHEL-BAP-CIVIL-Design

PURPOSE:	PLANNING-P25
DATE:	03/12/2021
Issued By	
SIGNATURE:	
NAME:	T.Ezhilinban
DESIGNATION:	Dy. Gen. Manager
DEPARTMENT:	Civil Projects & Services

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER & LEVELS ARE IN METER U.N.O
2. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. THIS DWG PREPARED BASED ON INPUT DWG NO:C20-1308-C629
4. INTERNAL ARRANGEMENT OF FACILITIES ARE INDICATIVE ONLY.

LAYOUT
SCALE 1:750

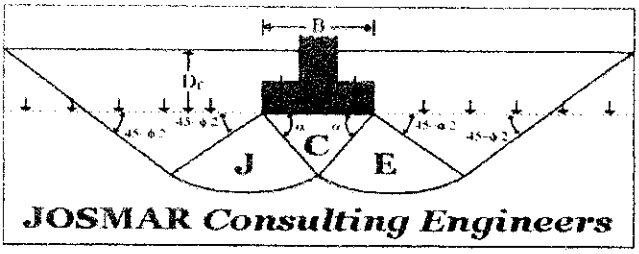
REV.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.

PROJECT NAME:	ISRO SHOP			SCALE:	1:750
CUSTOMER NAME:	–				
CUST.CONSULTANT NAME:	–		NAME.	SIGN.	DATE
BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT. RANIPET – 632 406.	CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.	DRAWN.	S.ROBIN BRITTO	Sd.	27/07/2019
		CHECKED.	ARUN PRASAD	Sd.	27/07/2019
		APPROVED.	T.EZHILINBAN	Sd.	27/07/2019
DEPT: CIVIL_DESIGN	DEPT CODE: 9716	CAD FILE NAME.	C629-ISRO-PROP-SHOP		
TITLE: PROPOSAL-1_LAYOUT OF PRODUCTION SHOP-ISRO		DRAWING NUMBER.		REV.	SHEETS
		BHEL_RPT	BHE-BAP-C10-2084	P25	–
		CUST DWG.	---	–	–

\\BAPNAS1\G\CIVIL\CAD — Plotted:3-Dec-21 — A1:LS

JOSMARCONSULTING ENGINEERS

GEOTECHNICAL ENGINEERING DIVISION



GEOTECHNICAL INVESTIGATION REPORT

Client : **BHEL**

Project: **Factory Building**

Site Address:

Aerospace Buildings,
BHEL BAP,
Ranipet.

REPORT NO. JCE/GEOTECH/2020/033

23.03.2020

JOSMAR
Consulting Engineers

ISO 9001:2008 CERTIFIED

Client File # 20-I-033
BHEL

23rd March 2020

Site Address:

Aerospace Buildings,
BHEL BAP,
Ranipet.

SUB: **GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF FACTORY BUILDING AT RANIPET. AMENDED WITH RESULTS OF CHEMICAL ANALYSIS.**

Dear Sir,

We are pleased to hereby transmit one (01) original and one (01) photocopy of our Geotechnical Investigation Report for the above captioned project.

Should you have any questions, please do not hesitate to contact this office.

Please note that our final report is deemed acceptable to you, if we do not hear from you in writing within 10 calendar days from the date that you received it.

It has been a pleasure being of service to you on this project. Assuring you of our continued co-operation, we remain.

Yours Truly,

FOR JOSMAR CONSULTING ENGINEERS
(Geotechnical, Structural & Materials Consultants)

Er.S.RAVICHANDRAN. M.E.,PhD
CEO

No.9, Officers Colony, Velachery, Chennai -600042. Phone: 044-22593067,48559093 Email: josmar.consultants@gmail.com
Website: www.josmarconsulting.com

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- Laboratory test results

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- Bearing Capacity calculation
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- Chemical Analysis of soil

INTRODUCTION

This report presents the results of the geotechnical investigations carried out by JOSMARConsulting Engineers–Geotechnical & Foundation Engineering Division for theproposed construction ofFactory Building atAerospace area, BHEL BAP, Ranipet.

This work was authorized by M/s.**Bharath Heavy Electricals Limited,**vide their acceptance through work order dated on29.02.2020.**Eightboreholes have been requested by the client for thevast area measuring about 93000 sqft. Our recommendations arebased on those eight boreholes only.**

Standard penetration tests were conducted inside the boreholes, while the boreholes were drilled up to a maximum depth of9.00mbelowthe existing ground level.

The investigation consists of drilling eight boreholes, soil sampling, field and laboratory testing and preparation of a Geotechnical Report for theproposedconstruction ofFactory Building with Machine foundations.

SCOPE OF WORK

The scope of this investigation is to:

i) Determine the soil profile at site, with ground water observation.

ii) Recommend a suitable foundation system and safe bearing pressure at foundation level.

Eight (8) boreholesweredrilled up to a maximum depth of9.00m.
Soil & rock samples werecollected for visual identification,classification and laboratory testing.

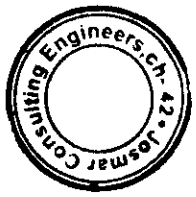
Borehole locations plan is presented in **Appendix- A.**

Borehole logs are presented in **Appendix- B.**

Laboratory test results are presented in **Appendix- C.**

Bearing capacity and settlement calculation are presented in **Appendix- D.**

Chemical analysis of soil are presented in **Appendix- E.**



SITE DESCRIPTION

The site for the proposed construction of Factory Building is proposed at Aerospace Buildings, site of BHEL BAP, Ranipet.

The top surface of the site is approximately at the same level of the adjacent road.
The site is bounded by Factory at West direction, vacant land at South & East directions; while at Northern direction, there is a road.

EXPLORATION PROGRAM & TECHNIQUES

After the visual inspection of the site, the subsurface investigation was carried out as mentioned below:

Eight (8)explorationboreholesweredrilled to a maximum depth of 9.00m

BH - 1 was started on07th March 2020 and completed on09th March 2020
BH - 2 was started on03rd March 2020 and completed on06th March 2020
BH - 3 was started on10th March 2020 and completed on12th March 2020
BH - 4 was started on18th March 2020 and completed on19th March 2020
BH - 5 was started on16th March 2020 and completed on17th March 2020
BH - 6 was started on 20th March 2020 and completed on 21st March 2020
BH - 7 was started on13th March 2020 and completed on14thMarch 2020
BH - 8 was started on23rdMarch 2020 and terminated at 3m, due to curfew.

Boreholes were drilled at site, in order to obtain an average soil profile of the site. Rotary drilling was performed using water as drilling fluid in the sub soil with casing pipe to stabilize the boreholes up to the required depth. Field testing and sampling was conducted in accordance with IS: 2131-1981.

Standard penetration tests(SPTs) are performed at the sub soil. In this test, a standard split spoon (IS: 9640-1980)of length about 450 mm and external/internal diameter of 51/35 mm initially penetrates the soil for15cm to bypass the expected accumulated sludge at the bottom of the hole by means of a 63.5 kg (140 lbs.) hammer falling freely along a guide from a height of 750 mm.

The total number of blows (N) required, to advance the spoon into the bore, for another two successive 15cm (a total of 30 cm) is recorded as a measure of the soil relative density or consistency.

Rock samples were extracted by rotary drilling techniques using single tube core barrel of 73mm diameter, fitted with a diamond bit. The extracted cores are soft& hard in nature. However the recovered samples were measured for total core recovery (TCR) as well as rock quality designation (RQD) values. Drilling in Rock layers was continued up to hard rock as the termination criteria.

The appropriate estimation of the properties of the encountered rock strata can be obtained by referring to the borehole logs and the following description.

TABLE - 1

RQD (%)	ROCK QUALITY
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

TABLE - 2

RECOVERY (%)	DESCRIPTION OF ROCK
0 – 20	Rock is treated as soil
20 - 35 with SPT>50 blows/ 30cm	Soft or disintegrated rock
35 – 50	Intermediate rock
50 – 85	Medium rock
>85	Sound rock

The rock core box photos are presented below.

LABORATORY TESTING PROGRAM

All the extracted soil samples were brought to the Geotechnical & Materials Testing Laboratory of JOSMAR *Consulting Engineers* for further examination in accordance with IS: 1498-1970. Selected samples were subjected to the following physical tests.

1 Natural Moisture Content (IS: 2720 Part II - 1973)
2. Sieve Analysis (IS: 2720 Part IV - 1985)
3. Liquid limit (IS: 2720 Part V - 1985)

4. Plastic limit and Plasticity Index (IS: 2720 Part VI - 1972)
5. Differential Free Swell Test (IS: 2720 Part XL - 1977)
6. Specific Gravity test (iS: 2720 Part-III)
7. Direct Shear test (IS 2720- Part-XIII)
8. Water Absorption test on Rock (IS: 2386 – Part- III)
9. Point Load Strength Index Test on Rock (IS: 8764)
10. Unconfined compression test on Rock (IS: 9143)

ROCK DESCRIPTION

Rock samples were collected and tested in our laboratory to determine the point load index and unconfined compression tests on prepared core samples of the rock specimen. Rock Quality Designation values are mostly Nil and observed up to 50%, that indicates very poor to poor RQD values. TCR (Total Core Recovery) values are observed between 4 to 66% that indicates Rock in soil form or in completely disintegrated state, up to moderately weathered state.

The general rock description of this project area shall be described as metamorphosed igneous rock, as the rock possesses different colors. Both white Granite as well as Grey Granite was encountered in metamorphosed state.

Compressive strength of intact rock core samples has been observed between 125 to 342 kg/cm2, indicating medium to sound rock condition.

SUBSURFACE SOIL DESCRIPTION

Based on boreholes information, sub surface soil profile at the proposed construction of Factory Building is given below.

BH-1

0.00 - 1.20mWhitish, Silty sands, poorly graded sand-silt mixtures (SM),(Non-Plastic) with dense to very dense relative density

1.20 - 6.20mWhitish, highly Weathered/disintegrated, highly to completely fractured Metamorphosed Igneous Rock(TCR=5% to 33%, RQD= 0 to 10%)

BH-2

0.0 - 1.40m Whitish, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic) with very dense relative density

1.40 - 6.40m Whitish, highly to Moderately Weathered/Disintegrated, highly to moderately fractured, Metamorphosed Igneous Rock (TCR= 10% to 64%, RQD= 0 to 27%)

BH-3

0.00 - 1.50m Brownish, Silty sandy clay with low plasticity and low swelling (CL) (Plastic) Very stiff consistency

1.50 - 3.00m Brownish Black, Silty sand, poorly graded sand- silt mixtures (SM) (Non-Plastic) dense relative density

3.00 - 3.50m Completely Weathered Rock

3.50 - 8.50m Blackish, Highly to Moderately Weathered/Disintegrated, highly to moderately fractured, Metamorphosed Igneous Rock (TCR= 6% to 66%, RQD= 0 to 50%)

BH-4

0.00 -2.50m Blackish, Silty sand,poorly graded sand-silt mixtures (SM) (Non-Plastic) with dense to very dense relative density

2.50 - 3.00m CompletelyWeathered Rock

3.00 - 8.00m Blackish, Highly Weathered/Disintegrated, Highly fractured, Metamorphosed Igneous Rock(TCR= 8% to 27%, RQD= 0%)

BH-5

0.00 - 1.50m Greyish, Silty sandy clay with low plasticity and low swelling (CL) (Plastic) Hard consistency

1.50 - 3.00m Brownish Yellow, White, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic) very dense relative density

3.00-3.50m Completely Weathered Rock

3.50 -8.50m Dark Grey, HighlyWeathered/Disintegrated, Highly to completely fractured, Metamorphosed Igneous Rock (TCR=6% to 20%, RQD= 0% to 13%)

BH-6

0.00 - 1.00m Whitish, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic) very dense relative density

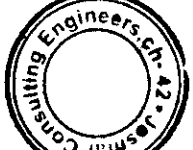
1.00 - 1.20m Completely Weathered Rock

1.20 - 6.20m Whitish, Highly Weathered/Disintegrated, highly fracturedMetamorphosed Igneous Rock (TCR=5% to 21%, RQD= 0% to 21%)

BH-7

0.00 - 1.00m Brownish, Silty Sandy Clay with low plasticity and low swelling (ML) (Plastic) Hard consistency

1.00 - 2.00m Yellow-White, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic) very dense relative density



2.00 - 3.00m Yellowish White, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic) with very dense relative density

3.00 - 4.00m Highly Weathered Rock

4.00 - 6.00m Whitish, Highly Weathered/Disintegrated, highly to completely fractured metamorphosed Igneous Rock(TCR= 5% to 7%, RQD= 0%)

6.00 - 7.00m Greyish, Highly Weathered/Disintegrated, highly fractured, Metamorphosed Igneous Rock (TCR= 16%, RQD= 0%)

7.00 - 9.00m Whitish, Moderately Weathered, highly fractured Igneous Rock (TCR= 10% to 14%, RQD= 0%)

BH-8

0.00- 1.50m Yellow-White, Silty sand, poorly graded sand sand-silt mixtures (SM) (Non-Plastic) with very dense relative density

1.50 - 3.00m Highly Weathered/Disintegrated Rock(TCR= 10%, RQD= 0%)

GROUND WATER

Ground water was not encountered up to a depth of 9.0 meter below ground level during the time of field investigation.

FOUNDATION RECOMMENDATIONS

- It is understood that there is going to be a Industrial building needs to be designed at the captionedsite. Foundation system and Safe bearing pressure needs to be recommended. Similarly the Slab on grade construction is to be carried out to transfer heavy loads of machinery to the subsurface soil, with tolerable settlements.

Industrial Building

- Spread / Isolated foundation shall be adopted for the proposed structure.
- The foundation shall be placed at a depth of 2.0m below ground level on very dense soil/ highly weathered Rock. When the very dense strata is not been reached, it is recommended to place the foundations on a gravel fill of required thickness upon excavations.
- An allowable bearing pressure of 200 kPa shall be considered for design.
- Grade beams shall be adopted in order to minimize the differential settlements.
- Expected settlements shall be less than the permissible limits for the foundation and the differential settlement shall be considered up to 75% of the expected total settlement.

Design parameters

PARAMETERS	symbol	COHESIONLESS SOIL (SM, SP)		
		Medium Dense	Dense	Very Dense
SPT N Value (blows)	N	10-30	30-50	>50
Bulk unit weight (kN/m^3)	Y	18	20	22
Saturated unit weight (kN/m^3)	Y'	11	13	15
Specific Gravity	(Gs)	2.63 to 2.68		
Angle of Shearing Resistance in Degree	Ø	29	34	36
Cohesion (kN/m^2)	C	.....	.....	....
Co efficient of Active Earth Pressure	Ka	0.36	0.33	0.30
Co efficient of Active Earth Pressure	Kp	2.77	3.0	3.33
Co efficient of Earth Pressure at rest	K0	0.53	0.5	0.47
Coefficient of permeability (cms/sec)	K	$1.0x10^{-4}$ to $1.0x10^{-6}$		
Friction co efficient	F	0.28	0.34	0.42
Modulus of elasticity (kN/m^2)	Es	15,000	20,000	30,000
Poisson's Ratio	Ч	0.25	0.30	0.40

Machine Foundations

- Machine foundations shall be designed and founded on individual block foundations. Block foundation system shall be adopted for bearing the dynamic loading conditions from the machinery.
- Foundation shall be placed at a minimum depth of 2.5 m below the ground level on the weathered/disintegrated rock. However if rock surface is not encountered at some locations, all the soil above rock surface shall be removed up to the competent rock strata and P.C.C shall be poured to arrive at the required level of foundation.
- An allowable net bearing pressure of 200 kPa shall be utilized for design of foundation.

Slab on grade/ floor construction

The floor construction area shall be free from any compressible soil and shall be supported by Moorum soil layers followed by GSB. Field density tests are required during construction of floor support, at every 25cm thickness with a minimum compaction of 95%. Plate load tests shall be conducted to confirm the bearing capacity. A safe bearing pressure of 150 kPa shall be used for the design of floor slab.

In case of heavy loads anticipated on floor slab, it is recommended to use ground improvement techniques by Geo-composite soil reinforcement.

SETTLEMENT CONSIDERATIONS

The tolerance of structures to settlement is a function of type and size of foundations, and type and methodology of construction. Generally, 25mm is considered as maximum limit of tolerable settlement for machine foundations on sandy soil layers. Accordingly, the total settlements associated with the recommended bearing capacity values presented above should be within tolerable limits. Differential settlements in the case of granular soils could be about 75 percent or less of the total settlements. However it is very common to state the requirement for differential settlement, it is more logical to state it in terms of angular distortion. Post-construction of settlements are expected to be smaller because in granular soils, most of the total settlements (about 75% or more) have the tendency to take place by the time construction is over.

FOUNDATION CONSIDERATIONS

A PCC (Plain Cement Concrete) layer of 10cm thickness is recommended below the foundation. Any over excavation in the foundation trenches should be re-filled by plain concrete and any disturbed and loose materials found in the foundation trenches should be removed before placement of PCC.

BACKFILLING AND COMPACTION

Excavated materials on site can be used as general backfill material upon testing the bulk samples, after excavation. It shall be carried out during the start of construction. Backfilling materials shall be placed in horizontal layers not exceeding 25cm thickness and each layer shall be compacted to at least 95% of the maximum dry density. Field density tests are needed on each layer of backfill to control quality.

EXCAVATION

Excavationthrough the site soil at the overburden can be carried out by conventional equipment such as dozers or JCB. Ground water was not encountered up to a depth of 9.0meter below ground level, hence there is no need of dewatering arrangement. However if any water encountered at the time of excavations due to seepage there may be requirements of proper dewatering arrangement during excavation for foundations.

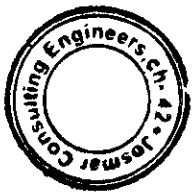
A PCC (Plain Cement Concrete) layer of 5-10cm thickness is recommended below the foundations after the excavation completed.

CHEMICAL ANALYSIS OF SOIL

Chemical analysis of soil samples were carried out at selected depths and the results are included in Annexure E. Both sulphates and chlorides are at slightly higher levels,. Hence sulphate resisting Portland cement shall be used for foundation construction.

GENERAL COMMENTS

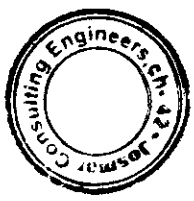
The recommendations for the foundation design and construction are based on the information obtained from the boreholes drilled at site.When foundation construction is underway, the recommendations of this report should be checked through field inspection, to validate the information for use during the construction stage.

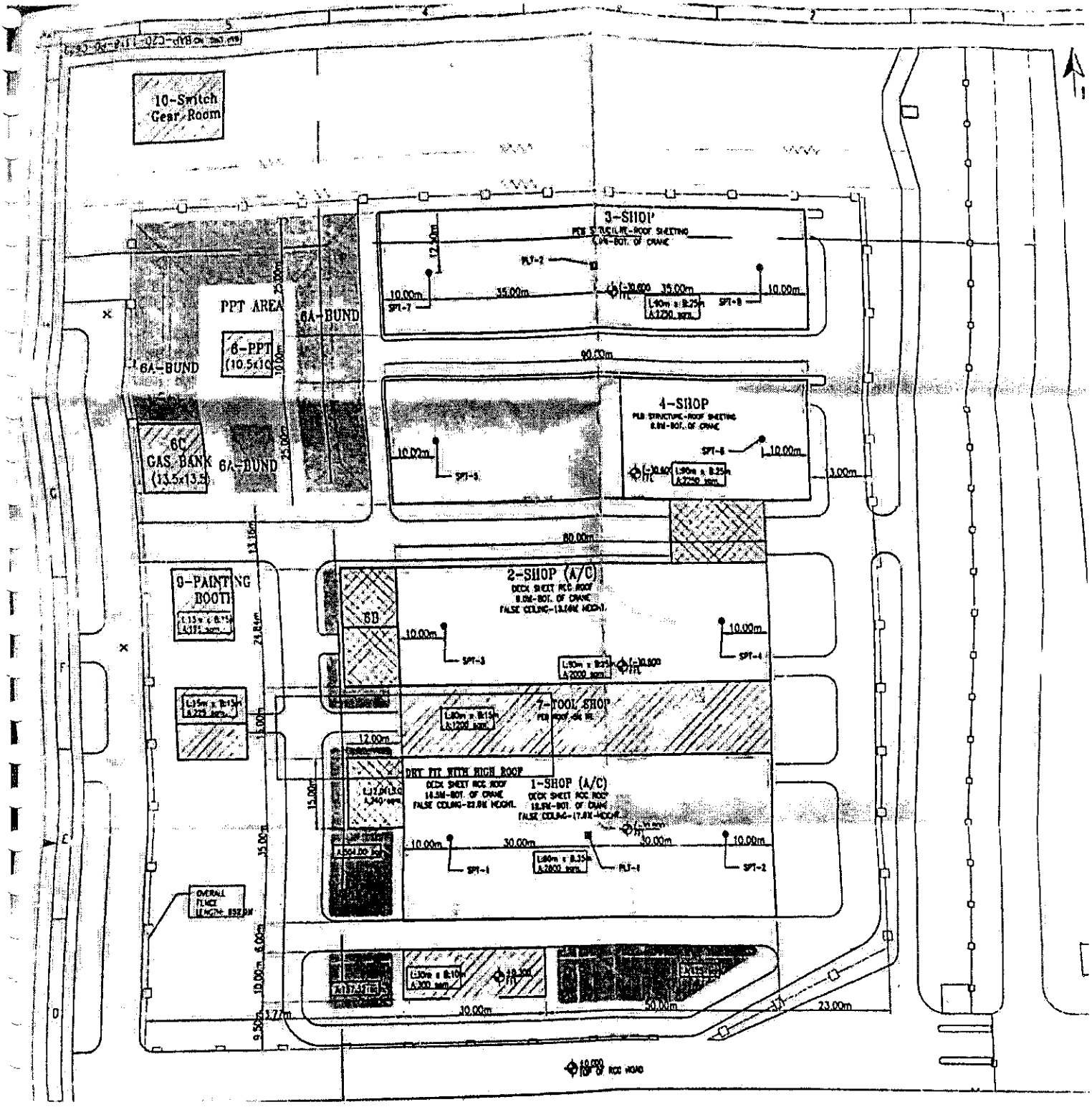


APPENDIX- A

LAYOUT PLAN &

BOREHOLE LOCATIONS PLAN





APPENDIX- B

BOREHOLE LOGS

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BOREHOLE LOG

			Ele . Of G.L	:	0.00m
Client	:	BHEL	Water Table	:	Nil
Project	:	Factory Building	Type Of Boring	:	Rotary
Location	:	Ranipet	Dia of Boring	:	150mm
B.H. No	:	1	Started on	:	07.03.2020
Final Depth	:	6.20m	Ended on	:	09.03.2020
Address	:	Aerospace Buildings, BHEL BAP, Ranipet.			

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0-15 cm	15-30 cm	30-45 cm	N- Value	Relative Density /Consistency
			Whitish, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic)	10	20	24	44	Dense
			Ditto	10	12	14	26	Medium dense
				50/10cm				Very dense
			Whitish, Moderately Weathered, highly to moderately fractured Igneous Rock (drilled by Diamond core bit)					TCR=5%, RQD=0%
			Ditto					TCR=10%, RQD=10%
			Ditto					TCR=19%, RQD=0%
			Ditto					TCR=32%, RQD=0%
			Ditto					TCR=32.5%, RQD=0%
			BH-1 terminated at a depth of 6.20m in rock strata.					

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BOREHOLE LOG

Client	: BHEL	Ele. Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 2	Dia of Boring	: 150mm
Final Depth	: 6.40m	Started on	: 03.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 06.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0-15 cm	15-30 cm	30-45 cm	N-Value	Relative Density /Consistency
			Whitish, Silty sand, poorly graded sand- silt mixtures (SM) (Non-Plastic)				>50	Very dense
			Ditto				>50	Very dense
			Whitish, Moderately Weathered, highly to moderately fractured igneous Rock (drilled by Diamond core bit)					TCR=10%, RQD=0%
			Ditto					TCR=11.33%, RQD=0%
			Ditto					TCR=14%, RQD=0%
			Ditto					TCR=64%, RQD=27%
			BH-2 terminated at a depth of 6.40m in rock strata.					

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BOREHOLE LOG

Client	: BHEL	Ele . Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 3	Dia of Boring	: 150mm
Final Depth	: 8.50m	Started on	: 10.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 12.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0			Brownish, Silty sandy clay with low plasticity and low swelling (CL) (Plastic)	4	9	10	19	Very stiff
3.0			Brownish, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic)	10	14	20	34	Dense
			Ditto	10	20	22	42	Dense
3.5			Highly Weathered Rock	50/6cm			>50	
4.0			Blackish, Moderately Weathered, highly to moderately fractured Igneous Rock (drilled by Diamond core bit)					TCR=4%, RQD=0%
5.0			Ditto					TCR=6%, RQD=0%
6.0			Ditto					TCR=21%, RQD=0%
7.0			Ditto					TCR=62%, RQD=20%
8.0			Ditto					TCR=66%, RQD=50%
8.5			BH -3 terminated at a depth of 8.50m. in Rock strata					
10.0								

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BOREHOLE LOG

Client	: BHEL	Ele. Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 4	Dia of Boring	: 150mm
Final Depth	: 8.00m	Started on	: 18.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 19.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0-15 cm	15-30 cm	30-45 cm	N- Value	Relative Density /Consistency
0.0								
0.5			Blackish, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic)	10	16	24	40	Dense
1.0								
1.5			Ditto	50/24cm			>50	Very dense
2.0								
2.5			Completely Weathered Rock	50/2cm			>50	
3.0			Blackish, Moderately Weathered, highly to moderately fractured Igneous Rock (Drilled by Diamond core bit)					TCR=10%, RQD=0%
3.5								
4.0			Ditto					TCR=12%, RQD=0%
4.5								
5.0			Ditto					TCR=10%, RQD=0%
5.5								
6.0			Ditto					TCR=8%, RQD=0%
6.5								
7.0			Ditto					TCR=27%, RQD=0%
7.5								
8.0			BH-4 terminated at a depth of 8.00m, in Rock strata					
8.5								
9.0								
9.5								
10.0								

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BOREHOLE LOG

Client	: BHEL	Ele . Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 5	Dia of Boring	: 150mm
Final Depth	: 8.50m	Started on	: 16.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 18.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N-Value	Relative Density /Consistency
			Greyish, Silty sandy clay with low plasticity and low swelling (CL) (Plastic)	10	16	20	36	Hard
			Brownish Yellow, White, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic)	50/22cm			>50	Very dense
			Ditto	50/18cm			>50	Very dense
			Ditto	50/10cm			>50	Very dense
			Greyish, Moderately Weathered, highly to moderately fractured Igneous Rock (Drilled by Diamond core bit)					TCR=6%, RQD=0%
			Ditto					TCR=6%, RQD=0%
			Ditto					TCR=11%, RQD=0%
			Ditto					TCR=20%, RQD=0%
			Ditto					TCR=13%, RQD=13%
			BH -5 terminated at a depth of 8.50m, in Rock strata					

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BOREHOLE LOG

Client	: BHEL	Ele . Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 6	Dia of Boring	: 150mm
Final Depth	: 6.20m	Started on	: 20.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 21.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0			Whitish, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic)	50/20cm		50/9cm	>50	Very dense
3.5			Whitish, Moderately Weathered, highly to moderately fractured Igneous Rock (Drilled by Diamond core bit)					TCR=5%, RQD=0%
			Ditto					TCR=5%, RQD=0%
			Ditto					TCR=9%, RQD=0%
			Ditto					TCR=18%, RQD=0%
			Ditto					TCR=18%, RQD=18%
6.0			BH -6 terminated at a depth of 6.20m, in Rock strata					

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BOREHOLE LOG

Client	: BHEL	Ele . Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 7	Dia of Boring	: 150mm
Final Depth	: 9.00m	Started on	: 13.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 14.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N - Value	Relative Density /Consistency
			Brownish, Silty sandy clay with low plasticity and low swelling (CL) (Plastic)	5	10	22	32	Hard
			Brownish, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic)	50/20cm			>50	Very dense
			Yellowish White, Poorly graded sand, gravelly sand with fines (SP-SM) (Non-Plastic)	50/15cm			>50	Very dense
			Ditto	50/16cm			>50	Very dense
			Highly Weathered Rock	50/0 cm				
			Whitish, Moderately Weathered, highly fractured Igneous Rock (Drilled by Diamond core bit)					TCR=5%, RQD=0%
			Ditto					TCR=7%, RQD=0%
			Greyish, Moderately Weathered, moderately fractured Igneous Rock					TCR=16%, RQD=16%
			Whitish, Moderately Weathered, highly fractured Igneous Rock					TCR=10%, RQD=0%
			Ditto					TCR=14%, RQD=0%
			BH -7 terminated at a depth of 9.00m. in Rock strata					

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BOREHOLE LOG

Client	: BHEL	Ele . Of G.L	: 0.00m
Project	: Factory Building	Water Table	: Nil
Location	: Ranipet	Type Of Boring	: Rotary
B.H. No	: 8	Dia of Boring	: 150mm
Final Depth	: 2.00m	Started on	: 23.03.2020
Address	: Aerospace Buildings, BHEL BAP, Ranipet.	Ended on	: 23.03.2020

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0			Brownish Yellow, Silty sand, poorly graded sand-silt mixtures (SM) (Non-Plastic)	50/25cm			>50	Very dense
1.0			Highly Weathered Rock	50/2cm				Rebound
2.0			Whitish, Moderately Weathered, highly fractured Igneous Rock (Drilled by Diamond core bit)					TCR=10%, RQD=0%
3.0			BH -8 stopped at a depth of 2.00m, due to curfew					
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								
10.0								

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INDIVIDUAL BOREHOLE LOGS

Client : BHEL

Project : Factory Building

Location : Ranipet

Water Table : Nil

Depth (m)	BH-1 SPT	BH-1 SYM	BH-2 SPT	BH-2 SYM	BH-3 SPT	BH-3 SYM	BH-4 SPT	BH-4 SYM
0.0								
0.5	44							
1.0	26		>50		19		40	
1.5	>50		>50					
2.0	TCR=6% RQD=0%		TCR=10% RQD=0%		34		>50	
2.5								
3.0	TCR=10% RQD=10%				42		>50	
3.5			TCR=11.3% RQD=0%		>50			
4.0	TCR=19% RQD=0%						TCR=10% RQD=0%	
4.5					TCR=4% RQD=0%			
5.0	TCR=32% RQD=0%		TCR=14% RQD=0%				TCR=12% RQD=0%	
5.5					TCR=6% RQD=0%			
6.0							TCR=10% RQD=0%	
6.5	TCR=32.5% RQD=0%		TCR=64.3% RQD=27%		TCR=21% RQD=0%			
7.0	6.20m		6.40m				TCR=8% RQD=0%	
7.5					TCR=62% RQD=20%			
8.0							TCR=27% RQD=0%	
8.5					TCR=66% RQD=50%		8.00m	
9.0					8.50m			
9.5								
10.0								
10.5								
11.0								
11.5								
12.0								
12.5								
13.0								
13.5								
14.0								
14.5								
15.0								

Silty sand with Clay

Sandy soil

Highly Weatheared Rock

Whitish Igneous Rock

Blackish/ Grey Igneous Rock

Moderately Weathered, Moderately Fractured

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INDIVIDUAL BOREHOLE LOGS

Client : BHEL

Project : Factory Building

Location : Ranipet

Water Table : Nil

Depth (m)	BH-5 SPT	BH-5 SYM	BH-6 SPT	BH-6 SYM	BH-7 SPT	BH-7 SYM	BH-8 SPT	BH-8 SYM
0.0								
0.5								
1.0	36		>50		32		>50	
1.5			>50				>50	
2.0	>50		TCR=5% RQD=0%		>50		TCR=10% RQD=0%	
2.5					>50			
3.0	>50		TCR=5% RQD=0%		>50			
3.5	>50							
4.0			TCR=9% RQD=0%		>50/0cm			
4.5	TCR=8% RQD=0%							
5.0			TCR=15% RQD=0%		TCR=5% RQD=0%			
5.5	TCR=6% RQD=0%							
6.0					TCR=7% RQD=0%			
6.5	TCR=11% RQD=0%		TCR=21% RQD=21%					
7.0			6.20m		TCR=15% RQD=16%			
7.5	TCR=10% RQD=0%							
8.0					TCR=10% RQD=0%			
8.5	TCR=13% RQD=13%							
9.0	8.50m				TCR=14% RQD=0%			
9.5					9.00m			
10.0								
10.5								
11.0								
11.5								
12.0								
12.5								
13.0								
13.5								
14.0								
14.5								
15.0								

Silty sand with Clay

Sandy soil

Highly Weathered Rock

Whitish Igneous Rock

Blackish/ Grey Igneous Rock

Moderately Weathered, Moderately Fractured

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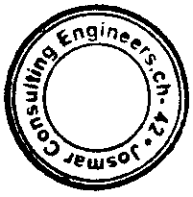
APPENDIX- C

LABORATORY TEST RESULTS

GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF FACTORY BUILDING AT ISRO BAY, RANIPET, TAMILNADU.

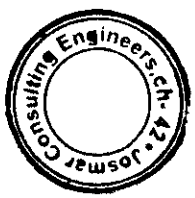
PHYSICAL ANALYSIS OF SOIL SAMPLES

Bore hole No.	Depth, m	W_N, %	W_L, %	W_P, %	I_P, %	FSI %	IS	GRAVEL %	COARSE SAND %	MEDIUM SAND %	FINE SAND %	SILT & CLAY %
BH-1	0.5	22	NON-PLASTIC				SM	8	15	20	25	32
	1.0	20	NON-PLASTIC				SM	12	10	13	30	35
BH-2	1.0	23	NON-PLASTIC				SM	10	13	12	25	40
	1.4	18	NON-PLASTIC				SM	20	10	15	30	25
BH-3	1.0	24	29	18	11	-	CL	-	10	16	30	44
	2.0	22	NON-PLASTIC				SM	-	8	15	35	42
	3.0	20	NON-PLASTIC				SM	5	15	18	32	30
BH-4	1.0	18	NON-PLASTIC				SM	8	12	15	35	30
	2.0	20	NON-PLASTIC				SM	10	10	13	35	32
BH-5	1.0	24	29	18	11	-	CL	-	10	15	30	45
	2.0	18	NON-PLASTIC				SP-SM	10	20	25	34	11
	3.0	17	NON-PLASTIC				SP-SM	15	22	23	30	10
BH-6	1.0	17	NON-PLASTIC				SP-SM	14	15	20	40	11
BH-7	1.0	24	28	18	10	-	CL	-	10	16	30	44
	2.0	21	NON-PLASTIC				SM	5	12	16	25	42
	2.5	17	NON-PLASTIC				SP-SM	20	24	20	26	10
	3.0	15	NON-PLASTIC				SP	25	20	26	24	5



ABBREVIATION:

W_N	=	Natural Moisture content (%)
W_L	=	Liquid limit (%)
W_P	=	Plasticity Limit (%)
I_P	=	Plasticity Index (%)
F.S.I	=	Free Swell Index (%)
IS	=	Indian Standard Classification
CL	=	Low compressibility Clay of $W_L < 35\%$
CI	=	Inorganic Clay of $35\% < W_L < 50\%$
CH	=	High Compressibility Clay of $W_L > 50\%$
SP	=	poorly graded sand
GP	=	poorly graded gravel
SW	=	Well graded sand
SM	=	Silty sand
GW	=	Well graded gravel



Correlations of SPT N values with Common properties of soils

A) Granular Soil

Standard Penetration No., SPT N	Description	Relative Density, Dr %	Approx. Angle of Internal Friction, Φ°	Approx. Rang of Most. Unit Wt.,ɣ kN/m³
< 4	Very loose	< 20	< 29	11-16
4-10	Loose	20-40	29-30	14-18
10-30	Medium Dense	40-60	30-36	17-20
30-50	Dense	60-80	36-41	17-22
> 50	Very Dense	> 80	> 41	20-29

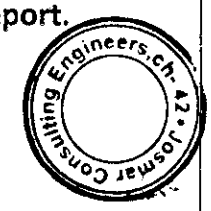
B) Cohesive Soil

Standard Penetration No., SPT N	Description	Unconfined Compressive Strength, kPa	Approx. Rang of Most. Unit Wt., ɣkN/m³
< 2	Very Soft	0-25	14.4-16
2-4	Soft	25-50	16-17.4
4-8	Firm (medium)	50-100	17.6-19.2
8-15	Stiff	100-200	19.2-20.8
15-30	Very Stiff	200-400	20.8-22.4
> 30	Hard	> 400	> 20

Note: These values are most appropriate values in general. However, the soil properties vary between sites to site and hence it shall be used only for guidance

Keeping Samples:

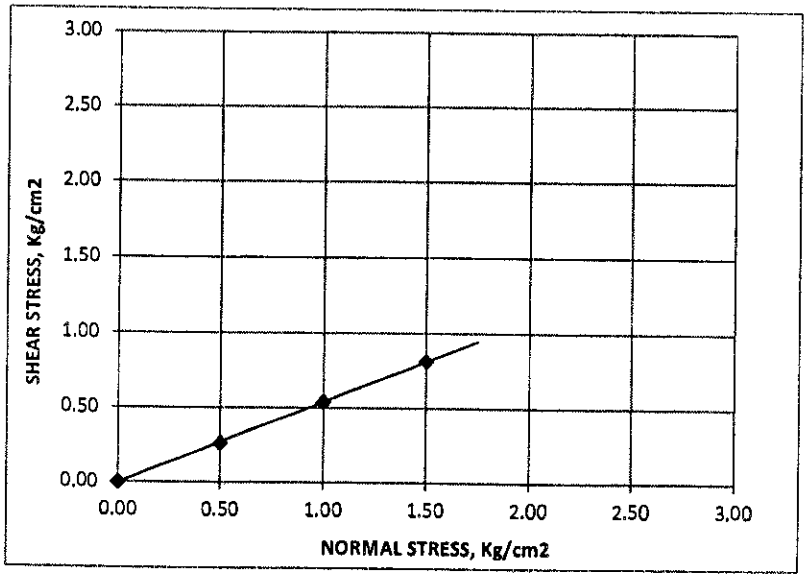
1. Samples will be kept up to 15 days from the date of submission of report.
2. Sample disposal will be carried out for every 15 days.



Direct Shear Test

Client BHEL
Project Factory Building

		BH #	BH-1
Mat'l. Descp.	Whitish, Silty sand, poorly graded sand silt mixtures (SM)	Depth (m)	1.00
Angle of Internal Friction	29	Moisture Content (%)	24.0
		'Cohesion, C (Kg/cm^2)	0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.257
1.000	0.534
1.500	0.811

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Direct Shear Test

Client BHEL
Project Factory Building

BH # BH-2

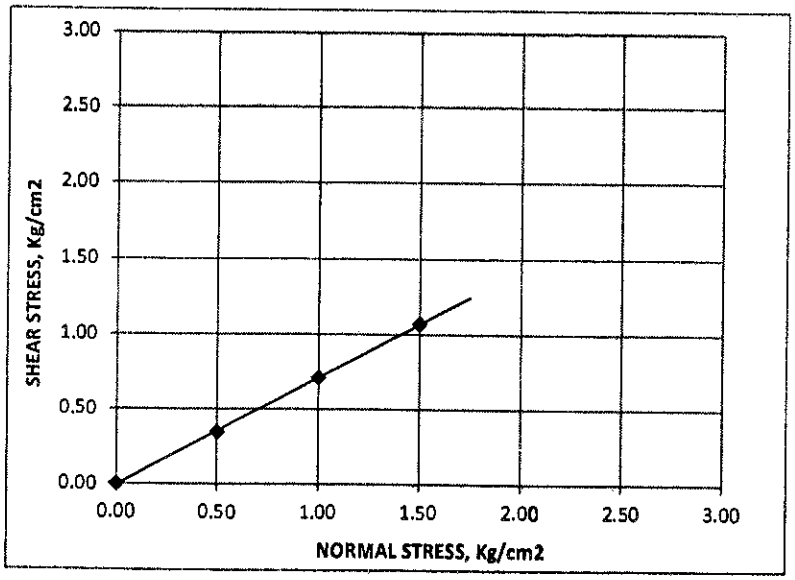
Mat'l. Descp. Whitish, Silty sand, poorly graded sand silt mixtures (SM)

Depth (m) 1.00

Angle of Internal Friction 36

Moisture Content (%) 25.0

'Cohesion, C (Kg/cm^2) 0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.343
1.000	0.706
1.500	1.069

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Direct Shear Test

Client BHEL
Project Factory Building

Mat'l. Descp. Brownish, Silty sand, poorly graded sand silt mixtures (SM)

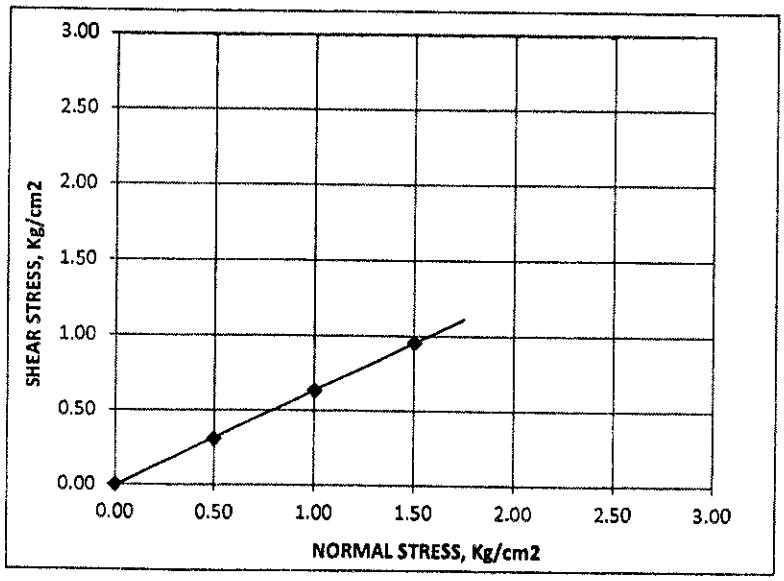
BH # BH-3

Depth (m) 2.00

Angle of Internal Friction 33

Moisture Content (%) 26.0

'Cohesion, C (Kg/cm^2) 0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.305
1.000	0.629
1.500	0.954

Direct Shear Test

Client BHEL
Project Factory Building

BH # BH-4

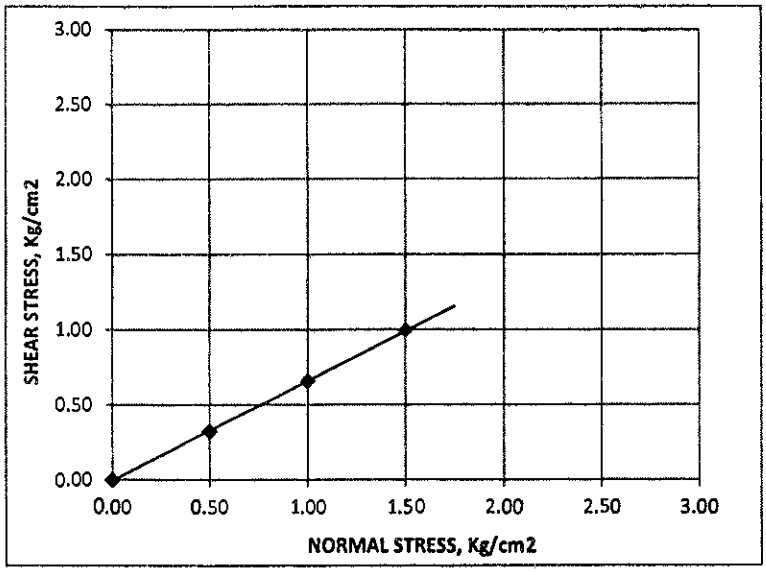
Mat'l. Descp. Blackish, Silty sand, poorly graded sand silt mixtures (SM)

Depth (m) 1.00

Angle of Internal Friction 34

Moisture Content (%) 25.0

'Cohesion, C (Kg/cm^2) 0

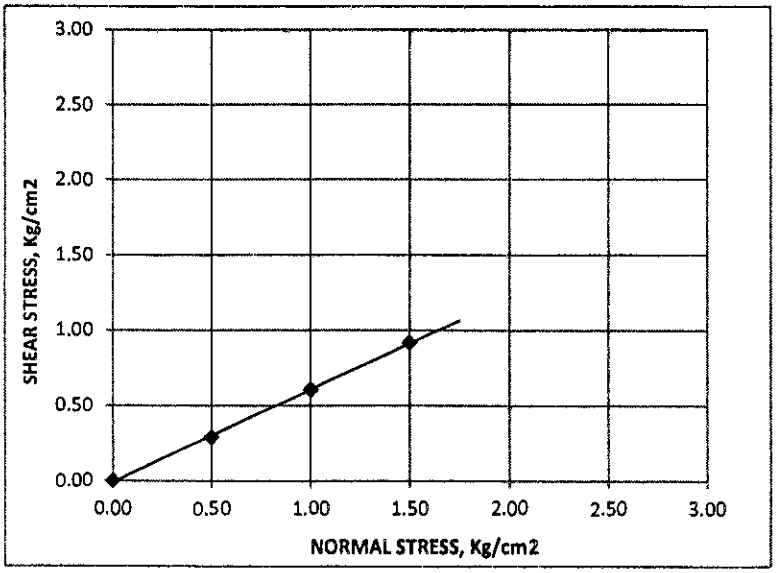


Normal Stress	Shear Stress
0.000	0.000
0.500	0.317
1.000	0.654
1.500	0.991

Direct Shear Test

Client BHEL
Project Factory Building

		BH #	BH-5
Mat'l. Descp.	Greyish, Silty sand, poorly graded sand silt mixtures (SM)	Depth (m)	1.00
Angle of Internal Friction	32	Moisture Content (%)	25.0
		'Cohesion, C (Kg/cm^2)	0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.292
1.000	0.604
1.500	0.916

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Direct Shear Test

Client BHEL
Project Factory Building

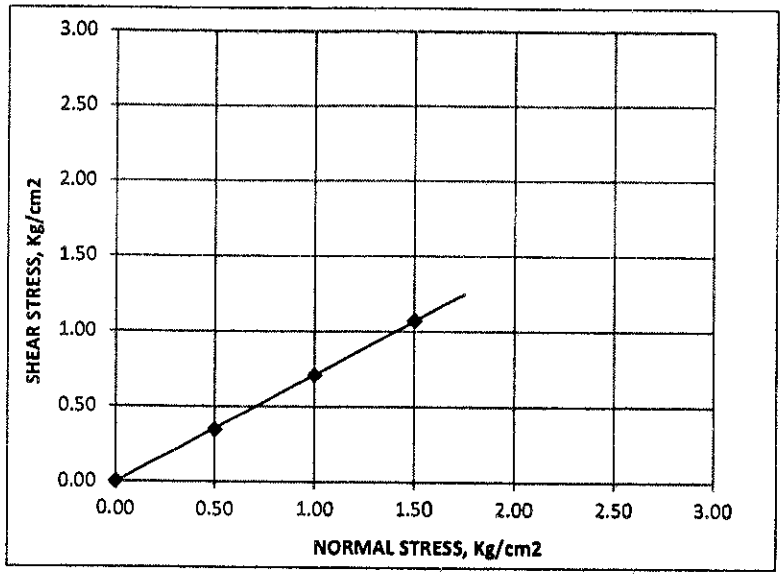
BH # BH-6

Mat'l. Descp. Whitish, Poorly graded sand

Depth (m) 1.00

Angle of Internal Friction 36

Moisture Content (%) 17.0
'Cohesion, C (Kg/cm^2) 0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.343
1.000	0.706
1.500	1.069

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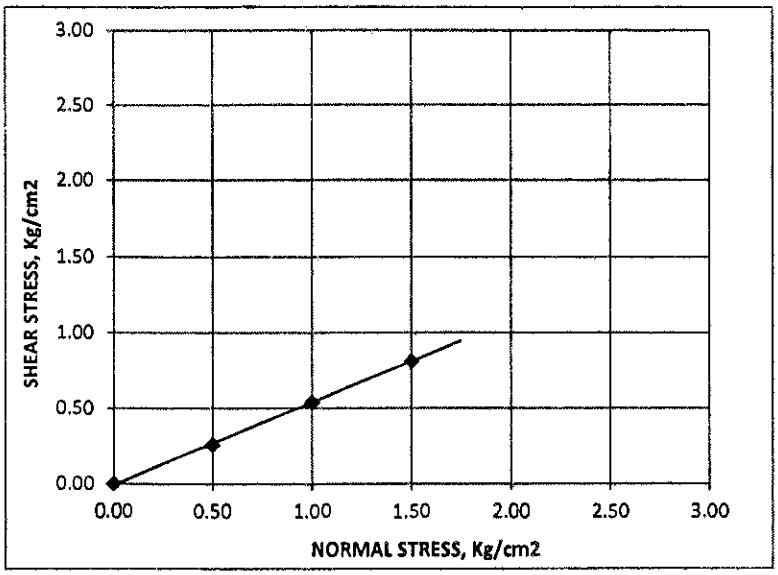
Direct Shear Test

Client BHEL
Project Factory Building

		BH #	BH-7
Mat'l. Descp.	Brownish, Silty sand, poorly graded sand silt mixtures (SM)	**Depth (m)**	1.00
Angle of Internal Friction	29	**Moisture Content (%)**	25.0
		'Cohesion, C (Kg/cm^2)	0



Normal Stress	Shear Stress
0.000	0.000
0.500	0.257
1.000	0.534
1.500	0.811

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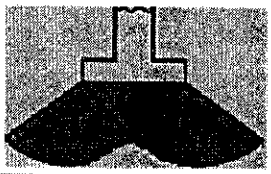

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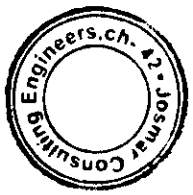
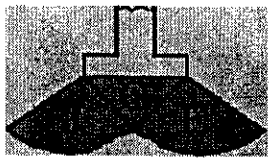
CLIENT	: BHEL
PROJECT	: Industrial Buiding
LOCATION	: Ranipet

IS: 2386 - Part - 3 Water Absorption test of Rock

Sl. No.	BORE HOLE NO.	DEPTH (m)	ROCK WEIGHT (gm)	ABSORBED WEIGHT OF ROCK SAMPLE (gm)	PERCENTAGE OF ABSORPTION (%)
1	BH- 1	3.00-4.00	161.0	164.0	1.86
2	BH- 2	2.00-3.50	235.0	240.0	2.13
3	BH- 3	5.50-6.50	229.0	234.0	2.18
4	BH- 4	3.00-4.00	247.0	250.0	1.21
5	BH- 5	4.50-5.50	242.0	244.0	0.83
6	BH- 6	3.00 - 4.00	249.0	253.0	1.61
7	BH- 7	5.00-6.00	191.0	195.0	2.09





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Determination of Unconfined Compressive Strength of Rock- IS: 9143

Client : BHEL

Bore hole No.	BH- 1	BH- 2	BH- 3	BH- 5	BH- 6	BH- 7
Depth of the sample, m	2.00-3.00	5.00-6.40	6.50-7.50	7.50-8.50	5.00-6.20	6.00-7.00
Diameter of sample, cm	5	5	5	5	5	5
Length of sample, cm	10	10	10	10	10	10
Area of sample, cm^2	19.63	19.63	19.63	19.63	19.63	19.63
Weight of sample, g	595	598	588	602	589	590
Failure Load, kg	2450	5000	5250	6715	4750	6000
Compressive strength, (Load/Area) kg/cm^2	125	255	267	342	242	306

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CLIENT	:	BHEL
PROJECT	:	Industrial Building
LOCATIDN	:	Ranipet

As per Indian Standard the Point Load test calculations are calculated below

IS: 8764 - Amendment No.1 December 2006

(Page 6, clause 7.1.1) — Substitute the following for the existing formula:

$$I_s(50) = \frac{P}{D^{1.5}\sqrt{D_{50}}}$$

where

$I_s(50)$ = point load strength index in MPa (for the standard core size),
P = failure load in N,
D = core diameter in mm, and
D_{50} = standard core diameter (50 mm).

Sl.No.	Depth (m)	Bore hole No.	Diameter (mm)	Height (mm)	Area (mm^2)	Weight (kg)	Failure Load (P) (N)	D_{50}	D^1.5	SQRT (D50)	$I_{s(50)}$, (N/mm^2)
1	3.00-4.00	BH- 1	50	50	1962.5	0.372	10602.88	50	353.553	7.071	4.241
2	3.50-5.00	BH- 2	50	50	1962.5	0.360	12016.59	50	353.553	7.071	4.807
3	5.50-6.50	BH- 3	50	50	1962.5	0.358	9896.02	50	353.553	7.071	3.958
4	4.00-5.00	BH- 4	50	50	1962.5	0.348	12723.45	50	353.553	7.071	5.089
5	5.50-6.50	BH- 5	50	50	1962.5	0.368	8482.30	50	353.553	7.071	3.393
6	4.00-5.00	BH- 6	50	50	1962.5	0.353	5654.87	50	353.553	7.071	2.262
7	8.00-9.00	BH- 7	50	50	1962.5	0.345	7068.58	50	353.553	7.071	2.827

The unit of failure load shall be kN instead of N/mm2 and unit of Is(50) shall be N/mm2 instead

Dial Reading	=	0.2	Mpa
Piston Diameter	=	30	mm
Area	=	706.858347	mm2
Load	=	P*A	
	=	0.000283	N
	=	0.283	(kN)

APPENDIX- D

SBC & SETTLEMENT CALCULATIONS

COMPUTATION OF BEARING CAPACITY AS PER IS: 6403:1981 FOR BH-1 to BH-8

1 Geometrical Data :

Shape of the Foundation	Square	
Shape considered for bearing capacity design	Square	
Size of Footing (B)	3.00	m
Breadth to Length Ratio of Foundation (B/L)	1.00	
Depth of Foundation below E.G.L. (D_f):	2.00	m
Inclination of Vertical Load with the Vertical (α)	0.00	Deg.

2 Soil Data :

Type of Bearing Strata :	Sand	
Design SPT "N" value of the Bearing Strata:	73	
Type of Shear Failure:	General	
Angle of Shearing Resistance - Limited to a Maximum of:	34	Deg.

3 Design Parameters:

Saturated Density of Soil above the foundation detph (γ_{bulk})	17.00	kN/m^3
Effective Overburden pressure at foundation level (q)	14.40	kPa
Water Table Correction Factor (w')	0.50	
Bearing Capacity Factors:		
N_c =	N/A	
N_q =	30.02	
N_γ =	42.39	
Shape Factors:		
S_c =	N/A	
S_q =	1.20	
S_γ =	0.80	
Depth Factors :		
D_c =	N/A	
D_q =	1.000	
D_γ =	1.000	
Inclination Factor:		
I_c =	N/A	
I_q =	1.00	
I_γ =	1.00	

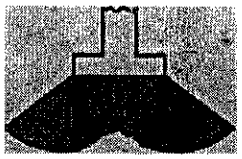
4 Ultimate Bearing Capacity (Qu) :

$Qu=q*(Nq-1)*Sq*Dq*Iq + 0.5*B*Y*Ny*Sy*Dy*Iy*w'$ 933.892 kPa

5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50	
Qsafe :	373.56	kPa
$Q_{safe\ limited\ to}$	**200**	**kPa**

This value of bearing capacity 200 kPa has to fullfill the settlement limit 50mm



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Settlement Calculation as per IS 8009-part1 for BH-1 to BH-8

Immediate settlement = q x B" x (1-m2)x If / Es

q - Allowable bearing pressure =	200	kPa
B - width of foundation =	3.0	m
m - poisson's ratio of soil =	0.3	
If - Influence factor (Square centre) =	1.12	
Es-Modulus of Elasticity of Soil =	51337	
Immediate settlement = q x B x (1-m2)x Is x If / Es =	0.01191	
Immediate Settlement =	**12**	**mm**

SAFE BEARING CAPACITY BASED ON SETTLEMENT

DEPTH	WIDTH	ALLOWABLE SETTLEMENT	ALL. BEARING CAPACITY
2.00m	3.00m	25 mm	200 kPa

As an immediate settlement of 12mm has been estimated, it is within the maximum allowable settlement of 25mm. Hence Spread / Isolated footing shall be adopted. Recommended Design bearing pressure = 200 kPa

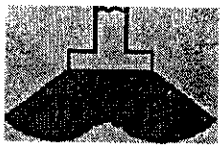

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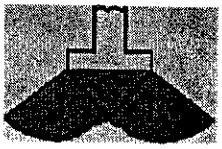
TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values BH-1	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
2.00	Highly to Moderately Weathered Rock (Incompressible Strata)					
3.00						
4.00						
5.00						
6.20						



JOSMAR CONSULTING ENGINEERS

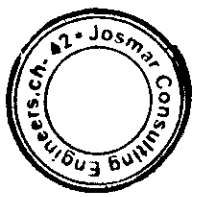
TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

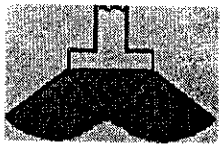
CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values BH-2	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
2.00	Highly to Moderately Weathered Rock (Incompressible Strata)					
3.50						
5.00						
6.40						





JOSMAR CONSULTING ENGINEERS

TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

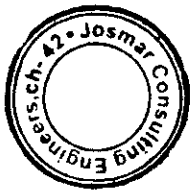
CLIENT : BHEL

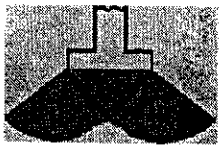
PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
	BH-3					
2.00	34	4.0	1.30	44	30	30
3.00	42	6.0	1.15	48	32	32
3.50	50	7.0	1.12	56	36	36
4.50	Highly to Moderately Weathered rock (Incompressible Strata)					
5.50						
6.50						
7.50						

Note: Below 3.5m, it is incompressible due to the presence of higly to moderately weathered Rock. Hence E value is considered upto 3.5m depth.





JOSMAR CONSULTING ENGINEERS

TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

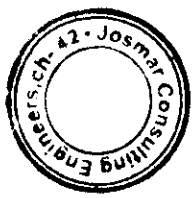
CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
	BH-4					
2.00	50	4.0	1.30	65	40	40
3.00	50	6.0	1.15	58	36	36
4.00	Highly to Moderately Weathered Rock (Incompressible Strata)					
5.00						
6.00						
7.00						
8.00						

Note: Below 3.0m, it is incompressible due to the presence of higly to moderately weathered Rock. Hence E value is considered upto 3.0m depth.



JOSMAR CONSULTING ENGINEERS

TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
	BH-5					
2.00	50	4.0	1.30	65	40	40
3.00	50	6.0	1.15	58	36	36
3.50	50	7.0	1.12	56	36	36
4.50	Highly to Moderately Weathered rock (Incompressible Strata)					
5.50						
6.50						
7.50						

Note: Below 3.5m, it is incompressible due to the presence of higly to moderately weathered Rock. Hence E value is considered upto 3.5m depth.

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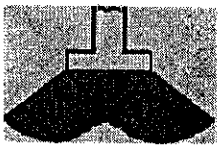


JOSMAR CONSULTING ENGINEERS

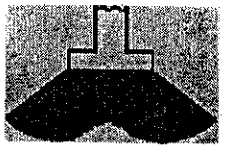
TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values BH-6	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
2.00	Highly to Moderately Weathered Rock (Incompressible Strata)					
3.00						
4.00						
5.00						
6.20						



JOSMAR CONSULTING ENGINEERS

TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

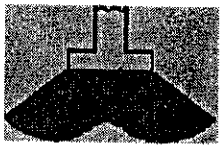
CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
	BH-7					
2.00	50	4.0	1.30	65	40	40
3.00	50	6.0	1.15	58	36	36
4.00	50	7.9	1.06	53	34	34
5.00	Highly to Moderately Weathered rock (Incompressible Strata)					
6.00						
7.00						
8.00						

Note: Below 4.0m, it is incompressible due to the presence of higly to moderately weathered Rock. Hence E value is considered upto 4.0m depth.



JOSMAR CONSULTING ENGINEERS

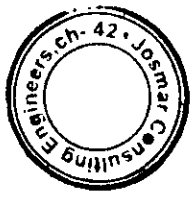
TABLE FOR CORRECTION OF SPT VALUES as per IS :2131-1981

CLIENT : BHEL

PROJECT : Factory Building

LOCATION : Ranipet

Depth (m)	Field SPT N- Values BH-8	Over burden pressure (t/m2)	Over burden correction factor (C_n)	Over burden Correction (N')	Dilatancy correction (N")	Corrected N Values
2.00	Highly to Moderately Weathered Rock (Incompressible Strata)					
3.00						



APPENDIX- E

CHEMICAL ANALYSIS OF SOIL

GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF FACTORY BUILDING AT ISRO BAY, RANIPET, TAMILNADU.

Chemical Analysis of Soil

Bore Hole : 2
Depth : 1m

S.No	Parameters	Protocol	Unit	Result
1	pH	IS 2720 (Part 26) 1987 (RA 2016)	-	8.25
2	Chloride as Cl	EPA 9253:1994	mg/kg	499
3	Sulphate	EPA 375.4:1978	mg/kg	2983
4	Nitrate	IS 14684:1999(RA 2016)	mg/kg	215
5	Carbonate	CVR/SOP/ENVI/262	mg/kg	BDL(DL:1.0)

Bore Hole : 03
Depth : 2m

S.No	Parameters	Protocol	Unit	Result
1	pH	IS 2720 (Part 26) 1987 (RA 2016)	-	8.15
2	Chloride as Cl	EPA 9253:1994	mg/kg	476
3	Sulphate	EPA 375.4:1978	mg/kg	2975
4	Nitrate	IS 14684:1999(RA 2016)	mg/kg	205
5	Carbonate	CVR/SOP/ENVI/262	mg/kg	BDL(DL:1.0)

Bore Hole : 05
Depth : 2m

S.No	Parameters	Protocol	Unit	Result
1	pH	IS 2720 (Part 26) 1987 (RA 2016)	-	8.05
2	Chloride as Cl	EPA 9253:1994	mg/kg	460
3	Sulphate	EPA 375.4:1978	mg/kg	2855
4	Nitrate	IS 14684:1999(RA 2016)	mg/kg	220
5	Carbonate	CVR/SOP/ENVI/262	mg/kg	BDL(DL:1.0)

Bore Hole : 06
Depth : 1m

S.No	Parameters	Protocol	Unit	Result
1	pH	IS 2720 (Part 26) 1987 (RA 2016)	-	8.25
2	Chloride as Cl	EPA 9253:1994	mg/kg	465
3	Sulphate	EPA 375.4:1978	mg/kg	2865
4	Nitrate	IS 14684:1999(RA 2016)	mg/kg	218
5	Carbonate	CVR/SOP/ENVI/262	mg/kg	BDL(DL:1.0)

BDL: Below Detection Limit; DL: Detection Limit