Tender Document for the work of:

Civil and structural works for water treatment plant at OPaL - Dahej in Gujarat

This tender document contains 228 pages

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

NOTICE INVITING TENDERS

1. Tender Notice Number : BAP:CF: 29/2013-14 dated 10.01.2014
2. Name of work : Civil and structural works for water treatment plant at OPaL - Dahej in Gujarat
3. Completion Time : As per schedule A
4. Estimated Cost : Not applicable
5. Document cost : Rs. 1040/- (To be remitted if down loaded from web also)
6. Earnest Money Deposit : Rs.2,00,000/-
7. Last Date & Time for receipt of Completed Tender. : Before 3.00 P.M. on 05.01.2014.
8. Date & Time of tender Opening:
   - Technical bid : At 03.00 P.M. on 05.01.2014.
9. Place of submission of Tender: : Office of Sr. Manager / Civil Township BHEL, Ranipet 632406. Vellore Dist. Tamil Nadu.
10. Period of Contract : 5 months

This tender document contains 228 pages including the following.

Part I :- Technical Bid from Page No.1 to 207 including General conditions of Contract, Special conditions of contract, drawings, Annexure A to G, Schedule A to D, etc
Part II :- Commercial Bid from Page No.1 to 21 of Bill of Quantities.

Tender should be submitted in a sealed cover consisting of three inner sealed covers such as i) EMD cover, ii) Technical bid cover & and all documentary evidence for meeting the qualifying requirements iii) Price bid cover (consisting of rate schedule only), super scribing the name of work, Tender Notice number , Due date of Opening.

Tenders without EMD shall be summarily rejected.

Note: **The tenderer shall return the duly filled in tender document after affixing signature on all the pages of the Tender Documents**.

Issued to :

1. Eligibility criteria:

1. Average annual financial turnover during the last 3 years ending 31st March 2013, should be at least 30% of the estimated cost.

AND

2. Experience of having successfully completed similar works during the last 7 years as on 30th September 2013 For Government Departments, Government Undertakings, reputed private sectors etc. should be any one of the following:

a. Three similar completed works costing not less than the amount equal to 40% of estimated cost.

OR

b. Two similar completed works costing not less than the amount equal to 50% of estimated cost.

OR

c. One similar completed work costing not less than the amount equal to 80% of the estimated cost.

Note:

1. Possession of PF registration number is not mandatory. However the successful tenderer has to register with PF authorities and furnish the registration number before first Running Account Bill.
2. Similar work means construction of residential buildings and office buildings involving finishing items.
3. BHEL reserves its right to reject the tender on account of unsatisfactory past performance by the present tenderer in another project / sister unit awarded under different enquiry.
4. Name of the bidders who stand qualified after compliance of the above qualification criteria shall be forwarded to customer (if required) for their approval and the price bids of only those bidders shall be opened.
5. The tenderers are requested to visit the site before quoting for the work. The site is around 40 KM south of Bharuch in Gujarat state.

Annexure-A

INSTRUCTIONS TO TENDERERS

1. Sealed Tenders for the above said work is hereby invited from Contractors experienced in works of similar kind and magnitude.
2. Tenders should be addressed to Manager (Civil Township), Near Mukundarayapuram Railway Station, Bharat Heavy Electricals Limited, BAP, Ranipet 632 406, Vellore Dist. T.N. Fax 04172-242026 cell 09943977151 email vdinakar@bhelrpt.co.in
3. The full name and address of the tenderer, name of the work, Tender Notice No. and the date of tender opening should be super scribed on the cover.
4. **The local address of the Contractor, the name of the person to whom all the correspondence are to be addressed should be indicated with telephone number (both office & residence), FAX / e-mail address, mobile no. etc..**
5. All entries in the tender documents should be in same ink. Erasures and over writing are not permitted. All cancellations and insertions should be duly signed by the tenderer concerned with proper indication of the name, designation and address of the person signing.
6. Tenderers shall fill in all the required particulars in the blank spaces provided for this purpose in the tender documents and also sign each and every page of the tender document including the drawings (wherever applicable) attached there to before submitting the tender.
7. Unit rates should be quoted in figures as well as in words in Indian Currency only – i.e., Rupees and Paise with reference to each item and for all the items shown in the attached schedule. The rates shall include all taxes & duties payable and including expenses towards PF and ESI contributions amount of each item and the total on each sheet as also the grand total amount of the whole contract shall be filled in by the tenderers.
8. BHEL reserves its right to reject the tender on account of unsatisfactory past performance by the present tenderer in another project / sister unit awarded under different enquiry.
9. The contractor shall not at any time do, cause or permit any nuisance on the site or do any thing which shall cause unnecessary disturbance or inconvenience to owners, tenants or occupiers of the properties near the site and to the public generally.
10. Trees designated by the Engineer – in – charge shall be protected from damage during the course of the works and earth level within 1 metre of each such tree shall not be changed. Where necessary such trees shall be protected by providing temporary fencing.
11. **Discrepancy in words & figures – quoted in the price bid**:
    a) If, in the price structure quoted for the required goods / services / works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
    b) If there is an error in a total corresponding to the addition or subtraction of sub totals, the subtotals shall prevail and the total shall be corrected and
    c) If there is a discrepancy between words and figures, 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).
    d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date up to which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

12. In quoting their rates, the tenderers are advised to take into account all factors including any fluctuations in market rates. No claim for enhanced rates will be entertained on this account after acceptance of the tender or during the currency of the contract.

13. **The rates to be quoted shall be firm** and shall inclusive of all applicable statutory levies arising from Central/State legislature and rules and regulations framed there under prevailing at the date 7 days prior to the last date of bid submission. Any variation in the existing statue or by introduction of new Tax and duties applicable to the above work will be to the account of BHEL at actual against the documentary evidence.

14. (a) **The tender for the works shall remain open for acceptance for a period of "THREE MONTHS" from the date of opening of tender.**

(b) Tenderer shall not increase their quoted rates, once the tender has been opened and during execution of the contract in case his/their tender is accepted.

15. Quantities shown in the attached schedule are only tentative and approximate and are liable for variation without entitling the contractors to any compensation, provided the total value of the contract does not vary by more than 20% (twenty percent).

16. **Before quoting, the tenderers are advised to inspect the site of work and its environments and be well acquainted with the actual working and other prevailing conditions, position of materials and labour**. They should be well versed with BHEL General Conditions of Contract, Instructions to tenderers, drawings wherever applicable and specifications and all other documents which form part of the agreement to be entered into subsequent to award of work. The tenderers shall specially note that it is the tenderer's responsibility to provide any item which is not specially mentioned in the specification or drawing, but which is necessary to complete the work.

17. Should a tenderer find discrepancies or omissions in the drawings wherever applicable / Specifications / Scope of work / Terms & Conditions attached to the tender documents or should be in doubt as to their meaning, he should at once address to the authority inviting the tender for clarifications.

Every endeavor is made to avoid any error which can materially affect the basis of the tender but the successful tenderer shall take upon himself to provide for the risk of any error which may be subsequently discovered and shall make no subsequent claim on account thereof.

18. In the event of tender being submitted by a firm, the tender must be signed separately and legibly by each partner or member of the firm or in their absence, by the person holding the power of Attorney on behalf of the firm concerned. In the latter case, a copy of the power of attorney duly attested by a Gazetted officer must accompany the tender.

19. Every tender must be accompanied by Demand Draft / Pay order for the amount mentioned as Earnest Money. This Earnest money will be refunded to the unsuccessful tenderers after finalization of the award of work. In the case of successful tenderer, the earnest money will be retained as part of the Security Deposit for satisfactory completion of the work.

20. The Earnest Money Deposit shall be submitted in a separate sealed cover and may be furnished in the form of Demand Draft drawn infavour of Bharat Heavy Electricals Limited, RANIPET payable at Ranipet), Vellore Dist. T.N.

21. Where as a result of forfeiture of the Earnest money for a particular work from the standing Earnest Money Deposit, the Standing Earnest Money Deposit of the contract is correspondingly reduced and until the said deficit shall have been made good in ful by the contractor, the benefit of tendering under the Standing Earnest Money Deposit Scheme shall not be available to the contractor.

22. Unless the Contractor whose tender is accepted signs the contract agreement within fifteen days (15 days) of the date of the order directing him to do so, the amount of Earnest Money already deposited by him may be forfeited and acceptance of his tender withdrawn.

23. If after opening of tenders, a tenderer revokes his tender or increases his earlier quoted rates or after acceptance of his tender does not commence the work in accordance with the instructions of Engineer-in-charge, the Earnest Money Deposited by him will be forfeited and acceptance of his tender withdrawn. If only a part of the work included in the tender had been awarded to the tenderer, the amount of Earnest Money to be forfeited will be based on the value of the contract so awarded.

24. Tenderers shall not increase their quoted rates in case the Bharat Heavy Electricals Limited negotiate for reduction of rate. Such negotiation shall not amount to cancellation of withdrawal of the original offer and the rates originally quoted shall be binding on the tenderers for a period of three months from the date of opening of tenders by which time a final decision on the award of work will be made. Once the contract is awarded to successful tenderer the rates quoted in the tender as accepted shall be valid and binding on him till the work is completed in all respects and final bill is paid.

25. Canvassing in any form in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable for rejection.

26. BHARAT HEAVY ELECTRICALS LIMITED reserves the right to reject any or all the tenders received or accept any tender or part thereof without assigning any reason thereof. In the case of acceptance of a part of tender, the time for completion may also be reduced to the extent considered appropriate by the accepting authority.

27. Conditional and unsigned tenders, **tenders containing absurd rates and amounts**, tenders which are incomplete or otherwise considered defective, tenders which are not in accordance with the tender conditions laid down by the Accepting Officer and tenders not submitted in the prescribed forms are liable to be rejected.

28. Where the tender called for covers only the building work proper and excludes internal services such as sanitary and water supply installation, electrification etc. the building contractor will have to leave pockets, chases, holes etc. as required for other works and will have to phase his work to ensure smooth progress of the work of the other agencies also as directed by the Engineer – in – charge.

29. Where the tender schedule contains special items of work such as special floor finishes, foam concrete for insulation, special water proofing treatment to roofs etc. it will be entirely at the discretion of the Head of Civil Engineering department to allot these items of work to other contractors specialized in these works. In such cases the main building contractor will have to render the necessary co-operation to the other agencies involved so as to ensure smooth progress of all works.

30. Documents to be submitted :

The contractors who are not on the approved list of contractors of this organization must submit the following testimonials simultaneously with their tenders. These testimonials shall be signed by the person (s) issuing the same indicating their name, designation and full address.

i) List of similar works executed by the company since last seven years.

ii) List of movable/immovable assets.

iii) Name of Banker and copy of latest audited Profit & Loss Accounts and Balance sheet. (Ref. Eligibility criteria).

iv) PAN number.

v) Name of the Banker, address and Account Number.

vi) Sales Tax & Service Tax Registration Certificates.

vii) PF & ESI Registration Certificate.

31. The tenders should be accompanied by a list of contracts already held by the Contractor at the time of submitting the tender and giving the following particulars:

    a) Name of work, value and address.

    b) The balance work remaining to be done on the same.

32. Tenders shall be received up to 15.00 Hours on the said due date and be opened on the same day at 15.00 Hours. Tenders received after 15.00 Hours would not be opened. The times indicated are Indian Standard Time (IST).

Tenders submitted by post should be sent in "Registered post with ack. Due / Speed post". These should be posted with due allowance for any delay in postal delivery. Tenders received after the due date and time of opening tenders are liable to be rejected.

If a tenderer submits only one envelope / cover containing all the bids or combined bids e.g. techno-commercial bid & price bid together, the bid is liable for rejection. The decision to accept such bids shall be at the sole discretion of BHEL, which may be done by BHEL after segregating the bids so received.

33. The contractor's responsibility under this contract shall commence from the date of receipt of the order or acceptance of Letter of Indent.

34. If a tenderer expires after the submission of the tender or after the acceptance of the tender, BHEL may, at their discretion, cancel such tender.

35. If a partner of the firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at their discretion unless the firm retains its character/s.

36. BHARAT HEAVY ELECTRICALS LIMITED will not be bound by any power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. They may however, recognize such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

37. If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage. Further the tenderer will be liable for any damage caused.

38. Words imparting the singular number shall be deemed to include the plural number and vice-versa where the context so requires.

39. The General and Special Conditions of Contract are complementary to each other and where they are in conflict, the special condition shall prevail.

40. The expenses for completing the stamping of the agreement shall be paid by the contractor.

41. Any covering letter and comments of the Contractor should be submitted in duplicate along with the offer.

42. Should a tenderer or a contractor on the list of approved contractors have a relative or in the case of firm or Company of contractors any of its share holder's relative is employed in a Gazetted Capacity in the Boiler Auxiliaries Plant, Bharat Heavy Electricals Limited, Ranipet 632 406, the authority inviting tenders shall be informed of this fact at the time of submission of the tender, failing which tender may be disqualified or if such a fact subsequently come to light, the relevant provisions of the General Conditions of Contract will apply.

43. These 'INSTRUCTIONS TO TENDERER'S & 'GENERAL CONDITIONS OF CONTRACT OF BHEL' shall be deemed to form an integral part of the contract agreement for the work to be entered into. In cases of variation between the two in any matter, the conditions in the 'THE INSTRUCTIONS TO TENDERERS' shall prevail. Extracts of some of the important clauses of BHEL G.C.C are enclosed (Annexure containing extracts of clauses 22, 40 & 60 of BHEL GCC). The contractor has to obtain, at his cost, a copy of the BHEL GCC, scrutinize the

same, and when submitting his tender, indicate his acceptance of BHEL GCC in the proforma enclosed at **Annexure B**.

44. The Contractor shall comply with the provision of Employees Provident Fund and Miscellaneous Provisions Act 1952 and rules, regulations and other orders issued there under. He, as an employer, shall be liable to pay employer's contribution/deductions towards PF under the PF Act in respect of all labour employed by him, for the execution of the contract in accordance with the provisions of the Employees Provident Funds and Miscellaneous Provisions Act, 1952 as amended from time to time. For this purpose he shall indicate the code number obtained from the Regional Provident Fund Commissioner or he should obtain a code number if he has not and produce the Photostat copy of the challan / receipt of monthly remittance of the contribution made by him to the PF Commissioner.

45. The Contractor should get himself registered with the E.S.I. Authorities as an independent Employer, obtain a separate code number and remit the dues in respect of the labour employed by him for the work and produce the Challans / Reciepts of remittance of the ESI contributions due under the E.S.I. Act to the Company authorities. He shall also furnish such returns, as are due, under the Act, to be sent to the appropriate authorities through the Principal Employer.

    i) If any action is brought in by P.F. Commissioner/ESI authorities on BHEL for the work done by the Contractor for his labourers regarding PF/ESI amount due, short remittances, non remittances etc., the Contractor shall defend the case on behalf of BHEL and/or reimburse BHEL the expenses so incurred.

    ii) If applicable, the Contractor shall apply and obtain license under Contract labour (R&A) Act 1970 and comply with the relevant provisions of this Act in respect of the labour employed by him for executing this contract. The Contractor shall furnish necessary returns to the authorities through the Principal Employer.

    iii) If applicable, the Contractor shall insure all his labourers and materials. Any claim by his employees for the damages shall be settled by the contractor even action is against BHEL or to reimburse the legal expenses incurred by BHEL.

46. Contractor shall produce necessary records, documents, explanation whenever he is called upon to do so, by any Government Agencies like ESI, PF, VIGILANCE etc..

47. TERMS OF PAYMENT:

    The Terms of payment will be as per the Terms & Conditions enclosed.

48. EXTRA ITEMS / DEVIATED ITEMS:

    No extra items of work shall be carried out by the contractor other than those authorized to do so in writing by the Engineer. For any such items of work executed as per instructions of Engineer, the rates will be fixed on the basis indicated under clause 52 of BHEL GCC.

49. SECURITY DEPOSIT: Chapter–III clause 18. (18.1.1 to 18.1.5) Page Nos. 12 & 13 of General Conditions of Contract booklet deleted & Revised below)

a) The rate of Security Deposit (SD) will be as below:

- Up to Rs. 10 lakhs: 10%
- Above 10 lakhs up to 50 lakhs: Rs. 1.lakh + 7.5% of amount exceeding Rs. 10 lakhs.
- Above 50 lakhs: Rs. 4 lakhs + 5% of the amount exceeding Rs. 50 lakhs.

The Securtiy Deposit should be collected before start of the work from the Contractor.

b) The security deposit may be furnished in any one of the following forms:

i) Cash (as permissible under the Income Tax Act)

ii) Pay order, Demand draft in favour of BHEL,

iii) Local cheques of scheduled banks, subject to realization.

iv) 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 pledged in favour of BHEL and discharged on the back).

v) Bank guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.

vi) 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.

vii) Security Deposit can also be recovered at the rate of 10% from running bills. However in such cases at least 50% of the Security Deposit should be collected before start of the work and the balance 50% may be recovered from the running bills.

viii) EMD of the successful tenderer can be converted and adjusted against the security deposit.

ix) The security deposit shall not carry any interest.

(Note: Acceptance of security deposit against Serial No.4 & 6 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.)

For extra items of work and deviated quantities, security deposit will be recovered at 10% of the value of deviated amount. The security deposit will be released as stipulated under clause 18.1.5 of GCC.

50. Loading factor for non-acceptance of compensation for delay clause:

Offers which deviate from this clause, will attract maximum 10% loading on the offer and accordingly proportionate percentage will be loaded for accepting lesser percentage of compensation for delay clause. Example: If the tenderer has accepted for maximum 5% compensation for delay clause, then balance 5% will be loaded for evaluating lowest bidder.

51. Interest on EMD & Security Deposit:

No interest shall be payable by BHEL on Earnest Money or Security Deposit, if applicable, or any money due to the Contractor by BHEL

52. **Benefits to Micro, Small & Medium Enterprises (MSE) :**

Guidelines of the Govt. of India shall be followed to provide benefits to MSE. MSE suppliers can avail the intended benefits only if they submit along with offer, attested copies of either EM-II certificate having deemed validity (Two years from the date of issue of acknowledgement in EM-II) or valid NSIC certificate or EM-II certificate along with CA certificate (Format enclosed as per Appendix – IV) applicable for the year, certifying quantum of investment in plant and machinery within the permissible limit as per the act for relevant status (Micro or small) where the deemed validity of EM-II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.

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

APPENDIX – IV

Certified by Chartered Accountant on letter head

This is certify that M/s ……, (hereinafter referred to as 'company') having its registered office at …… is registered under MSMED Act 2006, (Entrepreneur Memorandum No (part–II) ……..…… dtd :…… Category:……(Micro/Small)).(Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on date …… as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated 5, 2006 :
   Rs……... Lakhs
2. **For Services Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
   Rs…….. Lakhs

The above investment of Rs…….. Lakhs is within permissible limit of Rs…… Lakhs for ……. Micro/Small **(Strike off which is not applicable)** Category under MSMED Act 2006.

Date:

(Signature)

Name –

Membership Number –

Seal of Chartered Accountant

53. Reverse Auction:

"BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-*acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.*

In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance *to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue."*

Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit „online sealed bid" in the Reverse Auction. Non-submission of „online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

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

5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

7. 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" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

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

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

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL‟s standard practice.

12. 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 the 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.

13. 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.

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

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

ANNEXURE: B

It is hereby agreed by me/us that the BHEL General Conditions of Contract 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.

ANNEXURE 'C"

CLAUSE 22 OF GENERAL CONDITIONS OF CONTRACT

LABOUR

The contractor shall employ labour in sufficient numbers either directly or through sub-contractors 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. The contractor shall not employ, in connection with the works, any person who has not completed eighteen years of age.

The Contractor shall pay to labour employed by him, either directly or through sub-contractors, wages not less than fair wages, as defined in the Contractor's Labour Regulations.

The Contractor shall in respect of labour employed by him, either directly or through sub-contractors, comply with or cause to be complied with contractor's labour Regulations in regard to all matters provided therein.

The Contractor shall comply with the provisions of the payment of Wages Act, 1936, Minimum Wages Act, 1948, Workmen's Compensation Act 1923, Industrial Disputes Act, 1947, Maternity Benefit Act 1961, or any modifications thereof or any other law relating there to and rules made there under from time to time.

The Contractor shall be liable to pay his contribution and the employee's contribution of the State Insurance Scheme in respect of all labour employed by him for the execution of the contract, in accordance with the provision of "The Employees' State Insurance Act, 1948" as amended from time to time. 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.

The Contractor shall be liable to his contribution and the employees 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.

The Engineer-in-charge shall, on a report having been made by an Inspecting Officer as defined in the Contractor's Labour Regulations, 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.

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.

In the event of the Contractor committing a default or breach of any of the provisions of the aforesaid contractor's Labour Regulations, 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 Contractors 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.

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.

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.

SAFETY CODE

RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OFSAFETY 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.

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.

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.

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.

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.

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.

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.

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.

In case of fatal or disabling injury/accident to any person at construction 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.

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.

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.

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.

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.

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.

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.

ANNEXURE: 'D'

CLAUSE 40 OF BHEL GENERAL CONDITIONS OF CONTRACT

INSURANCE OF WORKS AGAINST DAMAGE AND LOSS DUE TO FIRE, STRIKE, TEMPEST, FLOODS, EARTHQUAKE, RIOT AND AGAINST DAMAGE BY AIRCRAFT – (Not applicable for this work)

The contractor shall, within one month after the date of acceptance of the contract, insure the work 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.

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.

ANNEXURE:'E'

Terms & Conditions

01. The contract period is as per Annexure "A".

02. The offer shall be submitted in three parts

    a) EMD

    b) Technical and Commercial Bid

    c) Price Bid

03. The technical bid shall cover all the technical details like

    (i) The Experience of the contractor i.e., the eligibility criteria of the tenderer shall be as specified in the tender notice.

    (ii) The list of technical personnel in their organization with their qualification & experience in the field.

    (iii) The infrastructure available with them

    (iv) The certificates received from the Government/ reputed organizations for having taken up similar work of equivalent value.

    (v) The list of clients with their addresses, contact persons.

    (vi) The list of works being done at present with the details of Contact persons and addresses.

    (vii) The EMD in the form of DD shall be drawn in favour of "Bharat Heavy Electricals Limited, Ranipet 632 406 payable at Ranipet, Vellore Dist. T.N.

    (viii) EMD shall be submitted in a separate sealed cover.

    (ix) The details of the tenderer's office with full address, Phone No. FAX No., Mobile No. shall be specified on the Tender document cover. If the tenderer gives wrong information, then the EMD submitted by the tenderer will be forfeited.

04. Prices shall be quoted in the price schedule as per the **BOQ**

05. The contractor shall comply with all statutory regulations like ESI, PF Contract Labour License (if applicable), Minimum Wages Act etc.,

06. The rate quoted shall include the wages payable to the employees, Statutory charges like ESI, PF, Bonus, Holiday & EL wages, safety appliances etc., While quoting the rate, the contractor shall take into account, the **implication of probable revision in the minimum wages also.**

07. The contractor shall issue necessary safety appliances like Safety Shoes, Gum Boots, Acid & Alkali Proof Hand Gloves, Masks etc., to their workers for safe operation.

08. The contractor shall maintain all the records w.r.t. ESI, PF, Wages & Attendance.

09. The tenderer shall fill up the questionnaire as per **Annexure – 2** and enclose along with Technical bid.

10. The minimum wages shall be as per Gujarat Minimum wages Act:

Please note that the minimum wages are normally revised by the authorities from every year April month.

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.

11. Normally, no advance payment shall be paid to the contractor.

12. However, advance payment in exceptional circumstances, if specifically provided shall be interest bearing and secured through an equivalent bank guarantee and shall be limited to a maximum of 5% of the contract value.

    Recovery of advances will be made from the running bills progressively such that the amount paid along with the interest is fully recovered by the time the contractor reaches 90% billing of total value of works to be executed. (Interest rate shall be the prime lending rate of SBI plus 2%).

13. During the progress of the work progressive payment will be made to the contractor on production of invoice with necessary statutory clearance and the bill will be processed within 15 days from the date of submission all the relevant documents.

14. Progressive payment shall be made for the actual work done on production of relevant invoice and all Payments will be made only through e-Mode, necessary authorization has to be submitted along with the tender as per the format enclosed.

15. **Return of surplus materials:**

    All surplus materials in good condition, which are not returned to the BHEL Stores and quantities of materials consumed in excess of max. permissible limit as fixed by BHEL shall be charged for at punitive rates, which will be 100% higher than the recovery rates. Excess consumption over and above the theoretical consumption up to 5% will be charged at the following rates:

    a) Reinforcement steel = Rs. 54,340.00 M.T.

    b) Structural steel = Rs. 51,320.00 / M.T.

SPECIAL CONDITIONS

Scope of work:

1. The work to be done under this contract consist of providing all labour, construction equipment, supervision, materials, scaffoldings, tools & plants, transportation & storage and all incidental items not shown or specified but reasonably implied or necessary for completion of entire civil works required.
2. Tenderer drawings annexed hereto are preliminary and give the nature of work and only for guidance to the tenderers. The work shall be carried out in accordance with drawings to be made available during the course of execution of works.
3. The contractor in the event of this work awarded to him, shall establish an office at site and keep posted an authorized responsible officer with a valid power of attorney for the purpose of the contract. Any order or instructions of the Engineer – in – charge or his duly authorized representative, at site office will be deemed to have been communicated to the contractor at his legal address.

Completion schedule:

The contractor is required to commence the work within 15 days from the date of issue of LOI, failing which the contract is liable to be cancelled and EMD / SD shall be forfeited.

The work shall be executed in a workman like manner and as per relevant Indian Standard Specification.

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.

NATURE , QUALITY OF WORKS

This work is the completion of balance works left out by the previous contractor special care shall be taken so that the continuity should be maintained with the existing work.

All materials supplied by the contractor and incorporated on the work shall conform to the latest IS specifications including the applicable amendments and revisions from time to time.

It is not the intent to specify here in all details, however the work in all respects shall confirm to CPWD / IS codes and standard engineering practices and workmanship. If there is any ambiquity between the specifications, the decision of the Engineer – in – charge shall be final and binding on the contract.

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.

The contractor shall prepare and submit quality assurance program / comply with any other quality plan requirement proposed by BHEL with all details along with tender documents and indicate the field equipments that he is going to use for quality assurance.

SITE CLEARANCE

Written permission for erection of temporary work sheds at site will have to be obtained from BHEL. Once the work is completed the contractor should remove his temporary shed and also the unwanted materials and dispose the debris as instructed by the Engineer – in – charge, around the constructed area, the contractor should remove all dbris and clear unwanted materials.

PROJECT INFORMATION

Project site is around 40 KM from Bharuch in Gujarat State.

Note:

Bidders are requested to visit site and verify themselves about the actual lead and assess the site condition before quoting for the job. No compensation for not acquainting themselves with the actual site conditions will be entertained at the later stage.

Technical specifications

01. All civil and road works shall have to be carried out strictly as per the specifications including all applicable official amendments and revisions laid down in Tamil Nadu Building Practice volume I & II for reference the above volumes are kept in the office of Addl. General Manager / Civil Projects & Services.

02. All structural and fabrication works shall have to be carried out as per BHEL General Specifications and special conditions incorporated under “Structural Steel Construction” (for reference the specifications are kept in the office of the Addl. General Manager / Civil Projects & Services.

03. Issue of stores materials to contractors and subsequent materials accounting will be done as per the conditions laid down under “ Issue of stores materials to the contractors”. The stores will be issued to the contractors at the rates specified in Schedule “B”.

Undertaking by the tenderer / contractor:

01. I/We have gone through the BHEL General Specifications and Special Conditions incorporated under “Structural Steel Construction”.

02. I/We have gone through the customer **/ EIL** specifications and agreed to follow the specification for construction.

ISSUE OF STORES MATERIALS TO THE CONTRACTOR (FORMS PART OF THE CONTRACT)

For all the materials like cement, reinforcement steel, structural steel and All free issue materials transporting and handling to work site shall be to the contractor's account.

(A) REINFORCEMENT STEEL:

01. Reinforcement steel (CTD/MS rounds) will be issued from BHEL stores section wise, at random lengths commercially available and by weight recoverable from the contractor at the issue rate specified.
02. The cost of all cuttings, conversion or substitution as well as wastage shall have to be borne by the contractor.
03. Measurements will be made for payment, section wise, linear length and converted to weight by considering the standard sectional weight / RM as given in the relevant IS standards.
04. All surplus reinforcement rod with the contractor shall be returned to BHEL stores at his own cost in the form of full lengths, useful cut bits and scrap. The invisible (non-returnable) wastage should not exceed a maximum of 5% of actual consumption.
05. The contractor shall return all the scrap to the disposal stores at his own cost. Bent rods will also be taken as scrap only, irrespective of their length. The maximum permissible limit of scrap without recovery is 5% of the actual consumption, should the quantum of returned scrap exceeds over 5% will be charged for and recovered at twice the issue rates. The quantity of steel rods not accounted for will be recovered at punitive rates which will also be twice the issue rates.
06. The reconciliation of issue and consumption will be made section wise and allowable wastage will also be worked out accordingly. Any variation between standard weight and the actual weight on account of the rolling variations the same will be allowed. The percentage limit given for the wastage is the upper limit and it is only to ensure proper planning in cutting the steel and it does not entitle to automatic consideration of the percentage for reconciliation purposes when the actual wastage section wise is less.
07. If steel issued to the contractor are damaged / lost, recovery will be made at penal rates which will be 100% more than the issue rate.

(B) STRUCTURAL STEEL:

01. The structural steel materials will be issued free of cost from BHEL stores at random lengths and sizes as stocked by BHEL and the cost of all cuttings, conversion, or substitution as well as wastage shall have to be borne by the contractor.

02. All surplus raw steel remaining with the contractor shall be returned to BHEL stores at his own cost, after completion of fabrication, in the form of full lengths, useful cut bits and scrap. The following yard stick will be adopted for the purpose of classification of scrap and useful cut bits.

i.	Mild steel and alloy steel plates and sheets	500mm x 500mm and above	Useful cut bits.
ii	Mild steel and alloy steel plates and sheets	Less than 500mm x 500mm	Scrap
iii	Structurals	One metre and above in length	Useful cut bits
iv	Structurals	Less than one metre in length	Scrap

03. All scrap shall be returned to BHEL stores based on their actual weight and useful cut bits / full lengths section wise with their section weights. The labour employed for segregation of scrap from useful cut bits will be at the cost of the contractor.

04. The invisible (non-returnable) wastage should not exceed a maximum of 2% by weight of fabricated steel work and the returnable wastage generated by way of scrap shall not exceed 3% by weight of fabricated steel. Every care should be taken to see that raw steel is utilized most economically by preparing necessary cutting plans and getting them approved from Engineer – in – charge.

05. Should the quantum of invisible wastage exceeds 2% permissible limit, recovery at two (2) times the issue rate (which will be evaluated on an average cost per tone basis considering the total raw steel materials issued) will be effected from the contractor's bill for the excess quantity of wastage involved.

06. If the quantum of scrap exceed 3% permissible limit recovery at two (@) times the issue rate will be effected from the contractor's bill for the excess quantity of scrap involved. The contractor shall submit a material tallying statement on completion of the work indicating the details of quantities of each material (section by section) received, quantities used for fabrication as per DOD lists, quantity returned in full lengths, useful cut bits and scrap and the quantity reckoned as invisible wastages.

WORKS CONTRACT – VARIOUS STATUTORY REQUIREMENTS – SPECIAL CONDITIONS

All the works contract in BHEL, will be governed by the following statutory regulations.

The rate indicated in the schedule excludes PF & ESI etc.

Since with effect from 01.11.1990 Provident Fund become applicable for engagement of a worker even for a single day, deduction of PF by the contractor has to be ensured. The contractor has to remit the PF dues of the workers before the submission of the running account bill.

Contractors are required to possess PF and ESI account with the code numbers allotted to them by the appropriate authorities at Vellore / Ranipet. They all comply with all the statutory requirements including minimum wages declared by BHEL. On award of contract they shall obtain necessary license under contract Labour Regulation and Abolition Act and comply with the provision of the said Act.

The lists of number of employees who are to be engaged with details of their names, age, father's name, etc. and their daily attendance have to be maintained by the contractor.

The contractor has to ensure payment of the statutorily prescribed minimum wages as applicable from time to time and maintain proper records of their timely disbursement. These records would need to be preserved and made available even after the contract is over for any verification by the various statutory authorities.

Proof of deduction as well as remittance of the PF dues to the appropriate authorities has also to be shown and proper records maintained.

Similarly the contractor should cover all his workers (including that of subcontractor's workers) under ESI scheme. The contractor shall be asked to furnish along with the bill each month details in the following format for having effected payment of both deduction / contribution towards PF/ESI to the concerned statutory authorities.

Details of workers employed by the contractor for the month of ……

Sl. No.	Name of the contract worker	No. of days worked	Amount of PF deducted	Amount of ESI deducted	Amount of payment of PF to authorities	Voucher ref. (Copy attached)	Amount of ESI contribution paid	Amount of ESI contribution paid	Voucher ref. (Copy attached)

The tenderer has to furnish proper returns to the concerned statutory authorities.

The tenderer has to ensure that all the required information in the tender is to be furnished, failing which BHEL reserves the right to reject the offer.

The contractor has to submit Sales Tax Registration No. irrespective of their liability, if any.

The final payment will be released only on production of clearance certificate from PF,ESI and Assessment orders from the Commercial Tax authorities concerned.

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	**Civil and structural works for water treatment plant at OPaL – Dahej in Gujarat**	**As per BOQ**	5 months

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

BILL OF QUANTITIES
ANNEXURE TO SCHEDULE – A

NAME OF WORK: **Civil and structural works for water treatment plant at OPaL – Dahej in Gujarat**

.

SL.NO.	APPROXIMATE QUANTITY	DESCRIPTION OF WORK	SPECIFICATION	RATE (both in figures and words)	UNIT	AMOUNT

As per separate sheets attached

SCHEDULE – B

ISSUE OF STORES MATERIALS TO THE CONTRACTOR

1. The following materials will be issued to the contractor at BHEL stores/stock yard.

SL.NO.	DESCRIPTION	PLACE OF	ISSUE RATE
1	MS Reinforcement rods cold twisted deformed rods	BHEL Stores or Stock Yard	Free issue
2	Structural Steel	BHEL stores or stock yard	Free issue

2. It will be the responsibility of the contractor to submit his indents for the above stores in writing at least SEVEN days in advance of the actual requirements

3. Issue of stores is subject to their availability at the place of issue noted above. Items of stores to be issued by BHEL, which are not available at the time of indenting by the contractor, may be supplied by BHEL after necessary procurement. The contractor shall not be entitled to any claim or compensation for delay in the supply of stores materials by BHEL under any circumstances.

4. The material will be issued only during the working hours of the BHEL stores department.

5. The contractor shall from time to time, render proper account of all materials issued to him by BHEL. If he fails to do, no further issue of materials will be made to him and he will responsible for any delay in the execution of the work, which may occur on this account.

6. All surplus materials in good condition, which are not returned to the BHEL Stores and quantities of materials consumed in excess of max. permissible limit as fixed by BHEL shall be charged for at punitive rates, which will be 100% higher than the recovery rates.

7. The steel materials if issued will be in random lengths and sizes as stocked by the BHEL and the cost of all cutting, conversion, substitution and fabrication as well as wastage shall have to be borne by the contractor.

8. The Structural and reinforcement steel will be issued at free of cost at BHEL stores, Recovery for the excess consumption up to 5% over and above theoretical consumption will be recovered as stated in the special condition. Beyond 5% punitive rate shall be charged, which will be 100% higher than the recovery rate specified above.

9. The decision of the accepting officer/Engineer-in-charge as the case may be as to the extent to which materials have been rendered surplus or consumed in excess of the actual requirements shall be final, conclusive and binding on the contractor.

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 -					

a. Machinery shall not be worked overtime without the written permission of the Engineer-in-charge and cost of liability of the same will be contractor's.
b. All coolies, waterman, etc., required in addition to BHEL crew mentioned in Column 4 above shall be arranged for by the contractor at his own expense.

SCHEDULE – D

NOTE: All drawings are to be signed by the contractor as well as the officer entering in to contract.

Civil and structural works for water treatment plant at OPaL – Dahej in Gujarat

SL.NO.	DRAWING NUMBER	DESCRIPTION

ANNEXURE - 2

Questionnaire should be answered by the tenderer by ticking the suitable boxes. Non filling up and signing liable for rejection at the discretion of the BHEL

Sl.No.	Description	Yes	No
01	Whether the tenderer **has understood** the scope of work and agrees to deploy manpower as indicated in the tender. (If there is any clarification required, the same may be got cleared from the Executive-in-charge, before submitting the offer.)		
02	Whether the tenderer **has agreed to all Terms & Conditions given in the tender.** (If there is any deviation, the same may be mentioned in separate sheet). No deviation certificate furnished.		
03	Whether the tenderer has their **own code for ESI & PF**. A copy of the certificate enclosed.		
04	Whether the tenderer has enclosed **copy of the present Service/ Sales/ Works contract sales Tax registration certificates.** If a vendor is exempted from the registration under Service/Sales Tax, the documentary evidence is attached.		
04a	Under which Service Head(s):		
04b	Service Tax @ % is applicable as extra for this tender.		
04c	Whether Input credit for the Materials is availed by the tenderer.		
04d	Whether Input credit for the service portion is availed by the tenderer.		
05	Whether the **vendor/Contractor is availing service Tax credit/VAT Credit on inputs.**		
06	Whether the vendor will submit **VAT/Service Tax invoice** as per the existing ACT and the rules their under.		
07	Whether the **PAN Number of the vendor** is furnished. If exempted from IT, the exemption certificate shall be enclosed.		
08	Whether the tenderer agrees to keep the validity of their offer for **three months** from the date of opening of bid.		
09	Whether Audited P&L account and balance sheet for the last three years enclosed.		
10	Whether the tenderer **agrees for the payment terms** BHEL.		
11	Whether the tenderer submitd **EMD along with technical bid.** (If not enclosed , the tender will not be considered.)		
12	Whether the tenderer has agreed to **submit Security** Deposit after conversion of EMD **before start of the work**		
13	Whether the tenderer has **enclosed the list of their clients with addresses & contact persons.**		
14	Whether the tenderer has enclosed **the certificates/ evidence of Government/ Reputed** organization for the similar work done to their clients.		
15	Whether the tenderer has enclosed the **list of similar works Carried out** with supporting documents		
16	Whether the **includibility / excludability of the taxes and duties** in the rates offered has been clearly indicated. If the same is not		

	done, BHEL WILL CHOOSE TO ASSUME THE RATES ARE INCLUSIVE ONLY.		
17	All payments will be made through **e-payment** only for which required certificate to be submitted along with tender as per the enclosed format.		
18	Whether the tenderer has enclosed the **list of technical personnel,** their qualification & experience who will be deployed for this work.		
19	Whether the tenderer has indicated the address of their local office in Ranipet along with phone no. & fax no.		
20	Whether the tenderer has enclosed the certificate to establish that the tenderer is an **independent contractor** working on his own.		
21	Whether the tenderer agreed for the period of completion mentioned in schedule A		
22	Whether the tenderer agreed for the compensation for delay as specified in clause 43 of General Conditions of Contract.		

Note: If any of the question is not applicable, please mention as “N. A.”

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

AUTHORITY TO TENDER

Tender Notice No. : BAP:CF: 29/2013-14

Office of the Addl. General Manager
(Civil Projects & Services),
Bharat Heavy Electricals
Limited, Ranipet 632 406

Tender Schedule No. :

Percentage rate tender for works required in BHEL – Ranipet. Messers / Mr. ……..of…….. are / is hereby authorized to tender for the above work. The tender is to be delivered at the Office of the Addl. General Manager / Civil Projects & Services by ……..hours on ……..addressed to the Office of the Addl. General Manager (Civil Projects & Services) Bharat Heavy Electricity, Ranipet – 632 406 subscribed "tender" for the work of **Civil and structural works for water treatment plant at OPaL – Dahej in Gujarat.**

Any correspondence concerning this Tender should be addressed as indicated above quoting the Tender Notice and Schedule Nos. and other relevant particulars.

Bharat Heavy Electricals Limited do not Bind Themselves to Accept the Lowest or any tender. Further Bharat Heavy Electricals Limited reserves the right to reject any or all the Tender Received or Accept any Tender or Part Thereof without Assigning any Reason there of.

Signature of the Officer,

Issuing the documents

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

TENDER

To.

The Bharat Heavy Electricals Limited,

Boiler Auxilaries Plant,

Ranipet 632 406.

I/We hereby offer to carry out the work of **Civil and structural works for water treatment plant at OPaL – Dahej in Gujarat.**

1. I/We have carefully perused the following documents connected with the above noted work and agree to abide by the same.
2. Specifications (General & particular)
3. Drawings.
4. Schedule 'A','B','C','D','E' and Bill of Quantities attached hereto.
5. BHEL General & Special conditions of contract. Tender Notice, Annexures and Instruction to Tenderers attached hereto,.

I/We forward herewith the sum of Rs. 2,00,000/- as Earnest Money which shall be refunded if this tender is unsuccessful. I/We further agree to deposit such sum which along with the sum of Rs.2,00,000/- mentioned above shall make up the full Security Deposit for this work as provided for under condition 18 of the Bharat Heavy Electricals Limited, General Conditions of Contract.

I/We further agree to execute all the work referred to in the said documents upon the terms and conditions contained or referred to therein and as detailed in schedule 'A' and Bill of Quantities annexed thereto and to carry out such deviations as may be ordered vide condition 6 of the BHEL General Conditions of Contract up to a maximum of 20% of tendered amount.

I/We further agree to refer all disputes, as required by condition 60 of the said General Conditions of Contract, to the Sole Arbitration of an Officer, to be appointed by the General Manager, BHEL, in his sole discretion, whose decision shall be final and binding on both the parties.

Witness:

1.

2.

Signature of the Tenderer,

Date:

Accepting officer

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

CERIFICATE OF NO DEVIATION

I / We . . . . . of M/s . . . .

Hereby certify that there is no deviation from the tender conditions either technical or commercial and I am /We are agreeing to all the terms and conditions mentioned in the Tender Specification.

Date:

Signature of the tenderer

Civil works for Water Treatment Plant at OPaL Dahej in Gujarat

Service Tax

The Bidder shall not include Service Tax in their quoted rates but the bidder has to separately indicate the Service Tax rate, amount and workings thereof in the Price bid schedule included in the bid documents.

If service tax amount is not indicated separately in the price bid schedule included in the Bid documents, it will be presumed that the quoted rate is inclusive of applicable service tax and bids will be evaluated accordingly.

Section - A. Works Contract involving supply of materials:

Approximate value of free issue materials supplied by BHEL will be around **Rs. 119.29 Lakhs**

Bidders have to quote full Service Tax payable in the Price bid format included in the Bid document. Out of Full Service Tax amount indicated by the Bidder, 50% of the same shall be considered for evaluation of offers in the case of Bidders being an Individual, Sole Proprietary ship firm, Hindu Undivided Family or Partnership firm whether registered or not, including Association of Persons. For Other Bidders full Service Tax quoted shall be considered for evaluation.

In such cases of successful Bidder being an Individual, Sole Proprietary ship firm, Hindu Undivided Family or Partnership firm whether registered or not, including Association of Persons, 50% Service Tax amount quoted in the Price Bid format will be considered for reimbursement against valid documentary evidence. For others Service Tax quoted in the Price Bid will be considered for reimbursement against valid documentary evidence.

In such cases of Bidders being an Individual, Sole Proprietary ship firm, Hindu Undivided Family or Partnership firm whether registered or not, including Association of Persons, Service Tax payable by BHEL as receiver of Works contract Service i.e. 50% of the Service Tax payable for Works contracts service on composition basis on quoted price and the value of Free issue materials by BHEL @ **2.472%** presently, shall be added to arrive at the total cost to BHEL for each bidder for the purpose of evaluation of Bids.

The applicable Service Tax is _____% (tenderer has to quote this percentage at the time of submission).

ACCEPTANCE FOR ELECTRONIC FUND TRANSFER / RTGS TRANSFER

01	**NAME & ADDRESS OF THE SUPPLIER / VENDOR PHONE NO. WITH STD CODE**	
02	**VENDOR CODE** (as in WORK ORDER)	
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 / OD / CASH CREDIT
G)	**VENDOR NAME AS PER BANK RECORDS**	
H)	**BANK BRANCH RTGS IFSC CODE**	
I)	**BANK BRANCH NEFT IFSC CODE**	
J)	**VENDOR'S EMAIL ID** (give two ids)	
K)	**NAME OF AUTHORISED 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._____

Note: This EFT Form is to be submitted duly filled in manually in all fields and duly signed by Authorised Signatory and certified by Banker.

GENERAL CONDITIONS OF CONTRACT
FOR
LUMP SUM, ITEM RATE AND
PERCENTAGE CONTRACT

SPECIMEN

Civ 02

GCC

Bharat Heavy Electricals Limited
BOILER AUXILIARIES PLANT
RANIPET-632406

GENERAL CONDITIONS OF CONTRACT
FOR
LUMP SUM, ITEM RATE AND
PERCENTAGE CONTRACT

Bharat Heavy Electricals Limited

BOILER AUXILIARIES PLANT

RANIPET - 632 406.

CONTENTS

Condition No.	Description	Page No.
	CHAPTER - I	
1.	DEFINITIONS	1
	CHAPTER - II	
	SCOPE OF CONTRACT	
2.	HEADING TO THE CONTRACT	4
3.	CONTRACT DOCUMENTS	4
3A.	SECRECY	4
4.	WORKS TO BE CARRIED OUT	4
5.	PROVISIONAL ITEMS	5
6.	DEVIATIONS	5
7.	TIME	6
8.	STORES & MATERIALS	7
9.	DELAY & EXTENSION OF TIME	9
10.	PATENT RIGHTS	10
11.	OCTROI & OTHER DUTIES	10
12.	ROYALTIES	10
13.	PLANT & EQUIPMENT	10
14.	ASSIGNMENT OR TRANSFER OF CONTRACT	11
	a) SUB - CONTRACT	11
15.	COMPLIANCE TO REGULATIONS AND BYE-LAWS	11
16.	DELETED	11
17.	DELETED	11

CHAPTER - III

SCOPE OF CONTRACT

18.	SECURITY DEPOSIT	12
19.	ORDERS UNDER THE CONTRACT	13
20.	ADMISSION TO SITE	13
21.	CONTRACTOR'S SUPERVISION	14
22.	LABOUR LAWS	15
23.	SAFETY RULES	15
24.	WATER	15
25.	TEMPORARY WORKSHOPS, STORES ETC.	15
26.	TOOLS & PLANT ON SITE	16
27	STATEMENT OF HIRE CHARGES	16
28.	PRECAUTIONS AGAINST RISKS	16
29.	NOTICE & FEES	16
30.	SETTING OUT OF THE WORKS & PROTECTING & MAINTAINING SIGNALS AND WORKS	16
31.	SITE DRAINAGE	17
32.	EXCAVATIONS, RELICS ETC.,	17
33.	FOUNDATIONS	17
34.	COVERING IN WORK	17
35.	APPROVAL OF WORKS BY STAGES	18
36.	EXECUTION OF WORKS	18
37.	DAY WORK	18
38.	INSPECTION OF THE WORK	18
39.	RESPONSIBILITY FOR BUILDING	19
40.	INSURANCE OF WORKS	19

41. DAMAGE AND LOSS TO PRIVATE PROPERTY & INJURY TO WORKMEN 20
42. COMPLETION 20
43. COMPENSATION FOR DELAY 21
44. LAWS GOVERNING THE CONTRACT 21
45. CANCELLATION OF CONTRACT FOR CORRUPT ACT 22
46. CANCELLATION OF CONTRACT FOR INSOLVENCY 22
ASSIGNMENT OF SUB-LETTING OF CONTRACT
47. CANCELLATION OF CONTRACT FOR DEFAULT 23
48. TERMINATION OF CONTRACT FOR DEATH 24
49. SPECIAL POWERS OF DETERMINATION 24
50. DELETED 24

CHAPTER - IV

VALUATION AND PAYMENT

51. RECORDS & MEASUREMENTS 25
52. VALUATION OF DEVIATIONS 26
53. REIMBURSEMENT / REFUND ON VARIATION IN PRICE 27
54. ADVANCES ON ACCOUNT 28
55. FINAL BILL 29
56. PAYMENT OF BILLS 29
57. RECOVERY FROM CONTRACTORS 30
58. POST-TECHNICAL AUDIT OF WORK AND BILLS 30
59. REFUND OF SECURITY DEPOSIT 30
60. ARBITRATION 30
61. JURISDICTION OF COURT 31
62. PAYMENT OF TAXES, DUTIES & LEVIES 31

ANNEXURE

LABOUR LAWS ANNEXURE - I 32
SAFETY RULES ANNEXURE - II 50

CHAPTER - I

DEFINITIONS IN THE CONTRACT AS HEREINAFTER DEFINED

The following terms shall have the meanings hereby assigned to them, except here the context otherwise requires :-

a. **'CONTRACT'** means and includes the conditions of contract, the documents forming the tender and acceptance, thereof, specifications, drawings, bill of quantities, schedule of rates and prices if any, general and special conditions of contract, schedules A,B,C,D and or general summary attached to the form of tender and contract agreements. All these terms and conditions and documents as applicable taken together shall be deemed to form one contract and thereby complementary to one another.

b. **'TENDER DOCUMENTS'** means and includes the form of tender, the applicable schedules A, B, C, D and / or general summary, general and special conditions of contract and specifications and drawings as given to the contractors on payment.

c. **'THE CONTRACTOR'** means the person or persons, firm or company whether incorporated or not, whose tender is being accepted and includes the contractor's legal / personal representatives, successors and permitted assignees.

d. **'THE WORK'** means the work described in the tender documents and / or individual work orders, drawings and specifications as may be issued from time to time to the contractor by the Engineer - In - Charge within the powers conferred upon them including modified or additional works and obligations to be carried out either at the site or at any factory, workshop or any other place as required for the performance of the contract.

e. **'THE SITE'** means the lands and other places on, under, in or through which the work has to be executed under the contract and any other lands and places provided by the company for the purpose of carrying out the contract.

f. **'THE COMPANY'** referred to as BHEL in this contract shall mean M/s. Bharat Heavy Electricals Limited including its Board of Directors, Director, Executive Director, Group General Manager, General manager, Dy. General Manager and / or the Officers of the company Including Sr. Manager, Manager, Dy. Manager, Sr. Engineer and Engineer authorised on behalf of Bharat Heavy Electricals Limited, Boiler Auxiliaries Plant, Ranipet.

g. **'THE ACCEPTING OFFICER'** means the official who signs the contract agreement on behalf of Bharat Heavy Electricals Limited and includes his successors.

h. **'ENGINEER-IN-CHARGE'** means the Officer / Engineer of BHEL who is in charge of works under the contract and includes such other Officer / Engineer as may be notified by BHEL from time to time.

i. **'APPROVED AND DIRECTED'** means approval and / or directions of the Officers / Engineers of BHEL issued from time to time with regard to the contract.

j. In the case of Lump-sum Contracts **'CONTRACTOR'S PERCENTAGE'** means the percentage offered by the Contractor as addition to our deducation 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.

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.

k. **'THE CONTRACT SUM'** means the sum accepted or the sum calculated in accordance with the prices accepted in the tender and / or the contract rates as payable to the contractor for the execution and full completion of the work.

l. The **'FINAL SUM'** means the actual amount payable under the Contract by BHEL, to the Contractor for the entire Execution and full completion of the work.

m. The **'DATE OF COMPLETION'** is the date or dates for completion of the whole or any part of the work as the case may be set out in or ascertained in accordance with the individual work orders of the tender documents, or any subsequent agreed amendments thereto.

n. A **'WEEK'** means sevan days without regard to the number of hours worked or not in any day in that week.

o. A **'DAY'** means a day of 24 (Twenty Four) hours irrespective of the number of hours worked or not in that day.

p. A **'WORKING DAY'** means any day other than the holidays declared by BHEL, Ranipet.

q. **'DEVIATION ORDER'** means an order given by the Engineer-in-Charge to effect an alternation addition or deduction which does not readically affect the scope or nature of the contract.

r. **'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.

s. **'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.

t. **'PROVISIONAL ITEMS'** means items for which approximate quantities have been included in the tender documents.

u. **'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 utilised on the particular item of work referred to.

v. Heading of these terms and conditions shall not affect the interpretation or construction thereof.

w. The **'DATE OF CONTRACT'** shall mean the date / dates on which the parties to the contract have signed the contract agreement.

x. **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.

y. **'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 BHEL 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 provide in the Letter of Intent. Unless and untill the contract agreement is executed, the Letter of Intent read in conjunction with the tender documents will constitute a binding contract.

CONTRACTOR / TENDER **ACCEPTING OFFICER**

CHAPTER - II

SCOPE OF CONTRACT

2. Heading to the 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 of 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 of the Specifications on the site and the Engineer-in-Charge or his representative shall be at all reasonable times 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 on any work in connection with this contract have noted that the Indian Officials Secrets Act 1923 (XIX of 1923) applies to them and shall continue so to apply even after the execution of such work under the 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" included 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 recognised principles and unless otherwise stated, the descriptions given therein shall be held to include waste on materials carriage and cartage, lead, hoisting, setting, fitting in position and all other labour necessary in and for the entire execution and full completion aforesaid. Any error in description or quantity in Schedule "A" or any omission therefrom 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" 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 or valuation as for deviations.

No work under these items is to be begun 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 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, when ever 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 by the Contractor to any matter concerning the order shall be notified 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) owing to differences or controversy that may arise from such an objection. In the absense such notification 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

Time is the essence of the contract and is specified in the tender documents or in each individual Work Order.

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 competion of the individual items there of and the contract or order as a whole. It shall indicate the fore cast 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 upto 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 there on 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 amitted. Provided the cause for suspenstion is not attributable to any default of the contractor's part to proceed with or fulfil 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-charge, 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 require 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 expence 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 material obtained for the works 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 mention 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.

All materials issued to the Contractor by BHEL for incorporation or fixing i the works shall on completion or on fore-closure 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. In 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 closing 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 custody, of the contractor, become damaged to such an extend that they cannot be usefully utilised, either in the same work or in other works, the Engineer-in-charge shall not accept the stores and in 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 material 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 reconcilation 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 supplies by BHEL then, in addition to any other liability which the Contractor would incur, the Engineer-in-charge may, be written notice to the Contractor, require 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 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-charg. 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 originally supplied by him and upon such removal the same shall revert in and become the property of the Contractor.

Should the Engineer-in-charge consider at any time during the construction or re-construction 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 Contracator 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 of to be 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 willl 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 endeavour 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. Octroi and Other Duties

All changes on account of Octroi, Terminal or Sales Tax and / or other duties on materials obtained for the Work (excluding materials provided by BHEL on payment) shall be borne by the Contractor.

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 and Equipment

The Contractor, shall at his own expense, supply all tools, plant and equipment (here-in-after referred to as T & P) required for the execution of the contract other than those listed in Schedule - C which subject to their availability may be hired by BHEL to the Contractor or issued free for use in the execution of the work, as specified in Tender documents.

14. Assignments or Transfer of Contract

The Contractor shall not without the prior written approval of the Accepting Officer assign or transfer the Contract or any part thereof, or any share, or interest there in to any other person. 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 Accepting Officer to the assignment or transfer of such money is given.

14 (a) Sub - Contract

The Contractor shall not sub-let any portion of the Contract without the prior written approval of the Accepting Officer.

15. Compliance to the Regulations and Bye - Laws

The Contractor shall confirm to the provision of any statute relating to the work and regulations and bye-laws of any local authority and of any water and lighting Companies or Undertakings with whose system the work is proposed to be connected. He shall, before making any variation from the drawings or the specifications that may be neccessiated for such connections give the Engineer-in-charge notice, specifying the variation proposed to be made and the reasons there for and shall not carryout any such variation until he has received instructions from the Engineer-in-charge in respect thereof. The Contractor shall be bound to give all notice required by Statute Regulations of Bye-laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

16. BLANK

17. BLANK

CHAPTER – III

PERFORMANCE OF THE CONTRACT

18. Security Deposit

18.1.1 Security Deposit should be collected from the successful tenderer. The rate of Security Deposit will be as below:

Upto Rs. 10 lakhs	10%
Above Rs. 10 lakhs up to Rs.50 lakhs	1 lakh+7.5% of the amount Exceeding Rs. 10 lakhs.
Above Rs. 50 lakhs	Rs.4 lakhs + 5% of the amount Exceeding Rs. 50 lakhs.

The security Deposit should be collected before start of the work by the contractor.

18.1.2 Security Deposit may be furnished in any one of the following:

i) Pay Order, Demand Draft in favour of BHEL.

ii) Local cheques of scheduled banks, subject to realization.

iii) 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 pledged in favour of BHEL and discharged on the back).

iv) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act subject to a maximum of 50% of the total security deposit value. The balance 50% has to be remitted either by cash or in the other form of security. 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) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the Security Deposit should be collected before start of the work and the balance 50% may be recovered from the running bills.

vii) EMD of the successful tenderer shall be converted and adjusted against the security deposit.

Viii) The security deposit shall not carry any interest.

NOTE: Acceptance of Security Deposit against Sl. No. (iv) and (vi) 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.

18.1.3 Security deposit shall not be refunded to the contractor except in accordance with the terms of the contract.

18.1.4 All compensation or other sums of money payable by the contractor to BHEL, under the terms of this contract or under any other contract with BHEL, may be deducted from the security deposit or realized by the sale of the securities or from the interest arising there from or from any sums which may be due or may become due to the contractor payable by BHEL on any account whatsoever against this contract or any other contract with BHEL, and in the event of his security deposit being reduced by reason of such deduction or sale as aforesaid, the contractor shall within seven days thereafter make good in cash or in securities endorsed as aforesaid, any sum or sums by which the security deposit has been so reduced.

18.1.5 50% of the security deposit may be refunded on completion of the work after payment of the final bill and the balance 50% of the security deposit is refundable only after the expiry of the maintenance period of six (6) months from date of completion of work as stipulated in the contract concerned.

19. Orders under the Contract

All orders, notices, etc., to be given under the contract shall be in writing, typescript or printed and if sent by registered post to the address given in the tender of the Contractor, 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.

20. 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 on account be allowed to extend his operations beyond these areas The Contractor shall provide if necessary or requried at the site, temporary access there to and shall alter, modify and maintain the same as required from time to time. He shall out and clear away the access route when no longer reqsuired restoring the 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) on 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 here of shall be taken published or otherwise circulated without the prior approval of the Engineer-in-charge.

No such approval shall however exempt the Contractor from cemplying with any statutory provison 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-charge shall have the power to exclude from the site any person whose admission there to may, in his opinion be undesirable for any reason whatsoever

The Contract shall be governed by the security regluations of BHEL including the entry exit timings, use of roades 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 under by circumstances.

21. Contractors Supervision

The Contractors shall either himself supervise the execution of the Contractor or shall appoint a competent Agent approverd by the Engineer-in-charge to act in his stead The Contractor shall employ an Engineer/Agent having atleast a Degree of Bachelor of Civil Engineer from a recognised University/on any work with a Contract value exceeding rupees two lakhs, and having atleast a Diploma in civil Engineering from a recognised college, on work with a contract value exceeding Rs. 50,000/- but not exeeding rupees two lakhs.

The Employment of an Engineer/Agent as aforesaid shall not be necessary if theContractor himself is in possession of a recognised technical qualification and is, in opinion of the Engineer-in-charge, capable of the receiving instructions of the Engineer-in-charge and of the executing the work to the satisfaction of the Engineer-in-charge. If the Contractor fails to appoint a suitable Engineer/Agent as aforesaid, the Engineer-in-charge shall have full powers to suspend the execution of work and stop payment of any advances that may have become due until such date as a suitable Engieer/Agent is appinted and the Contractor shall be held responsible for the delay caused to the work and no extension of time on this account shall be given to him as stipulated in condition (9) above.

Orders given to the Contractor's Agent Engineer shall be considered to have the same force as if they had been given contractor himsef,

The Contractor or his Agent shall be in attendance at the site during all working hours and shall superintend the executing of work with such additional assistance in each trade as the Engineer-in-charge may consider necessary.

The Contractor or his accredited agent shall attend when required and without making any claim for doing so, either the Office of the Engineer-in-charge or the work site to receive instructions.

The Engineer-in-charge shall have full powers, and without assigning any reason to require the Contractor immediately to cease to employ in connection with the

Contract any Agent, servant or employee whose continued employment is, in his opin on undesirable

The contractor shall not be allowed any compensation on this account.

22. Labour

The contractor shall elmploy labour in sufficient number either directly or through sub-contractors to maintain the required rate of progress and of quality ensure wormanship of the degree specified in the contract and to the satisfaction of the Engineer-in-charge. The contractor shall comply with all labour laws inforce from time to time.

23. Safety Rules

The Contractor shall comply with all safety rules of BHEL.

24. Water

The Contractor shall allow in his Tender and provide at his cost all water required for the work or his employees on the work, togethere with all pipes and fittings or other means that may be necessary or required to ensure a proper and ample supply of water for all purposes connected with the work.

In the event of a provision existing in the Tender documents for supply of water on payment by Bharat Heavy Electricals Limited, water will be supplied from the BHEL supply system or orther sources at any points fixed by the Engineer-in-charge on the site of work. The contractor shall make necessary arrangment for lifting pumping carrying or conveying the water as required at his own cost. The levy of water charges to be borne by the contractor in such case shall be specifically mentioned in the Tender documents.

25. Temporary workshops, store 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, siting, and erection of these buildings shall have the approval of the Engineer-in-charge and the Contractor shall all 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 termporary building shall be cleared away and the site restored and left in a clean and tidy condition to the entire satisfaction of the Engineer-in-charge.

26. Tool 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 defeult of the contractor he shall forthwith remove from the site all tool, plant, equipment etc., (other than those as may have been provided by BHEL)

27. Statments of Hire Charges

A monthly detailed statment of the hire charge incurred in respect of BHEL tools. plant, equipments etc., shall be given to the Contractor by the Engineer-in-charge.

28. Precaution Against risks

The Contractor shall be responsible for providing at his own expense, for all precaution to prevent loss or damage and for the necessary steps to be taken for the said purpose until the works have been handed over complete, in all respects to the Engineer-in-charge.

The Contractor shall provide all watchman necessary for the protection of the site, the work, the matrials, tools, plant, equipment and anything else lying on the site during the progress of the work. He shall solely be responsible for and shall take all reasonable and proper steps for protecting, securing, lighting and watching all placess on or about the work and the site which may be dangerous to any person whomsoever.

29. Notices and fees

The Contractor shall give all notices required by any Statutory provision or by the regulations and/or bye-laws of any local / 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 andsall make and supply all drawings and plans required in connetion with any such notice.

30. 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 cotractor to set out the work. the cotractor 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 deducted from any money then or thereafter becoming due to the Contractor.

Where requested by the Contractor, the level marks, centre line and chainage pegs corresponding to those shown on the Drawing will be pointed out to the Contractor on the ground but all bench marks or chainage pegs additional to those shown on the Drawing will be set out by BHEL authorities.

31. 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.

32. 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 directs.

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 Electricals 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.

33. Foundations

The Contractor shall not lay any foundations untill the excavations for the same have been examined and approved in writing by the Engineer-in-charge.

34. 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 uncover such work at his own expense.

35. 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-charge thereon shall be final conclusive.

36. 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 relevent entries in this book. Such entries will rank as order to notices in writing the intent and meaning of these conditions.

37. 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 payweek. 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, quantites, 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 Lumpsum 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.

38. 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). Whereof 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 as 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 to 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 of to the Contractor to rectify.

39. 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.

40. Insurance

The Contractor shall with in one month after the date of acceptance of the Contract, insure the work against loss or damages to the contract works, temporary work and materials erected in performance of the contract "all risks" basis from the time of arrival on site until taken over by BHEL on completion of the Contract.

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 ful 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 escavation 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. The insurance shall be effected in the name of BHEL and the Contractor shall submit to BHEL a draft of the insurance policy for approval. The policy when issued will be lodged with BHEL together with receipts of premium for such insurance and the contractor shall maintain such policienis force until the obligations of the Contracotr are full discharged.

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 Contracator or may at his descretion refuse payment of any advances to the Contractor until the Contractor shall have complied with the terms of this condition. This provision does not, however, absolve the Contractor of his responsibility for taking up the Insurance. The Contractor is, therefore, primarily responsible for the insurance in time.

41. Damage and Loss to Private Property and Injury to Workmen

The Contractor shall at his own expense reinstate and make good to the satisfaction of the Engineer-in-charge and pay compensation for any injury, loss or damage occassioned to any property or rights whatever including property and rights of BHEL (or agents, servants to employees of BHEL) the injury loss of damage arising out of or in any way in connection with the execution of the contract and further the Contractor shall indemnify BHEL against all claims enforceable against BHEL or any agent, servant, or employee of BHEL a private person, in respect of any such injury (including injury resulting in death loss or damage to any person) who so ever or property, including all claims which may arise under the Workmen's Compensation Act or otherwise, or which would be enforceable against BHEL.

42. 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 levelled 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. In 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 contractee, 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.

43. 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 to items or groups of items for which separate period of completion has been specified.

For the purpose the 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 per cent per week
b) Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 Years	at ½ per cent per week
c) Completion period (as originally stipulated) exceeding 2 years	at ¼ per cent 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) ~~Complete~~ Completion period (as originally stipulated) not exceeding 6 months	10 per cent

b) Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 Years — 7½ per cent

c) Completion period (as originally stipulated) exceeding 2 years — 5 per cent

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.

44. Laws Governing the Contract

This Contract shall be governed by the Indian Laws for the time being inforce.

45. Cancellation of Contract for Corrupt Acts

The Accepting Officer, whose decision shall be final and conclusive, shall without prejudice to any other right or remedy which shall have accrued or shall accrue thereafter to Bharat Heavy Electricals Limited, cancel the Contracat 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 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 forborne to do a day act in relation to the obtaining or execution of this or any other contract for BHEL service OR

b) Enter into 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 comission and the terms of payment thereof have previously been disclosed in writing to the Accepting Officer, 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 the Accepting Officer.

46. Cancellation of Contract for Insolvency, Assignment or Transfer or Sub-Letting of Contract

The Accepting Officer, without prejudice to any other or remedy which shall accure 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 or orders for administration, of his Estate made against him or shall take and proceedings, for liquidation or composition under any Bankruptcy Act for the time being in force or make any conveyance of assignment of his effects composition or arrangement for the benefit of his credit or purport to do so, or if any application be made under any Banruptcy Act for the time being in force for sequestration of his Estate or if a trust deed be granted by him on behalf of his cretitors, OR

b) being a company shall pass a resolution or the court shall make on order for the liquidation of its affairs, or a Receiver or Manager on behalf of the debentures holders shall be appointed or circumstances shall arise which entitle the court or debentures holders to appoint a Receiver or Manager OR

c) assigns, transfer, sub-lets or attempts to assign, transfer or sub-let any portion of the work without the prior written approval of the Accepting Officer OR

d) Shall suffer an excution being levied on his goods and allow it to be continued for a period of 21 days.

Whenever the Accepting Officer, exercises his authority to cancel the contract under this condition, he may complete the work by any means at the Contractor's risk and expense provided always to that in the event of the cost of completion (as certified by Engineer-in-charge which is final and conclusive) being less than the contract cost, the advantage shall accure to the BHEL and that if the cost of completion exceeds the moneys due to the Contractor under the contract, the contractor shall either pay the excess amount ordered by the Engineer-in-charge or the same shall be recovered from the Contractor by other means.

Engineer-in-charge will have pwers to take possession of the site and any materials constructional plant, implements, stores, etc. thereon and carryout the work by any means at the risk and cost of the Contracator.

In case the BHEL completes the work under the provisions of this condition the cost of such completion 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 materials purchased and or labour provided by the BHEL with an addition of such percentage or cover superintendence and establishement charges as may be decided by the General Manager whose decision shall be final and conclusive.

In the Contractor fails to pay the excess sum within a period of 30 days, the Engineer-in-charge shall have the right to sell any or all of the Contractor's unused materials, constructional plant implements, temporary buildings etc. and apply the proceeds of sale thereof towards the satisfaction of any sum due from the Contractor under the contract and if thereafter be any balance outstanding from the Contractor, it shall be recovered in accordance with the provisions of the Contract.

47. Cancellation of contact in part or Full for Contractor's Default

If the contractor :

a) makes default in commencing the within a reasnoble time from the date of handing over of the site and continue in that state a reasonable notice from Engineer-in-charge OR

b) in the opinion of the Engineer-in-charge at any time, whether before or after the date extended dato for completion, make default in proceeding with the work,withdue diligenec and continue in the state after a notice of seven days fromEngineer-in-charge OR

c) fails to comply with any of the terms and conditions of the contract or after 7days notice in writing with orders properly issued thereunder. OR

d) fails to complete the work order and items of work individual dates for completion and clear the site on or before the date of completion or fails to achieve the progress at set out under clause 7 of these General conditions of contract.

The Accepting Officer may, prejudice to any other right or remedy which shall have accrued or shall accrue after B H E L, Cancel the cantract as a whole or in part there or only such work oder items of work in default from the contract. Whenever the Accepting officer exercises his authority to cancel the cantract as a whole or in part under this condition he may complete the work at the contractor's rick and cost provided always that in the event of the cost of completion (as certified by Engineer-in-charge which is final and conclusive) being less than the contract cost the advantage shall accrue to the BHEL if the cost of comletion exceedds, the money due to the contractor under this contract the contracttor shall either pay the excess amount ordered by General Manager or the same shall be recovered from the contractor by other means. Engineer-in-charge will have power to take possession of site and materials, constructional plant, implements, stores etc there on.

In case the BHEL completes the work or any part there of under the provisions of the condition the of such completion to be taken in to account in determining the excess cost to be charged to the contract under this condition shall consist of the cost of materials purchased and / or labour provided by the BHEL. with an addition of such percentage to cover superintendance and establishment charges as may be decided by the General Manager whose decision shall be final and conclusive.

If the contract fails to pay the excess sum within a period of 30 days the Engineer-in-charge shall have the right to sell any or of the contractor's unused materials, construction plant, implements, temporay buildings etc and apply the proceeds of sale there of towards the satisfaction of any sum due from the contractor under the contract and if ~~here~~ there after be any balance out-standing from the contract, it shall be recovered in accordance with the provisions of the contract.

48. Termination of Contract for death

Without perjudice to any of the rights or remedies under this contract. if the contractor dies, the Accepting officer shall have the option of terminating the contract without compensation to the contractor.

49. Special Powers of Determidtation

If at any time after the acceptance of the tender BHEL shall for any reason whatsoever not require the whole or any part of the work to be carried out General Manager 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 foreclosing of the work.

He shall be paid at contract rates for the full amount of the exceuted 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 exponses sustained on account of labour and materials collected but which couls not be utilised 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 in the original spceifications drawings, designs and instructions, invoiving any curtailment of the work as original contemplated.

50. BLANK

CHAPTER - IV

VALUATION AND PAYMENT

51. Records and Measurements :

All items having a financial value shall be entered in the BHEL Measurment Book 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 mearured physically, with-out reference to any local custom that may obtain excepting where it may otherwise be directed in the tender documents. The measurments shall be taken joinly by any person duly authorised on the part of the BHEL and by the contractor.

The engineer -in-charge shall give resonable notice in writting to the contractor 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 in part,the expensce of such measurement shall be borne by the partly 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 exeded to Rs 500 the expensce or re-measurement is said to be borne by th other party . If the contractors representative fails to attend when required ,the engineering-in-charge shall have power to proceed by himself to take measurement and in that case thoso 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 not 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 aforesaind 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 withstaning 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 shall be taken in accordance with relevant standard method of measurement issued by the Indian Standard institution or as per Standard engineering practice.

52 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 parti cularanalogous item of work in BHEL schedule of rates. Howerer incase 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 workedout only for such items which are found both in contract schedule and BHEL Schedule of rates as group ofitems under the chapter.

   b) If a single appropriate analoguous item of work is not available in both schedule (contractor's and BHEL schedule) then the method of proportion will be applied to the nesarest 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 anologuous 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 at 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 can 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 all 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 on the parties.

53. 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 bering 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 thereunder 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 incorpoation in the works and made from materials of which the price has increased or decreased as aforeaid 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 immedialtly before the passing of such act or levying, increasing / decreasing of such duty, the BHEL shall increase in price or the duty reimbursed to the contractor the increase in price or 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 incorporeted on the work. The contractor shall howerver 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% provide always that any such increase shall not be payable if, in the opinion of the Accepting officer (whose decision shall be 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 or any reduction available and shall allow inspection of the same by any duly authorised 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 therof in writing to the Engineer-in-charge stating that the rate is submitted in pursuance to this condition togeether with all information relating thereto which he may be in a position to supply.

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 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.

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 adquately 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 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 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 accuring 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 or the account or otherwise or in any way vary or affect the contract.

55. Final Bill

As soon as possible after the competion of the work to the satisfaction of the Engineer-in-charge, the contract 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 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 Tools 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 an account of the preparation of the final bill.

56. Payment of Bills

All payment to be made to the Contractor under this contract shall be by "Crossed Cheque" marked "A/c payee only" (within a reasonable after the certification by the Engineer-in-charge) at the Nationalised Banks/Scheduled banks or their subsidiaries located in the station where either the work is executed or service rendered or at their branch nearest to the station whre the Office of the Engineer-in-charge is located.

57. Recovery from Contractor

Whenever under the contract any sum of money shall be recovered from or payable by the Contractor the same may be deducted any sum than due or which at any time thereafter may become due to the Contractor under the contract or under any other contract with BHEL or from his Security Deposit or he shall pay the claim on demand.

58. Post Technical Audit of work and Bills

BHEL reserve the right to carry out a post-payment audit and technical examination of the work and final bill including all supporting vouchers, abstracts etc., and to enforce recovery of any sums becoming due as a result thereof in the manner provided in the preceding sub-paragraphs provided. However, no such recovery shall be enforced after three years of passing the final bill.

59. Refund of Securlty Deposit

50% of the Security deposit mentioned in condition 18 above, may be refunded to the Contractor in respect of all contract on completion of work and after payment of final bill and the balance 50% on expiry of the maintenance period, provided the

Contractor shall have rendered a "No - Demand" Certificate. In case of work where maintenance period is not involved 100% of the Security Deposit may be refunded after payment or final bill provided that the Contractor shall have rendered a "No Demand" Certificate.

60. Arbitration

Except where otherwise provided for in the contract all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or there conditions or otherwise concerning the work or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the sole arbitration of the General Manager of BHEL and if General Manager is unable or unwilling to act, to the sole arbitration of same other persons appointed by the General Manager, willing to act as such arbitrator.

The cases referred to arbitration shall be other than those for which the decision of the Accepting Officer, or Engineer-in-charge as the case may be, is expressed in the contract to be final and conclusive. There will be no objection if the arbitration, so appointed is an employee of BHEL and that he had to deal with the matters to which the contract relates and that in the course of his duties as such he had expressed views on all or any of the matters in dispute or difference.

The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, such General Manager as aforesaid at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

Subject as aforesaid the provision of the Arbitration Act, 1940 or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being inforce shall apply to the arbitration proceeding under this clause.

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

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

The work under the Contractor shall if reasonably possible contine, during the arbitration proceedings and no payment due or payable to the Contractor shall be withheld on account of such proceedings.

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

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

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

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

In the event of disputes or differences arising between one public sector enterprise and a Govt. Department or between two public sector enterprises the above stipulations shall not appy, the provisions of BPF Office memorandum No. BPF/ CL001/76MAN/2(1.10) 75 - BPE (GM - 1) dated 1st January 1976 or its amendments for arbitration shall be applicable.

61. Jurisdiction of Court

For the purpose of Court proceeding if any, same shall be in the Court having jurisdiction over Ranipet - 632 406. (Vellore District, Tamilnadu).

62. Taxes etc.

All taxes, duties, levies that are payable to the Government or to any other authorities in respect of the works under the contractor at the time of contract or becomes payable in future shall be exclusively borne by the contractor and the BHEL is not liable for any reimbursement / Payment thereof.

ANNEXURE - I

TERMS AND CONDITIONS REGARDING COMPLIANCE WITH VARIOUS LABOUR LAWS BY THE CONTRACTORS FOR BHEL.
(Please See Condition - 22)

1. The Contractor shall not employ in connection with the work any person who has not completed 18 years of age.

2. The Contractor shall in respect of labour employed by him either directly or through sub-contractor's 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 & Abolition) Act 1970 and the related Tamilnadu ules.

b) The Minimum wages Act 1948 and the related Tamilnadu Rules.

c) The payment of wages Act 1936 and the related Tamilnadu Rules.

d) The factories Act 1948 and teh related Tamilnadu Rules.

e) The Employees' Provident Fund & Miscellaneous Provisions Act 1952.

f) The Employees State Insurance Act 1948.

g) The workman's Compensation Act 1923.

h) The Industrial Disputes Act 1947 and any other Law or modifications to the above or to the rules made there under from time to time.

i) Paymet of Bonus Act 1965.

REGISTRATION AND LICENSING

3. Every Contractor shall register his name with the Welfare Section of BHEL before taking up the work awared to him 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 anyone day.

   e) Licence No. & Date (applicable in case of Contractors employing 20 or moreworkers)

   f) Whether enrolled for PF, ESI, etc., and enrolment No.

This information is called for the purpose of informing the Inspectorate of Factories whenever they call for information regarding Contracts.

4. The Contractor employing 20 or more workmen is required to obtain licence from the authorities (The Deputy Chief Inspector of Factories / Assistant Commissioner of Labour as the case may be). This licence shall be amended and /or renewed wherever there is an increase in the workmen employed by him or in the event of contract being extended or renewed. The Contractor shall inform the licence number to the BHEL Management before taking up the work.

5. 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.

WAGES

6. The Contractor shall pay wages to the workmen employed by him at the rate which shall not be less than the minimum wages applicable under Law from time to time.

7. The Contractor shall fix wage periods in respect of which wages shall be payble. No wage period shall exceed one month.

8. 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.

9. All payment of wages shall be made on working days at the work site and during the working time and on dates notified in advance. In case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

10. Where the employment of any works is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before the expiry of the second working day from the day on which him employment is terminated.

11. Wages due to every worker shall be paid to him direct or to the person authories by him in this behalf. All wages shall be paid in current coin or currency or in both.

12. The Contractor shall ensure the disbursement of wages in the presence of such authorised representatives of BHEL Management.

13. The above payment shall be verified by the authorised Officers/ representative of BHEL with the foltowing certificates on the payment sheet Certified that the amount shown in Column No..... has been paid to the workmen concerned in my presence on..... at .....

14. A certificate of payment shall be furnished in duplicate by the Contractor to the Engineer-in-charge each month in Form "A" enclosed.

15. A Notice of showing the wage period and the place and time of disbursement of wages shall be displayed at the place of work and a copy to be sent to the welfare department by the Contractor undeer acknowledgement.

16. Notices showing the rates of wages, weekly rest days, wage period, hours of work, date of payment of wages, and addressed of the Inspectors having jurisdiction the date of unpaid wages shall be displayed in Tamil and English in conspicious places at the establishment and at worksite the contractor. The contractor shall inform the BHEL Management every month the details of contract labour engaged for each contract in the following form :-

    a) Serial Number

    b) Location

    c) Period of Work

    d) No. of Contract labour engaged during the work

    e) No. of days worked

    f) No. of Mandays worked

    g) Wages paid to his workers

The above statement shall be furnished to BHEL Management at the end of every month.

REGISTERS AND RECORDS AND COLLECTION OF STATISTICS

17. The following documents/formats under contract labour (Regulation and Abolition) Act 1970 and Tamil Nadu Rules there under shall be maintained by each Contractor.

    a) Register of Persons employed by the Contractor.

    b) Employment Card

    c) Service Certificate

    d) Muster Roll, Wage Register, Deduction Register, Wage Slip, Over Time Register, Register of Fines, Register of Advances etc.

18. The Contractor shall display the abstract of the contrac labour (Regulation and Abolition) Act and the Rules there under both in English and in Tamil.

19. Half Yearly Return shall be sent by the Contractor in duplicate to the Licensing Officer.

20. The Contractor shall submit the returns required under the Contract Labour (Regulation and Abolition) Act 1970 periodically to BHEL Management.

21. The Contractor shall without fail give upto date information in writing of the attendance of the workers employed by him.

22. The Contractor shall ensure that his workers keep and produce their Employment Card when coming to duty and take them back when leaving duty.

23. 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

24. 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 DAY.

25. The contractor shall inform BHEL Management in the prescribed from details of the contract workers scheduled to work on Sunday., the day of rest and also indicate the substiuted holiday in lieu there of. this shall be intimated two days in advance berfore his workmen are booked for work on sunday.

26. The contract labour working for more than nine hours in nay or for more than 48 hours in any week shall be paid wages at the rate of towice the ordinary rates of wages in accordance with the provisons of section 59 of the factories Act 1948

27. 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 relexation on this.

28. The contractor shall give four paid National Holidays to his workers, viz. 26th January, Ist, May, 15th August and 2nd October.

29. The contractor shall ensure that his workmen vacate the premises after the shift is over.

30. 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

31. The contractor shall comply with the provisions relating to wlfare and Health facilities as provided in the contract labour (Regulation and Abolition) Act 1970 read with the Tamilnadu contract labour Rules 1975.

NOTICES OF ACCIDENTS

32. Notwithstanding any thing 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 compliance of ESI/Workmen's Compensation Act, Factories Act and Rules made there under.He shall also maintain a register of accident as per Act.

33. The contractor shall get the contract labour engaged by him insured under workmen's Compensation Policy from General Insurance Corporation of India before actually starting the work of contract. The Insurance coverage should

be for the entire period of contract.The contractor shall comply with the provision of the Workmen's Compensation Act 1923 [This should be read in conjunction with the provision of ESI Act]

34. The contractor shall ensure that all his workmen are covered under the Employees State Insurance Act and and produce to BHEL such Registration Number/ Enrolment Number before executing the contract work.

35. The contractor shall regularly pay the amount of contribution i.e. employers contribution as well as employees contribution in pursuance of the above scheme as fixed from time to time .The contribution payable presently is 1.75% of wages to be recoverfrom the workmen and 4.75% of wages to be contributed by the contractor. Contribution recovered from employee and contribution made by the contractor may be rounded to the next higher multiples of five paise.

36. The contractor shall take note of any amendment that may be brought forth in the above contribution rate and accordingly.

37. The contractor shall ensure that his workmen are covered under the EPF & miscellaneous Provision Act 1952 and accordingly produce to the BHEL Managemaent the registration / enrolment number before awarding of contract work. As per the extisting provision every worker who has completed three months continuous service or has actually worked for not less than 60 days within a period of three months or less shall be entitled and required to become a member of the fund. The employees, contribution payable at present is 12% of wage which 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.

38. The contractor shall take note of any amendment in the rate of contribution payable under the scheme from time to time.

39. The contractor shall within seven days of the close of every month submit to BHEL a statement showing the amount to 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 provision of the ESI Act and PF as well as the schemes made thereunder to the authorities concerned.

40. Whenever any sum of shall sum of money is found to be recoverable from or payablle by the contractor under the above Acts the same shall be deducted from any sum that may be due or which at any time there after may become due to the contractor under this contract or under any other contract or from his security deposit in case the recoveries are not sufficient to satisfy the claims, the contractor shall pay the balance there of on demend. In case any recoveries are made this clause from the as may be required to replace the shortage caused by such recoveries in the amount of Security Deposit.

41. The contractor shall abide by all the labour and other laws applicable to contract labour/workers under this contract and shall at all times keep BHEL indemnified against all losses, claims, prosecutions under any law.

42. In case of non compliance of any of the provisions of the Acts and in case BHEL Haveing complied with the same BHEL will be entitled to recover the same from the contractor / sub contractor.

43. Non exercise of any of the power of or rights available to BHEL here under or under any law, shall not any way operate as waiver thereof.

ACCEPTING OFFICER

FORM - IV

(See Rule 21(1) of Tamil Nadu Contract Labour Rules)

Application for Licence

01. Name and Address of the Contractor (including his Father's Name in case of Individuals) :

02. Date of Birth and age (in case of Individuals) :

03. Particulars of Establishment where Contract Labour is to be employed :

a) Name and Address of the Establishment :

b) Type of business,trade industry manufacture :

c) Number and date of certificate of Registration of occupation, which is carried on the Estabilshment under the Act. :

d) Name and address of the Principal Employer :

04. Particulars of contract labour :

a) Nature of work in which cantract labour is employed or is to be employed in the establishment

b) Duration of the proposed contract work (give particulars of proposed date of commencing and ending) :

c) Name and address of the agent or Managerof contractor at the worksite :

d) Maximum No. of contract labour proposed to be employed in the establishment on any date :

05 Whether the contractor was convicted of any offence within the preceeding five years, if so give details :

06. Whether there was any order against the contractor revoking or suspending licence or forfeiting security deposit in respect of an earliercontract if so the date of such order :

07. Whether the contractor has worked in any other establishment within the past five years, if so, give details of the principal employer Estalishment and nature of work :

08. whether a certificate by the principal Employer in form V is enclosed :

09. Amount of licence fee paid No of Treasury challan and Date :

10 Particulars of security deposit if any, requested to be adjusted, including Treasury Receipt number :

11. The amount of security deposit or balance if any after adjustment of amount to be refunded under rule 31 deposited with treasury Receipt Number and date :

DECLARATION

I hereby declare that the details above are correct to the best of my knowledge and belief.

PLACE :
DATED :

SIGNATURE OF THE APPLICANT
[CONTRACTOR]

NOTE : The application should be accompanied by a treasury Receipt for the appropriate amount and a certificate in Form V From the principal employer.

(To be filled in the office of the Licensing officer)

Date of receipt of the application with challan for fees / security Deposit.

SIGNATURE OF THE LICENSING OFFICER

FORM - XIII

(See Rule 75 of Tamil Nadu Contract Labour Rules 1975)

Register of workman employed by contractor

Name and Address of the Contractor :

Name and location of work :

Name and address of establishment in /under which contract is carried on :

Name and address of Principal Employer :

01. Serial Number :

02. Name and surname of workman :

03. Age and sex :

04. Father's / Husband's Name :

05. Nature of Employment /Designation :

06. Permanent Home address of workman (village Taluk and District) :

07. Local Adderss :

08. Date of commencement of Employment :

09. Signature or Thump Impreesion of workman :

10. Date of termination of Employment :

FORM - XIV

(See Rule 76 of Tamil Nadu Contract Labour Roules)

EMPLOYMENT CARD

Name and Address of contractor : Nname and address of Estalishment in/under which contract is carried on _____

_____

Nature of work and location of work : Name and address of Principal Employer

_____

01. Name of the workmen :

02. Sl. No. of register of workmen¶ employed :

03. Name of Employment/Designation :

04. Wage rate (with particulars of unit in case of Piece work) :

05. Wage period :

06. Tenure of Emloyment :

07. Remarks :

SIGNATURE OF CONTRACTOR

FORM - XV

(See Rule 77 of Tamil Nadu Contract Labour Rules)

SERVICE CERTIFICATE

Name and Address of the contractor : Name and address of Establishment in/under which contract is carried on

Name and location of the work :

Name and address of the workman : Name and address of Principal Employer

Age or Date of Birth :

Identification marks :

Father's / Husband's Name :

Sl.No	Total period for which employed From	To		Nature of work done	Rate of wage (with particulars units in case of piece of work	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)

SIGNATURE

CONTRACTOR

FORM - XVI

(See Rule 78 [l] [a] [i] of Tamil Nadu Contract Labour Rules)

MUSTER ROLL

Name and Address of contractor

: Name and address of Establishment in/under which contract is carried on_____

Nature of location of the work

: Name and address of Principal Employer_____

For the Month of_____

Sl. No	Name of workmen	Father's/Husbands Name	Sex	Dates 1 2 3 4 5	Remarks
(01)	(02)	(03)	(04)	(05)	(06)

SIGNATURE OF CONTRACTOR

FORM - XVII

(See Rule 78(1) (a) (i) of Tamil Nadu Contract Labour Rules)

Register of wages

Name and Address of the Contractor :

Nature and location of work :

Name and address of establishment in/under which contractor is carried on :

Name and address of Principal Employer :

Wage Period : MONTHLY

01. Serial Number :
02. Name of workman :
03. Sl. No. in Register of workman :
04. Designation / Nature of work done :
05. No. of days worked :
06. Units work done :
07. Daily rate of wages / Piece rate :
08. Basic wages :
09. Dearness allowance :
10. Overtime :
11. Other cash Payment (Nature of payment to be indicated) :
12. Total :
13. Deductions, If any [indicate nature] :
14. Net anmount paid :
15. Signature / Thump impresion of workman :
16. Initials of contractor or his representative :

FORM - XIX

(See Rule 78(1) (b) of Tamil Nadu Contract Labour Rules)

Wage Slip

Name and Address of the Contractor : Name and Father's / Husband Name of the workman _____

Name and location of work : For the week / Fortnight / Month ending .....

01. No. of days worked :

02. No. of units worked in case of piece rate workers :

03. Rate of dialy wages /piece rate :

04. Amount of over time wages :

05. Gross wages Payable :

06. Deductions, if any :

07. Net amount of wages paid :

INTIALS OF THE CONTRACTOR OR HIS REPRESENTATIVE

FORM - XX

(See Rule 78(1) (a) (ii) of Tamil Nadu Contract Labour Rules)

Register of deductions for damage or loss

Name and Address of the Contractor :

Nature and location of work :

Name and address of establishment in/under which contractor is carried on :

Name and address of Principal Employer :

01. Serial Number :

02. Name of workman :

03. Father's / Husband's Name :

04. Designation / Nature of employment :

05. Particular of damage or loss :

06. Date of damage or loss :

07. Whether workman showed cause against deduction :

08. Name of person in which presence employee's explanation was heard :

09. Amount of deduction imposed :

Date of Recovery

10. No. of instalments imposed :

11. First Instalments :

12. Final Instalments :

13. Remarks :

FORM - XXI

(See Rule 78(1) (a) (ii) of Tamil Nadu Contract Labour Rules)

Register of Fines

Name and Address of the Contractor :

Nature and location of work :

Name and address of establishment in/under which contractor is carried on :

Name and address of Principal Employer :

01. Serial Number :
02. Name of workman :
03. Father's / Husband's Name :
04. Designation / Nature of employment :
05. Act / Omission for which fine imposed :
06. Date of offence :
07. Whether workman showed cause aganist fine :
08. Name of the person in whose presence employee's explanation was heard :
09. Wage period & Wage payable :
10. Amount of fine imposed :
11. Date on which fine realised :
12. Remarks :

FORM - XXII

(See Rule 78 (1) (a) (ii) of Tamil Nadu Contract Labour Rules)

Register of Advance

Name and Address of the Contractor :

Nature and location of work :

Name and address of establishment in/under which contractor is carried on :

Name and address of Principal Employer :

01. Serial Number :

02. Name of workman :

03. Father's / Husband's Name :

04. Designation / Nature of employment :

05. Wage period and wages payable :

06. Date and amount of advance given :

07. Purposes (s) for which advance made :

08. No. of instalments by which advance to be repaid :

09. Date and amount of each instalment repaid :

10. Date on which instalment was repaid :

11. Remarks :

FORM - XXIII

(See Rule 78(1) (a) (iii) of Tamil Nadu Contract Labour Rules)

Register of Overtime

Name and Address of the Contractor :

Nature and location of work :

Name and address of establishment in/under which contractor is carried on :

Name and address of Principal Employer :

01. Serial Number :

02. Name of workman :

03. Father's / Husband's Name :

04. Sex :

05. Designation / Nature of employment :

06. Dates on which overtime worked :

07. Total overtime worked or production in case of piece -rated :

08. Normal rate of wages :

09. Overtime rate of wages :

10. Overtime earning :

11. Date on which Overtime wages paid :

12. Remarks :

PAYMENT CERTIFICATE

FORM "A"

Certified that :

1. I as contractor of ..... have made payment to all contract Labourers in full in respect of contract No. ..... as per terms of my contract and in no case less than the rates applicable upto the period ending.

2. The above payment have been made by me in the presence of the authorised representative of ..... of ..... for ..... Employees amounting to Rs .....

3. The neccessary payment registers attendance register / Form 12 . Leave register / book under Laboure and industrial Law and other relevant records have been maintained by me and available with me for production as and when required .

4. No payment is due / outstanding to any contract Labourers engaged by me in respectof the aforesaid contract upto the period ending .....

CONTRACTOR

NAME :
DATE :

SUPERVISOR

NAME :
DESIGN :
DATE :

COUNTERSIGNED
OFFICER INCHARGE

NAME :
DESIGN :
DEPT. :

ANNEXUR II

SAFETY RULES

(See Condition 2)

A BHEL SAFETY CODE

A

1. Suitable scaffolds shall be provided for workmen for all work that connot safely be done from the ground, or from solid construction except such short period of work as can be done safely from ladder When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handholds shall be provided on the ladder and the ladder shall be give an inclination not steeper than ¼to 1(½ horizontal and 1 vertical)

2. Scaffolding or staging more than 3.25 metres above the ground or floor , swing or suspended from an overhead support or erected with stationary support , shall have a guard rail properly attached , bolted braced and otherwise secured atleast 1 metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends there of with only such openging as may be neccessary for the delivery of materials . Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3. Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally , and it height of a platform or gangway or stairway Is more than 3.25 metres above ground level or floor level it shall be closely boarded have adequate width and be suitably fenced,as described in 2 above.

4. Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 metre.

5. Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed , no portable single ladder shall be over 9 metres in length. Width between side rails in a rung ladder shall in no case be less than 30 cm for ladders upto and including 3 metres in length , For longer ladder this width shall be increased by atleast 6mm for each additional 30cm of length. Uniform step spacing shall not exceed 30cm.

   Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public.The contractor shall provide all necessary fencing and light to protect public from the accident and shall be bound to bear expenses of defence of every suit-action or other proceeding at law that may be brought by any person for injury sustained owing to neglect of the above precautions, and pay any damages and cost which may be awarded in any such suit, action or proceeding to any such person or which may with the consent of the contractor be paid to compromise any claim by such person.

6. **Excavation and Trencing**

All trenches 1.5 metres or more in depth, shall at all time be supplied with atleast one ladder for each 30m length or fraction there of ladder shall be extended from bottom of trench to atleast 1 metre above surface of the ground . Sides of the trench 1.5 metres or more in depth shall be stepped back to give suitable slope or securely held by timber bracing,so as to avoid the danger of sides collapsing . Excavated materials shall not be placed within 1.5 metres of the edge of trench or half the depth of trench, whichever is more. Cutting shall be from top to bottom under no circumstances shall under mining or under - cutting be done.

7. **Demolition :**

Before any demolition work is commenced and also during the progress of work.

a] All roads and open areas adjacent to the work site shall be closed or suitably protected .

b] No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.

c] All practical steps shall be taken to prevent danger to person employed from the risk of fire or explosion ,or flooding no floor , or roof or other part of building shall be so overloaded with debris or materials as to render it unsafe.

8. All necessary personal saftey equipment as considered adequent by the Engineer-in-charge shall be /available for use of person employed on the site and maintained in a condition suitable for immediate use and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

a] Workers employed on mixing asphaltic materials cement and lime mortars concrete shall be provided with protective footware and protective gloves.

b] Those engaged in handling any material which is injurious to the eye shall be provided with protective goggles.

c] Those engaged in welding work shall be provided with welder's protective eye shellds

d] Stone breaker shall be protective goggles and protective clothing and seated at sufficiently safe intervals.

e] When workers are employed in sewers and manholes which are in use , the contractor shall ensure that manhole covers are opened and manholes are ventiled atleast for an hour before the workers are allowed to get into them manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.

i] No paint containing lead or lead products shall be except in the form of paste or ready-made paint.

ii] Suitable face masks shall be supplied for use by workers when paint applied in the form of spray or surface having lead paint is dry rubbed and scrapped .

f] The contractor shall not employ men below the age of 18 and women on the work of painting with products containing lead in any form . Whenever men above the age of 18 are employed on the work of lead painting ther following precaution shall be taken :

i] No paint containing lead or lead products shall be used except in the form of paste or ready-made paint.

ii] Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or surface having lead paint is dry rubbed and scrapped

iii] Overalls shall be supplied by the contractor to workmen and adequate facilities shall be provided to enable working painters to wash during or cessation of work.

9. When work is done near any place where is risk of drowing ,all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt resue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the during the course of the work.

10. Use of hiosting machine and tackles including their attachments,anchorage and support shall conform to the following

a)

i] These shall be of good mechanical construction, sound materials and adequate strengih and free from defects and shall be kept in good working order.

ii] Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adeuate strength and free from defects.

b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 yrs shall be incharged of any hoisting machine including any scaffolding winch or give signals to operator.

c) In case of every hoisting machine and or every chain ,ring , hook, shackle swivel and pull block used in hoisting or lowering as means of suspension safe working load shall be ascertained by adequate means.Every hoisting macnine and all gear referred to above shall have the safe working load plainly marked there on In case of a hoisting machine having a variable safe working load,each safe working load at the condition under which it is applicable shall be clearly indicated. No part of any machine or gear referred to above in this paragraph shall be loaded be yond the safe working load except for the purpose of testing.

d) In case of department machine ,safe working load shall be notified by the Engnieer-in-charge. As regards contractor's machine the contractor shall notify safe working load of each machine to the Engineer-in-charge when ever he brings it to site of work and get it verified by the Engineer-in-charge.

11. Motors , gearing , transmission electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards, hoisting appliances shall be provided with such means as will reduce to the minimum risk of accident descent of load . Adequate precaution shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energised insulating mats, working apparel such as gloves,sleeves and boots as may be necessary shall be provided. Workers shall not wear any rings watches ,carry keys or other materials which are good conductors of electricity.

12. All scaffolds , ladders and other safety devices mentioned or described here in shall be maintained in a safe condition and no scaffold , ladder or equipment shall be altered or removed while it is use. Adequate washing facilities shall be provided at or near the places of work.

13. These safety provision shall be brought to the notice of all concerned bydisplay on a notice board at apromient place at the workspot persons responsible for ensuring compliance with the safety code shall be named thereon by the contractor.

14. To ensure effective enforcement of the rules and regulations relating to safety precaution , arrangement made by the contractor shall be open to inspection be the Engineer-in-charge or his represntation and the inpecting officers as defined in the contractor's Labour Regulations.

15. Nothing in the above conditions 1 to 14, the contractor is not exempted from the operation of any other Act or Rule inforce.

B. GENERAL SAFETY PRECAUTIONS TO BE FOLLOWED AT WORK SITES DURING EXECUTION

The following safety measures should be strictly adhered to during execution of works at sites.

1. Providing the working platform with toe-board and handrail for continuous working at heights.
2. Providing safety belt and lifeline at all times for men working at heights.
3. Providing dust or fume respirator in places where dust and fume concentration exists
4. Providing goggles and welding screens.
5. Providing acid and alkali proof rubber gloves for handling acids, alkali and chemicals, which are corrosive.
6. Providing rubber gloves for working on electrical works.
7. Ensuring proper lashing of the components while being transported in vehicles.
8. The vehicles must have side supports or have body to support the materials conveyed.
9. The materials should not be allowed to extend or overflow the sides of vehicles.
10. Materials should not be allowed to overhang from the rear edge of the body of the vehicle.
11. Driver of the vehicle must posses license.
12. Vehicle must not be overloaded prescribed limits.
13. Red flags and lights for parts projecting from the body of the vehicle must be provided.
14. The speed restrictions with in the factory must be strictly adhered to.
15. The gas cylinders must always be handled on trolleys or kept tied down not in use. They should never be rolled as Roller for conveying.
16. Cylinders should not used without regulators.
17. All excavations may be barricaded and red belts/ lamps must be provided .
18. All electrical connections must be properly earthed.
19. No work should be taken up for execution inside shop floor, with out obtaining necessary work permit.
20. Providing helmet for high level work.
21. The contractor should maintain a register regarding the driver license particulars.
22. All Personnel Protective Equipments (PPE) conform to standard specification as per the details given in the code of conduct.

(i) Safety helmets confirming to IS-2925: 1984
(ii) Safety Belts confirming to IS-3521: 1983
(iii) Safety Shoes confirming to IS-1989: 1978
(iv) Eye and face protection devices confirming to IS – 8520:1977 & IS – 8940:1978
(v) Hand and body protective devices confirming to: IS – 2573: 1975
IS – 6994: 1973
IS – 8807: 1978
IS – 8519: 1977

Contractor including the subcontractors, agents and labours engaged on work are required to scrupulously adhere to the safety regulations, safety precautions and measures. Any violation thereof will invite punitive action being taken against them. Also contractors with frequent violations of safety regulations will not entrusted with further work in this organization.

General:
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.

C. SAFETY PRECAUTION TO BE OBSERVED WHILE TRANSPORATING MATERIALS

I. Vehicle

1. Vehicle carrying materials should have proper registration documents and must be produced on demand by our Security staff.
2. The light on right side i.e. over the driver's cabin shall be in working condition
3. Both the head light as well as park lamps must be in working condition.

II. Movement of Vehicle

1. The vehicle should not travel at more than 20KMPH in our premises.
2. The driver of the vehicle must possess heavy duty licence and produce on demand by the Security Staff.
3. Vehicles carrying inflammable liquids in the tanks containers should have grounding chain or the tank container should be coated with insulating materials to avoid static electricity.
4. In road junction , speed breaker and Railway crossing the speed should be lowered and cehicles should proceed cautiously.
5. The driving should be ' keep to the left ' at all places.
6. The vehicles should not parked on the road which could obstruct the vehicular traffic.
7. No person other than driver should be allowed to sit or stand on the prime mover or trailer.
8. The vehicle should pass onlythrough the approved routes. Short cuts should be forbidden.
9. There must be a safe distance behind another moving truck.
10. The driver should aviod making quick starts, jerk stop or quick turns at excessive speed .

III Shipping

1. Strong side supports should be provided on both sides of the tailer. The side supports should be fixed in such a way that it cannot be removed even temporally.

2. Adequate packing must be given for easy slinging operations. The packing materilas should be good enough to withstand the load.

3. The stacking of loads on the truck should be evenly placed. The load should not be heaped together or dumped over the chassis.

4. The load on the truck should not be beyond its standard capacity. The carry ing capacity must be clearly marked on the trailers also.

5. The loaded materials should be fastened tightly with "WIRE ROPE ". Manila rope or coir rope should not at all be used. There must be side packing such as gunny or rubber tyre between the sharp edges of the job and wire rope in order to avoid cut in the wire rope.

6. There must be minimum two fastening and it should be more in case of lengthier loads.

7. The wire rope should be in sound condition i.e there should not be links , knots or bristles etc.

8. The wire rope ends should be clamped with 'U' clamps.

9. The loose pieces should be bundled before loading on the truck.

10. There must be red flags or red lamps for the lengthly loads which extend beyond chassis.

11. The materials should not be stacked too high to avoid hitting against live electric lines.

12. The load should not be overhanging more than 0.9 metres from the end of body.

13. While transporting the scraps, there must be wire net cover to prevent fall ing of scrap.

IV General

1. The vehicles should not be moved directly inside the production building in case the materials are to be unloaded there. But the vehicles should beparked outside the buliding and the driver should ascertain the passage as well as the unloading points, with the help of the shop officals. This will avoid the congestion of blocking of traffic in the gangway.

GENERAL AND SPECIAL SPECIFICATIONS

1. Site Clearance

All the area upon which the construction is to be carried out and areas which are required by the Contractor for his construction facilities are to be cleared off all rubbish and objectionable matter at Contractor's own cost. Trees, if any, shall not be uprooted or cut without the prior approval of the Engineer-in-charge. All spoils, unserviceable materials and rubbish shall be burnt or removed from site. Usable materials, saleable timber, fire-wood etc., shall be stocked properly at work site in the manner as directed by the Engineer-in-charge. The cost of clearing the areas shall be deemed to have been included by the renderer in his general rate.

2. Earthwork for Foundations

Earthwork excavation for foundations and filling in foundations shall conform to TNBP 23 and 24. The area to be excavated or filled in with excavated materials shall be clearly demarcated in the field by the Contractor. Excavation shall be done to lines and levels defined. Excavation shall be carried out to such widths, lengths, depths, profiles and grades as shown in the drawing or as may be specified by the Engineer – in – charge. Rough Excavation may be carried out up to a depth 15 cm less than the final level but the balance shall be excavated to precise level with special care. All soft pockets of soil met with even below the final level shall be removed and the excavation filled up as directed by Engineer-in-charge. The methods of excavation shall in every case be subject to the approval of the Engineer-in-charge and the contractor shall ensure the safety and stability of the excavations, being executed by him as well adjacent buildings, structures, services and other works in the vicinity of the site of work. Wherever necessary Engineer-in-charge may direct that the sides of the excavation should be timbered and shored at the contractor's own cost, adopting a proper method approved by the Engineer-in-charge. Not withstanding the above, should any slip occur, the contractor shall remove all the slipped materials from the excavated pit, at his own cost. He shall also make good at his own all damages caused to the work as well as adjacent buildings, structures etc., as a result of the slip, referred to.

All excavation work shall be subject to inspection and approved by the Engineer-in-charge before any further works in the excavated areas allowed commencing. Should any excavation be carried out beyond the specified depth, the contractor should fill it up at his own cost with the same type and class of material as it is proposed to be laid over the excavated portion. No payment will however be made to the contractor on his account.

The contractor shall ensure that the excavations and the structures under construction are kept free from water logging at all stages of construction. He shall take all necessary precautions and `streams, aquifers, springs, surface flows etc., are excluded effectively so as to ensure that the works are carried out in a reasonable dry conditions in accordance with the construction schedule.

Back filling around the foundations, trenches, and plinth and under the floor shall be done in accordance with TNBP 24 and 25. The finished level of the plinth filling shall be trimmed to the slope required to be given to the finished floor. Back filling, watering and consolidation of excavated earth in layers etc., complete as per specifications shall be done unless otherwise stipulated in the tender schedule.

Removal of Hard rock by Blasting

This shall include all rock occurring in large masses which cannot be removed except by blasting. Blasting shall be done in conformity with TNBP 19 & 23 and as instructed by the Engineer-in-charge. When rock blasting has to be done adjacent to structures, the following precautions shall be observed.

(1) All blasting should be completely muffled to prevent damage by flying pieces.

(1) Blasting within 3 meters of the structures shall be avoided

(2) No blasting should be done within 1.5 meters of concrete / masonry structures.

(3) An isolated boulder extending under the existing structure but projecting within the area of blasting should be blasted.
(4) The contractor shall be responsible for all damages caused by blasting and shall replace or repair the damaged structures at his own cost.

3. Plain and Reinforced Cement Concrete Works:

All design and construction shall be performed in accordance with the Indian standard code of Practice for plain and reinforced concrete – IS 456 and TNBP 30. Any Special requirements noted on the drawings or bill of quantities shall govern over the provisions of this specifications. Controlled concrete shall be used wherever specified in the schedule of items complying with all requirements of IS: 456 and as per special specifications appended herewith.

The coarse aggregate to be used shall be of hard broken granite stone jelly of various sizes as specified under respective items in the Bill of Quantities, conforming to IS 383 latest edition. The Engineer-in-charge may require the contractor to carryout moisture content tests in both fine and coarse aggregates. For determination of moisture content IS – 2386 shall be referred to. The amount of water to be added shall be then adjusted to compensate for any observed variation in the moisture contents. Proper control of mixing water is deemed of paramount importance. Mixtures with automatic water measuring drums shall be used or else. Water should be measured by volume in calibrated buckets. All measuring equipments shall be maintained in a clean serviceable condition and the accuracy periodically checked and got certified by the Engineer-in-charge. The contractor shall carryout slump tests apart from taking test cubes at regular intervals. All such methods of sampling and analysis of concrete shall be in accordance with IS – 1199.

Mixing of concrete shall be strictly carried out in an approved type mechanical mixer. The mixing equipment shall be capable of combining the aggregates, cement and water within the specified time (not less than 2 Minutes) into a thoroughly mixed and uniform mass and of discharging the mixture without segregation. Mixing shall be continued until there is a uniform colour and consistency, Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of any of the ingredients. Before depositing the concrete, all debris and dirt shall be removed from the space to be occupied by concrete. Concreting shall not be done unless the formwork conform to the shapes, lines and dimension as shown in the drawings.

Unless otherwise approved, concrete shall be placed on single operation to the full thickness of slabs and beams and similar members and not exceeding 1 metre deep in walls, columns and similar members. Concrete shall be placed continuously until completion of the part of the work between construction joints or as directed by the Engineer-in-charge. The concrete after being laid shall be compacted by means of vibrators of approved type under proper supervision as directed by the Engineer-in-charge. Care should be taken to avoid segregation and formation of air bubbles. The whole process starting from the mixing of concrete to the placing and compaction shall not take more than 20 minute and the process shall be completed before the initial setting takes place. Curing shall be accomplished in accordance with IS-456 by keeping the concrete covered with a layer of sacking, canvas or similar absorbent materials and kept constantly wet for the period as directed by the Engineer-in-charge.

Reinforcement

All reinforcement shall be clean and free from pitting, loose mill-scales, dust, loose rust and coats of paint, oil or other coatings which may destroy or reduce bond. General construction details and workmanship relative to reinforcement including bar bends, lap splices and installation shall be in accordance with the IS-2502 as well as IS-456. All bars be bent as per the bar bending schedules indicated in the drawings or supplied separately relevant to particular drawing. The contractor shall in all cases verify himself the correctness of schedules, giving the number, length and the bending details of the bars. The numbers, sizes, shape and position of all the reinforcement shall, unless otherwise, directed or authorized

by the Engineer-in-charge be strictly in accordance with the drawing. The reinforcement shall be adequately held in position by 18 / 20 SWG soft black annealed binding wire. The contractor must obtain the approval of Engineer-in-charge for the reinforcement placed, before any concrete is placed in the form. All reinforcing bars shall be so tied as to form a rigid cage to prevent displacement before or during concreting. Rate quoted for reinforcement should include cost of transporting M.S. Rods / CTD bars from BHEL Store to site of work, cleaning, cutting, bending, placing, binding with contractor's own binding wire and providing necessary cover blocks of concrete but excluding cost of steel which shall be supplied free of cost at BHEL Stores.

Form Work

Formwork shall conform to the shape, lines and dimensions of concrete and RCC structures as shown in the drawings and shall be well within the permissible tolerance. Formwork for concrete shall be of plywood, steel, good seasoned timber or other approved materials, properly designed easy for removal and cleaning. They shall be of sufficient strength and rigidity to maintain their position and shape under loads incidental to placing concrete. The number of props, their sizes and dispositions shall be such as to able safely carry the full dead load area constructional loads. The arrangement and alignment of formwork shall be got approved by the Engineer-in-charge prior to concreting. However this shall not relieve the contractor from his responsibility for proper work and safety. Formwork shall be sufficiently tight to prevent loss of cement slurry from the concrete. All joints and holes in the formwork shall be caulked with putty jute cloth or other approved materials to the satisfaction of the Engineer-in-charge. The stripping time for the shuttering and the formwork shall in general conform to the provisions in the relevant clauses of IS 456. Unless otherwise specified rates for reinforced cement concrete shall include cost of centering, shuttering charges also.

.4. Stone Masonry

General: Stone masonry shall conform to TNBP 35. Stone shall be obtained from the approved quarry and shall be free from decay and weathering.

All stones shall be thoroughly wetted before use. The mortar used for jointing shall be as per approved Drg. .

The walls shall be carried up truly plumb. Every stone shall be carefully fitted to the adjacent stones so as to form neat and closed joints.

To give sufficient lateral bond, vertical joints shall be avoided. Prescribed number of headers as required shall be provided to give sufficient transverse bond. At junctions of wall the stones each alternate course shall be so carried into each of the respective walls as to unite the work thoroughly. Where breaks are unavoidable in carrying up the work continuously in horizontal course sufficiently long steps shall be left to join the old and new work building of two thin faces and filling up the middle with small stuff or dry packing shall be strictly avoided. When plastering or raised pointing is not required to be done joints shall be struck flush and finished simultaneously.

Random rubble masonry

Random rubble masonry work shall conform to TNBP 35-L and J. Stones shall be hammer dressed at faces and joints to enable them to come into close proximity with each other. The face stone shall be laid headers and stretchers alternately, so as to break the joint by at least 75mm. Thickness of joint shall not exceed 12mm. No pinning shall be used on the face and face stone shall extend well back into the headers. Stones less than 130 mm. in height shall not be used on the face.

Bond stones running through the wall shall be provided at 1.8M intervals in walls up to 0.60 M. thickness and if the wall is more than 0.60 M. thick a line of headers shall be laid from face to back each header overlapping the other by at least 150 mm.

5. Brick Masonry:

First class Bricks: Brick shall be sound, hard, tough, and rectangular in shape and size, well burnt of uniform deep red or copper colour and conform to IS – 1077.

Brick shall be free from cracks, chips, flaws, stone or humps of any kind. Bricks shall be homogeneous in texture and evict a clear ringing sound on being struck and shall have a minimum compressive strength of 50KG / sq.cm. And shall not absorb water more than 20% of its weight, when soaked cold water for 24 Hrs. All bricks shall be table moulded.

Second Class Bricks: These shall be ground moulded but should otherwise conform to the specifications of first class bricks except for some surface cracks are allowable. These shall have minimum compressive strength of 50 Kg./sq.cm.

Samples of each type of brick, shall be got approved by the Engineer-in-charge before being used. All subsequent deliveries shall be up to the standards of the approved samples.

Brickwork shall conform to TNBP31 and IS –2212.

Brick works shall be classified as first or second class according to the classification of bricks used and the method of lying. The thickness of joints shall not exceed 6 mm. in first class brickwork and 10 mm in second class brick work.

Bricks shall be well soaked before use on works for at least 6 hrs. The soaked bricks shall be kept on wooden planks or platform. Brick required for masonry with clay or lime mortars shall not be soaked.

Brickwork shall be laid with specified mortar to be prepared in accordance with IS –2250. Brick works shall be laid in English Bond unless otherwise specified. Half or cut bricks shall not be used except when needed to complete the bond. Each course shall be taken up truly plumb, if battered, the batter is to be truly maintained. The level of brickwork shall be checked up at every one metre interval. Bricks shall be laid with frogs upward, while laying bricks shall be thoroughly bedded and flushed in mortar and taped into position with a wooden mallet and the superfluous mortar removed. Walls of all structures shall be carried up regularly in all cases, leaving no part, one metre lower than the other. Where the masonry of one part has to be delayed, the work shall be raked back according to bond (and not toothed) an angle not exceeding 45 Deg. But the raking back should not start within 60cm. of a corner vertical joints in alternate courses shall come directly over one another. The brickwork shall not be raised more than 14 courses per day. All iron fixtures, pipes, conduits, drains, sleeves, bolts, holdfasts of doors and windows etc. which are required to be built in walls shall be embedded in cement mortar or cement concrete as specified, in their correct position as the work proceeds.

Joints

Joints shall be restricted to 6 mm in first class brickwork and 10mm in second class brick work. All bed joints shall be normal to the pressure upon them, radial in arches and at right angles to the face in battered retaining walls. Care shall be taken that all joints are fully mortared (proportion as specified in the schedule items) well flushed up and in case where no pointing to be done, neatly struck at the work proceeds. The joints in faces which are to be plastered or pointed shall be squarely raked out to a depth of 12 mm while the mortar is still green. The raked joints shall be well brushed to remove loose particles. After the work the faces of work shall be cleared well by brush so as to remove any splashed mortar during the course of raising the brickwork.

Curing

Green work shall be protected from rain by suitable covering. Masonry work shall be kept thoroughly well watered on all faces for at least 10 days after completion. In case of fat lime mortar curing shall commence two days after laying of masonry and shall continue for seven days.

6. Scaffolding

Scaffolding will generally be single but may be double if warranted for the particular work as approved by the Engineer-in-charge. The contractor shall take all measure to ensure safety of work and the working people.

Payment for brickwork shall be made on cubic metre basis on the volume of actual work done. Half brick wall and brick on edge wall shall be paid on square metre basis. The rate of brick work shall include scaffolding and all items mentioned above and no extra payment will be made for cutting bricks if required either for openings or for rounding or insertions or for recesses at the time of brick wall construction.

7. Damp Proof Course

Damp proof course shall either be with cement concrete or with cement mortar of specified thickness as mentioned in the relevant item of schedule. Damp proof course shall not be carried across doorways. It shall be laid for all walls except verandah retaining wall or for particular wall only directed by the Engineer-in-charge. It shall be laid flush with floor level or as instructed by the Engineer-in-charge.

Damp proof course with cement concrete shall be of 25 or 38 mm thick in cement concrete M15/M20 as specified using 12mm. and down size aggregate well rammed and smoothened with trowel. It will be kept wet for 40 hours and after it has dried, two coats of hot bitumen shall be applied over it and allowed it to dry after which sand shall be sprinkled over it.

Damp proof course with cement mortar shall be 12 or 20 mm thick in cement mortar 1:3 well mixed with crude oil at 5% by weight of cement used.

8. Cement Plastering:

Cement plastering shall be in accordance with IS – 1661 and TNBP –56 & 57, Cement mortar shall conform to IS – 269. The mortar of specified mix and thickness shall be used.

The surface to be plastered shall be thoroughly cleaned so that it is free from dust, oil, salts etc., the joints of masonry shall be racked out to a depth of at least 12 mm. On cement concrete surfaces the surface shall be cleaned with wire brush and scarified by lines with trowel or hacking done. The surfaces in both cases shall be washed properly and kept wet for 4 hours before plastering is commenced.

Plastering shall be started from top and gradually worked down towards the floor. It shall not at any place be thinner than specified. To ensure even thickness plaster of about 15 cm X 15 cm shall be first applied horizontally and vertically at not more than 2 metres intervals over the entire surface to serve as gauges. The surface of these gauges shall be truly in the plane of finished surface. The mortar shall then be laid in the wall or other surfaces between the gauges and finished even. All corners shall be rounded to a radius of 24 mm unless otherwise directed. The contractor shall not be paid for any extra thickness of plaster done than as specified.

Plaster, when more than 15 mm thick shall be applied in two coals, a base coat followed by the finishing coat. Thickness of the base coat shall be just sufficient to fill up unevenness in the surface, no single coat, however, shall exceed 12mm in thickness. The under coat shall be roughened or scratched before it is fully hardened.

Curing shall start 24 hours after the plaster is laid. It shall be kept wet for 14 days. During this period it shall be suitably protected from all damages at the contractor's cost by such means as approved by the Engineer-in-charge.

Any cracks which appear in the surface shall be cut out in rectangular shape and redone as directed by the Engineer-in-charge. Wherever specified standard waterproofing compound as approved by the

Engineer-in-charge shall be added to the mortar at the rate of 2% or as specified by the manufacturer by the weight of cement for which the rate shall be paid separately. The rate for plastering shall include cost of scaffolding, swing etc., needed for the work with labour and material all complete.

9. Steel Door, Windows and Ventilators:

All steel doors, windows and ventilators shall conform to IS – 1038, IS – 1361 and IS 1081 or equivalent as mentioned in the bill of quantities and as approved by the Engineer-in-charge.

Rolled steel sections shall conform to IS – 226. The sections shall be cold straightened and finished goods shall be free from bends and other defects. Materials used in the fabrication shall be the best procurable and conforming to relevant IS specification. Thickness and specification of the glass to be provided shall be as indicated in the relevant item of the bill of quantities. Glass shall be free from flaws, specks, bubbles, etc., Bolts, nuts, screws, peg stays and other mild steel fittings shall be treated for corrosion as per relevant Indian Standards. Putty for glazing shall conform to IS – 420.

Doors, windows and ventilators, etc., shall be truly square and free from twist and warp. They shall be constructed of sections which have been cut to the required lengths and welded or riveted at the corners as per standard specifications.

All steel surfaces shall first be thoroughly cleaned free of rust scale or dirt and mill scale by approved means and shall be painted with one coat of approved primer conforming IS – 102 before dispatch. Alternatively if specified they may be galvanized by the “Hot dip” zinc spray or electro galvanizing process described IS – 1361. Doors, windows and ventilators shall be fixed in positions, as specified under IS 1081.

Whenever contractor is required to supply the doors, windows and ventilators etc., he shall first submit to the Engineer-in-charge, the details about source of supply, detailed drawing and specifications etc.,. for prior approval.

11. Wooden Doors, Windows and Ventilators :

All wood work for doors, windows, ventilators cup board, shelves, etc., conform to relevant IS specification and TNBP 82 and shall be well seasoned teak wood or well seasoned country wood (Pillamarudu or Karumarudu) as the case may be. Timber shall be best quality and shall be free from knots, injurious open shales, bore holes, decay, soft or spongy spots, hollow pockets and all other defects and blemishes. Timber shall conform to IS 1003 (Part 1). Size of doors, windows and ventilators shall as specified in the relevant item of schedule and detailed drawings and generally in conformity with IS – 1003, part I and part II. The rates for doors, windows and ventilators etc., shall be for the finished work inclusive of fixing them in position with necessary iron hold fasts and furniture fitting of oxidized iron or aluminium or oxidized brass as stated in the description of the relevant items of the bill of quantities and as directed by the Engineer-in-charge. Fittings and furniture shall be of best quality and machine made and robust type. Wherever glazed shutters are to be provided, the cost of glass panes of specified thickness and fixing them in position should be included in the quoted rate. All glass shall be of superior quality from approved manufacturer. In case of solid core flush doors, they should conform to IS:2202 Part I and Part II. The flush door shutters should have a finished thickness as specified in the scheduled item. Flush door shutters shall be obtained from firms of repute as approved by the Engineer-in-charge.

12. ROOFING : (A) R.C.C Slabs :

Roof slab shall be of RCC of specified mix conforming to IS : 456, with adequate main tensile, transverse and adhesive reinforcement of ribbed steel bars of mild steel rounds. Unless otherwise mentioned the rates for RCC slab shall include cost of concrete, centering and shuttering charges, vibration charges, rounding of corners, curing and finishing etc., complete. Expansion joints in reinforced cement slabs shall be as per TNBP 30.

The ceiling should be finished as per Clause 30 of TNBP. No extra payment shall be made towards cost of ceiling plaster necessitated on account of defective centering materials used or poor workmanship.

The top of roof slab shall be finished with weathering course treatment if so specified. The weathering course work shall conform to TNBP 44-HJ and consist of concrete with broken brick in neat slacked lime of specified thickness finished with one course of pressed split tiles / pressed tiles of specified thickness and size as described in the bill of quantities.

13. A.C. Rain Water Pipes

The pipes shall be of standard quality conforming to IS 1628. These shall be straight, true smooth and regular in thickness. They shall be free from cracks and other flaws. The supply shall include all necessary pipe fittings and accessories.

All pipes shall be fixed to wall or columns by standard M.S butt holder clamps of approved make. The spigot of the upper pipe shall be properly fitted into the socket of the lower pipe, such that there is uniform annular space for filling with the jointing materials. One third depth of this annular space is to be filled with spun yarn soaked in bitumen of approved quality and properly pressed with caulking tool. The remaining two, third depth of the joint is to be filled with Cement Mortar 1:2 (1Cement : 2 coarse sand) and shall be pressed with caulking tool and finished smooth at the top at an angle of 45 Deg. sloping up.

The rate shall include supplying and fixing pipes with specials and accessories, including sizing as required, jointing, testing, cutting of walls and making good necessary scaffolding etc., complete.

14. Flooring :

Flooring shall consist of a base course of cement concrete of specified thickness and proportion laid over the compacted earth or sand filling as specified and a finishing layer of concrete, mosaic, glazed tiles or any other material as specified to be laid. Flooring work for Factory shop floors as well as mosaic flooring shall be done as per the special specifications.

The bed flooring shall be prepared either level or sloped as per relevant drawing or as instructed by the Engineer-in-charge. Filling in basement with earth or sand shall be in accordance with TNBP 25. On the prepared bed, cement concrete of specified mix and thickness shall be laid and well consolidated.

A. Ellispattern, 1st Sort Flooring

On the clean wet surface of the concrete base before it has set, will be laid a layer of cement concrete to give a finished depth of 20/25 mm over the base concrete. The cement concrete will be of 1:3 proportions (1 cement and 3 hard broken stone chippings 3 to 10 mm Size). To make a coloured floor red oxide iron powder or other approved materials should be mixed with cement at the rate 10% of the weight of cement or as directed by the Engineer-in-charge. Ellis pattern flooring shall be done as described under clause 41-G of TNBP.

B. Glazed Tile Flooring

The tiles shall be of ceramic white or coloured and of specified dimensions as described in the schedule item. The top surface of tiles shall be glazed with a neat finish of uniform colour and texture and free from flaws, cracks, craze, specks or other imperfections. Tiles shall be true and shape with straight edges, non-absorbing and non – fading. Samples of tiles together with manufacturer's literature shall be submitted to the Engineer-in-charge for approval. Tiles shall conform to IS 177 latest.

Over the prepared surface of the floor a bedding layer of Cement Mortar (1:3) of specified thickness shall be laid-in-proper level and slope using screed patterns. The bedding layer shall be deeply scratched while it is set. A mortar set bed of 6mm thickness in cement lime mortar 1:1:3 (one cement one lime putty and three sand), shall be laid over the bedding layer. After mortar setting, bed has been leveled, a skin of neat cement shall be trowel led to the mortar setting bed immediately before the tiles are set. As soon as the mortar setting bed has sufficiently hardened, all tiles shall be finally secured in place and gently beaten in and finished surface brought to desired level. When grouting the glazed tiles, special care shall be taken to prevent scratching of the glazed surface. Joints shall be pointed with white or coloured cement to match the tile surface and cured. No joint shall be more than 1.5 mm thick.

15. White Washing and Colour Washing

White washing and colour washing shall be done as per clauses 63 and 64 of TNBP. The surface shall be thoroughly cleaned off mortar drops and foreign matter. All patching must be scraped properly. The white washing shall be done from pure shell lime / Janathacem. Samples of lime shall be got approved by the Engineer-in-charge. The wash shall be applied with a brush, the coats being laid on vertically and horizontally alternatively, each coat being allowed to dry before next coat is applied. For colour washing the desired shade shall be obtained by mixing approved quantity of colouring matter or distemper with shell lime solution and applied as per white. The contractor shall take every precaution to prevent white wash being splashed on wall, floor and other places and articles not to be white washed. No colour wash shall be done unless a sample pattern of the mixed colour has been approved by the Engineer-in-charge. The rates shall be inclusive of scaffolding charges, cost of ladder etc.,

16. Painting

All painting work shall be done in accordance with TNBP-66 and the relevant Indian Standard Specifications. Paints, varnishes, cement paints etc., shall be the highest grade products of well known approved manufacturer and shall be delivered to site in original sealed containers. It is desired that materials of one manufacturer only shall be used as far as possible. Colours shall be uniform and nonfading. Samples of all colours selected shall be submitted to the Engineer in charge for approval before bulk purchase is made. All finished work shall match corresponding samples kept with the Engineer.

Preparation of Surface :

Before painting wooden surfaces, protruding timber fibres shall be removed and nail marks shall be covered with putty. The surface shall be thoroughly cleaned and sand prepared. In case of steel work it shall be scraped, well brushed and cleaned free of rust, scale dirt. Base preparation for painting concrete, masonry and plastered surfaces shall be carried out as per IS 2395 – Part I. Before actually proceeding with the work of painting the concrete, masonry and plastered surfaces, it shall be verified that the surfaces shall be completely dry, free from efflorescence and alkaline effect.

Application

The primer shall be applied with brushes and spread as evenly and as smooth as possible. For steel work a priming coat of Red Oxide / Zinc Chromate paint shall be applied. Painting shall be done by skilled labourers in a work-man like manner. All coats shall be of proper consistency and shall be well brushed out, so that no brush marks are visible. The under coating should be nearest to the specified colour of the finishing coat. Unless otherwise specified ready mixed synthetic enamel paints shall be used for painting, wood and steel work. Under coats should be completely dry before finishing coat is taken up. Priming coat and under coat shall be rubbed with sand paper and dusted clean. The finished coat of approved paint shall then be applied.

17. Cement Painting

Cement Paint solution shall be applied to the surface with hair brushes in a number of coats to get uniform finish. After the first coat of paints has hardened, it shall be cured with water at least for 24 hours. The surface shall be wetted again before the application of the second coat. At least 24 hours should lapse between the two coats, number of coats shall be as specified in the schedule of quantities. It shall be kept damp at least for seven days.

18. French Polish

French polish to be used shall comply with IS 348. Polishing shall be obtained by dissolving 1 lb, of shellac in one gallon of mentholated spirit without applying any source of heat. After the shellac has dissolved ¼ lbs of cobalt, ¼ lbs of lobano and 0.4 oz of crystals of desired pigment shall be added. The solution shall be applied with a pad of fine muslin cloth tied as per general practice. The pad shall be dipped into the solution and wrung with fingers and be rubbed hard on the surface in this way, the first coat is to be given after this gets dried up, the successive coats shall be given in the same fashion till the mirror like surface is obtained. The wood to be polished shall be first applied with filler composed of 1.25 Kg. of whiting mixed with one litre of mentholated spirit and then sand papered when dry. The finished surface shall have uniform texture and gloss. Approved transparent sealer shall only be used in base preparation.

SPECIAL SPECIFICATION FOR CONTROLLED CONCRETE

a) PROPORTIONING MIX:

The proportion of aggregate, Cement and water to be used for controlled concrete shall be designed by preliminary tests of the materials to be actually used to obtain the densest to workable concrete requiring the minimum quantity of cement paste for binding the materials to give the required strength. However the maximum total quantity of aggregate by weight per 50 kg. of cement shall not normally exceed 450kg All proportions shall be by weight. However water may be added by weight or volume.

b) MIX DESIGN:

Immediately upon the receipt of the award of the contract, the Contractor shall inform the Engineer-in-charge the exact location of the sources of materials which he proposes to use and get the materials approved. The mix with the actual approved materials to be used shall be got designed by the Contractor in an approved laboratory chosen by BHEL and got approved by the Engineer-in-charge. These proportions shall be used so long as the materials continue to be the same quality and from the same sources. If during the progress of work, the Contractor wishes to change the materials, the proportions shall be fixed on the basis of fresh preliminary tests to give the required strength. No change of materials shall be allowed unless fresh tests with new materials show satisfactory results.

c) STRENGTH REQUIREMENTS OF CONCRETE:

Controlled concrete shall be in the following grades, M 15, M 20, M 25, M 30, and M 35 & M 40. The concrete mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than the appropriate values (as per I.S. 456) as given in table below:

Sl. No	Grade of. Concrete	Specified Characteristic Cube Strength	
		Preliminary test N/mm2	Works test N/mm2
1.	M 15	20	15
2.	M 20	26	20
3.	M 25	32	25
4.	M 30	38	30
5.	M 35	44	35
6.	M 40	50	40

d) WORKABILITY OF CONCRETE:

The proportions chosen shall be such that the concrete is of adequate workability for the conditions prevailing on the work in question, and shall be properly compacted. Water shall be added to the mixer to give the required workability. The water content of each batch shall be adjusted as necessary to maintain the required workability with simultaneous adjustment of cement concrete such that the water cement ratio is not changed. The workability tests shall be carried out in accordance with IS : 1199 - Latest, "Methods of sampling and analysis".

Workability of concrete shall be controlled by direct measurement of water content, making allowance for any surface water in the fine and coarse aggregates. Allowance shall be made for surface water present in the aggregate when computing the water content. Surface water shall be determined by one of the field methods described in IS : 2386, Part III.

e) CONSISTENCY AND SLUMP:

The concrete shall have a consistency such that it will be workable in the required position. It shall be of such consistency that when properly vibrated it will flow around reinforcing steel and all embedded parts. The slump for concrete as determined by slump tests as per Indian Standard 456 (latest edition) shall not exceed the maximum slumps indicated below for each type of construction as approved by the Engineer-in-charge.

Workability	Slum in MM		Type of Construction
	Min.	Max.	
Medium	40	80	All RCC works

The contractor shall not place concrete having a slump outside the limits specified without the approval of the Engineer-in-charge.

At least one slump test shall be made for every compressive strength test carried out. More frequent tests shall be made if there is a distinct change in job conditions or if required by the Engineer-in-charge.

f) TESTS:

Test shall conform to the specifications laid down in IS : 456. These tests shall be got done in an approved laboratory and in accordance with IS : 516 - Latest at the cost of the Contractor (for making necessary cube moulds, transporting the cubes to the Laboratory and all other incidental etc.). The test fees for the cubes shall be borne by the contractor. In order to ensure proper quality control sampling of the concrete of each specification placed on any day in work shall be done in accordance with the following table.

Quantity of Concrete in work	Total Number of samples(each sample to consist of 6 test cubes)
Up to 5.00 Cu.m.	1
Greater than 5.00 Cu.m. and less than 15.00 Cu.m	2
Greater than 15.00 Cu.m. and less than 30.00 Cu.m.	3
Greater than 30.00 Cu.m. and less than 50.00 Cu.m.	4
Greater than 50.00 Cu.m.	4 + one additional sample for each additional 50 Cu.m. or part thereof.

i) The sampling shall be spread as evenly as possible throughout the day. When wide changes in weather conditions occur during concreting, additional samples may be taken as desired by Engineer-in-charge. Each sample shall consist of 6 cubes of 15 x 15 x 15 cm concrete. Test cubes shall be kept immersed in water until required for test which will be usually at 7 days and minimum crushing strength of not less than the following:

Grade of Concrete	M15	M20	M25	M30	M35	M40
Crushing strength in N/mm2 at the end of						
a) 7 days	10	13.50	17	20	23.50	27
b) 28 days	15	20	25	30	35	40

All costs connected with the preliminary tests for proportioning the mix, sampling, curing, handling, other incidental charges, labour charges and cost of materials shall be borne entirely by the Contractor. Testing charges for cubes (work tests) shall be borne by contractor. Such testing shall be conducted at approved laboratory as directed by the Engineer-in-charge or at the contractor's own laboratory set up at site itself.

All samples for tests shall be taken in the presence of Engineer-in-charge and the Contractor or his authorized agents.

A set of six specimens from random mixer batches, shall constitute a test, three being tested for 7 days and three being tested for 28 days strength.

The strength test result shall be the average strength of the three companion test specimens, tested at 28 days, except that, if one specimen in a test shows manifest evidence of improper sampling, moluding or testing, the result shall be discarded and the remaining two strengths averaged.

ii) Normally, 7 days and 28 days tests shall be made on specimens. For any mix, a correlation between 7 days and 28 days strengths may be made in the laboratory. Soon after a job starts, a similar correlation will be evolved for samples of a concrete taken from the mixer. After that correlation has been established, the results of the 7 days test may be used as an indicator of the compressive strength which should be expected at 28 days, provided such results are consistent, if 7 days tests shown compressive strength that are too low, corrective measures shall be taken at once, at the Engineer's direction, without waiting for the results of the 28 days tests.

iii) Each class of concrete shall meet the following strength requirements:

The average of any three consecutive strength tests shall have a value equal to or greater than the specified strength subject to the condition that only one out of three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength.

iv) In the event that concrete tested in accordance with the requirements of this specification, fails to meet the requirement, the Engineer shall have the right to require any one or all the following.

1. Changes in the concrete mix proportions for the remaining work.
2. Curing and testing of the concrete represented by the tests which failed.
3. **Replacement of any such portions of the structure. (No payment for dismantled concrete, associated from worker or reinforcement shall be made. Embedded fixtures, reinforcement and adjoining structures, damaged during dismantling shall be made good by the Contractor at his own expense).**

4. Extended curing of the concrete represented by the specimen.
5. The contractor shall carry out all such measures as directed at his own expense.

Load tests of structural members may be required by the Engineer when the strength of the job control tests falls below the required strength and is not acceptable as per "Acceptance Criteria" stated earlier. The entire cost of the load test shall be borne by the Contractor. If the load testing is decided by the Engineer, the member under consideration shall be subjected to a superimposed load equal to one and quarter (1.25) times the specified superimposed load used for design and this load shall be maintained for a period of 24 hours before removal.

The detailed procedure of the test shall be decided by the Engineer-in-charge.

If, within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the deflection after the 24 hours under load, the test should be repeated. The structure should be considered to have failed to pass the test if the recovery after the second test is not at least 80 percent of the maximum deflection occuring during the second test.

If the member shows evident failure, such changes as are necessary to make the structure adequately strong, shall be made by the contractor free of cost to the Department. If on the other hand, the failure becomes apparent, the Engineer under special circumstances, can retain the portion of the structure under test, provided suitable strengthening and or load dispersed arrangement is feasible. Cost of such strengthening or load dispersed arrangement shall be borne by the Contractor.

Load test shall not be made until the expiry of 56 days of effective hardening of the concrete.

If a portion of the structure is found to be unacceptable it shall be dismantled and replaced by a fresh structure as per specification. The cost of such dismantling and reconstruction should be borne by the Contractor.

The proportions of cement, fine aggregate, coarse aggregate and water necessary to produce a concrete mix which will fulfill the requirements of this specification for each grade of concrete shall be determined on the basis of trial mixes conducted with the samples of the material to be used in the work by the Engineer-in-charge in the field Laboratory.

All mix design and test data and results shall be maintained as part of the record of the contract and shall be signed by the Engineer-in-charge and the Contractor. A register showing such record shall be maintained at site of work.

ENGINEERING DESIGN BASIS

DESIGN PHILOSOPHY

6.6 STRUCTURAL & ARCHITECTURAL

Rev 2: CATEGORYOF TERRAIN, FOR WIND LOAD CALCULATION CHANGED TO 1

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
2	01.12.2009	REISSUED FOR ENGINEERING	AH	PJS	SC
1	18.11.2009	REISSUED FOR ENGINEERING	DS	PJS	SC
0	19.06.2009	ISSUED FOR ENGINEERING	PM/AG	SC/SD	VK
A	02.03.2009	ISSUED FOR CLIENT'S COMMENTS/APPROVAL	PM/AG	SC/SD	VK

Copyright EIL – All rights reserved

PART – I : STRUCTURAL

(FROM PAGE 3 TO 20)

PART –II : ARCHITECTURAL

(FROM PAGE 21 TO 40)

Copyright EIL – All rights reserved

PART–I: STRUCTURAL

TABLE OF CONTENTS

S.No.	Title	Page No.
1.0	REFERENCED STANDARDS & PUBLICATIONS	4
2.0	GENERAL	6
3.0	MATERIALS OF CONSTRUCTION	6
4.0	DESIGN LOADS	6
5.0	SOIL AND HYDROSTATIC PRESSURE	9
6.0	FOUNDATION DESIGN	10
7.0	FLOORING DETAILS FOR BUILDINGS	11
8.0	SPECIAL CONSIDERATIONS FOR RCC STRUCTURES	11
9.0	SPECIAL CONSIDERATIONS FOR STEEL STRUCTURES	14
10.0	SPECIAL CONSIDERATIONS FOR MASONRY WORKS	17
11.0	DESIGN REQUIREMENTS FOR SPECIFIC APPLICATIONS	17
	11.1 PIPE RACK & PIPE SUPPORTS	17
	11.2 MACHINE FOUNDATIONS	17
12.0	SPECIFIC REQUIREMENT	18

Copyright EIL – All rights reserved

1.0 REFERENCED STANDARDS & PUBLICATIONS

(BIS codes of Practice shall be applicable)

S.No.	CODES	
1.	Code of practice for plain & reinforced concrete	IS: 456
2.	Code of practice for general construction in steel	IS: 800
3.	Code of practice for use of cold formed light gauge steel structural members in general building construction	IS:801
4.	Code of practice for use of structural steel in overhead transmission line towers	IS:802
5.	Code of practice for use of steel tubes in general building construction	IS:806
6.	Indian Standard on Dimension s of Hot Rolled Steel Beams, Columns, Channel and Angles	IS: 808
7.	Scheme of Symbols for Welding	IS: 813
8.	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel	IS:814
9.	Code of practice for use of metal arc welding for general construction	IS:816
10.	Code of practice for design loads	IS: 875
11.	Common burnt clay building bricks-specification	IS: 1077
12.	Steel tubes for structural purposes-specifications	IS: 1161
13.	Technical Supply Conditions for Threaded Steel Fasteners	IS: 1367
14.	Code of practice for construction of stone masonry	IS: 1597
15.	Fillers for expansion joints	IS: 1838
16.	Criteria for earthquake resistant design of Structures	IS: 1893 (Part -1& 4)
17.	Code of practice for design & construction of Foundations in soils	IS: 1904
18.	Code of practice for structural use of unreinforced masonry	IS:1905
19.	Steel for General Structural Purposes- Specification.	IS: 2062
20.	Recommended practice for hot dipped galvanising on iron and steel	IS:2629
21.	Methods for testing uniformity of coating of zinc coated articles	IS:2633
22.	Code of practice for Design and construction of Pile foundations	IS:2911
23.	Code of practice for design & construction of raft foundations	IS:2950
24.	Code of practice for design & construction of machine foundations	IS:2974

Copyright EIL – All rights reserved

25.	Code of practice for concrete structures for storage of liquids	IS:3370
26.	Steel Chequered Plates – Specification	IS: 3502
27.	Code of practice for design and construction of foundation for transmission line towers and poles	IS:4091
28.	Code of practice for earthquake resistant design and construction of buildings	IS:4326
29.	Criteria for blast resistant design of structures for explosions above ground	IS:4991
30.	Criteria for design of RCC chimneys	IS: 4998
31.	Method of test for determination of dynamic property of soil	IS: 5249
32.	Code of practice for anti-termite measures in buildings	IS: 6313
33.	Code of practice for determination of bearing capacity of shallow foundations	IS: 6403
34.	Code of practice for design & construction of steel chimney	IS:6533
35.	Method for determination of mass of zinc coating	IS: 6745
36.	Code of practice for calculation of settlement of foundations	IS: 8009
37.	Chlorpyrifos emulsifiable concentrates	IS: 8944
38.	Recommendations for metal arc welding of carbon and carbon manganese steel	IS:9595
39.	Two parts polysulphide based sealants	IS: 12118
40.	Indian Standard on Hot Rolled Parallel Flanged Steel sections for Beams, Columns and Bearing Piles	IS:12778
41.	Pulverized fuel ash-lime bricks-specification	IS: 12894
42.	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces	IS:13920
43.	Control Room Safety (a publication of Oil Industry Safety Directorate)	OISD-STD-163
44.	Fire Proofing in Oil and Gas Industry (a publication of Oil Industry Safety Directorate)	OISD-STD-164
45.	Fire Protection System for Electrical Installations	OISD-STD-173

Note *The above list is suggestive and not exhaustive. Apart from these basic codes any other related codes shall also be followed wherever required.*

Copyright EIL – All rights reserved

2.0 GENERAL

2.1 This specification defines the design criteria and loads that shall be taken in to account for the design of all industrial plant and non-plant structures and buildings for a pipeline project. The design considerations given hereunder establish the minimum basic requirements of reinforced concrete structures, structural steel works and masonry structures. However, all structures shall be designed for the satisfactory performance of the functions for which the same are to be constructed.

3.0 MATERIALS OF CONSTRUCTION

3.1 All shed type structures such as Compressor house, Ware house etc. shall be in structural steel.

3.2 Pipe supports, cross over, access way, service platform shall completely be of steel construction. All other buildings shall be as per Architectural Design Basis.

3.3 All buildings shall be of RCC Frame type construction with brick masonry walls.

3.4 Boundary wall shall be of Stone masonry.

3.5 Bricks for masonry works shall be of the class conforming to IS: 1077 which is locally available.

4.0 DESIGN LOADS

4.1 These loadings shall be applicable to all structures irrespective of the material employed for construction.

a. DEAD LOADS

The weight of all permanent construction including walls, fire proofing, floors, roofs, partitions, stairways and fixed service and other equipments excluding their content.

b. EQUIPMENT LOADS

The empty weight of process equipment including all fixtures, platforms, ladders and attached piping but excluding contents shall be considered. If piping weight is not indicated separately or included in the weight of the equipment, the same shall be taken as 10% of the weight of the equipment.

For horizontal equipments the weight on two supports shall be calculated based on the total weight and C.G. of the equipment.

c. LIVE LOADS

Live loads shall, in general, be as per IS: 875. However, the following minimum live loads shall be considered in the design of structures to account for maintenance and erection as well.

Copyright EIL – All rights reserved

i.	Process Building/Technological Structure (Open/Enclosed type)		
	Operating area	-	5.0 kN/m^2 (including 2.0 kN/m^2 for Piping)
	Maintenance area	-	7.5 kN/m^2
ii.	Compressor House/TG house		
	Operating area	-	7.5 kN/m^2
	Maintenance area	-	7.5 kN/m^2 (or as specified by machine vendor)
iii.	Service Platform		
	Vessel/Tower	-	3.0 kN/m^2
	Isolated platform (for valve operation)	-	2.5 kN/m^2
	Access way	-	2.5 kN/m^2
	Cross over	-	2.0 kN/m^2
iv.	Substation/Control Room		
	Panel floor	-	10.0 kN/m^2
	Partitions	-	1.0 kN/m^2
v.	Office building		
	Office area	-	3.0 kN/m^2
	Lobby	-	5.0 kN/m^2
	Exit way	-	5.0 kN/m^2
	Partitions	-	1.0 kN/m^2
vi.	Laboratory		
	Upper floors	-	4.0 kN/m^2
vii.	Staircase		
	Office	-	5.0 kN/m^2
	Substation/Control Room	-	3.0 kN/m^2
	Laboratory	-	3.0 kN/m^2
	Service platform	-	2.5 kN/m^2

Copyright EIL – All rights reserved

vi. Walkway

Gantry girder - 3.0 kN/m^2

Live load on various types of roofs shall be as per the requirements given in IS: 875.

d. **OPERATING LOADS**

Operating loads shall include the maximum designed equipment inventory in the operating cycle of the plant.

e. **WIND LOADS**

Wind loads shall generally be as per IS: 875. The basic wind speed for all the stations/terminals shall be taken as 44 m/sec.

Values of coefficients k_1, $\mathbf{k_2}$, k_3 shall be as:

k_1 (Probability factor, risk coefficient) = 1.00 for permanent structures and
= 0.90 for for temporary structures
= 0.70 for barricading structures/ Boundary Wall

k_2 (Terrain, height & structure size factor) = this shall be taken for relevant class of structure with **category** 1 terrain w.r.t. actual height of the structure 2

k_3 (Topography factor) = As per site

The design life span of all structures shall be taken as 50 years. Temporary structures shall be designed for a design life span of 25 years. Design life span for boundary wall/barricading structure shall be as per IS: 875.

To account for surface area of piping, platforms and other attachments fixed to the equipment the surface area of the equipment (vessel/column) exposed to wind shall be increased by 20% or as specified in the mechanical data sheet of the equipment.

f. **SEISMIC LOADS**

Seismic forces shall be as per site specific seismic spectra 6987-00-16-54-DB-01 for Seismic Zone III.

g. **IMPACT & VIBRATORY LOADS**

Structures subjected to impact or vibratory loads shall be designed as per the provisions of IS: 875 & IS: 2974**.**

Copyright EIL – All rights reserved

h. **BLAST FORCES**

Blast resistant control room or any other specified structure subjected to blast forces generated due to accidental blasts from hydrocarbon ignitions shall be designed to withstand all such forces. Design blast loads and blast resistant construction shall conform to OISD-STD-163.

i. **BUNDLE PULL**

Bundle pull for different types of Exchangers shall be taken for design of their supports unless it is made clear that bundle extractor is to be used.

Total Bundle Pull shall be considered on fixed pedestal alone.

j. **OTHER LOADS**

Apart from the specified live loads, any other equipment load or possible overloading during construction/hydro-test/ maintenance/erection shall also be considered in the design. Under hydro test condition the wind force shall be taken as 25% of normal loading.

Design of all structures shall also consider any other relevant and consequential load/stress imparted to the structure.

All liquid retaining/storage structures shall be designed assuming liquid up to the full height of wall irrespective of provision of any over flow arrangement. Pressure relief valves or similar pressure relieving devices shall not be made in underground water retaining/storage RCC structures.

All buildings/structures shall be designed to resist the worst combination of the above loads. However wind loads shall not be considered in combination with loads due to maintenance cranes in workshop, comp. House etc.

5.0 SOIL AND HYDROSTATIC PRESSURE

Pressure on basement walls: - In design of basement walls and similar approximately vertical structure below grade, provision shall be made for the lateral pressure of adjacent soil. Due allowance shall be made for possible surcharge from fixed or moving loads. When a portion or whole of adjacent soil is below free water surface, computations shall be based on the weight of the soil diminished by buoyancy (submerged weight of soil) plus full hydrostatic pressure.

Uplift on floor: - In the design of basement floor and a similar approximately horizontal construction below grade, the upward pressure of water, if any, shall be taken as the full hydrostatic pressure applied over the entire area. The Hydrostatic head shall be measured from the underside of construction. Factor of safety against uplift shall be 1.2. For the purpose of calculating downward load due to over burden; the weight for the same shall be calculated for volume over projected plan area only.

Copyright EIL – All rights reserved

6.0 FOUNDATION DESIGN

6.1 Minimum Requirements

Foundation design shall be as per Geo-Technical Data as specified in bid document.

6.1.1 Minimum depth of foundation for all structures shall be as per Geo-Technical Data. Factors of safety against overturning and sliding shall be as per values given in Table-1. Component of soil backfill weight over foundation slab shall be appropriately covered as foundation dead load. For stability checks the weight of soil as overburden shall be as per Table-1.

6.1.2 The design ground water level shall be as per the Geo-Technical Data and the hydrostatic pressure shall be adequately accounted for in design.

6.1.3 Allowable net bearing capacity of soil shall be based on the following settlement criteria for dead plus imposed load conditions:

- Foundations in unit areas, utility areas and foundations for Plant buildings. — 25mm settlement.
- Non Plant buildings. — 40mm settlement.
- Raft Foundations — 40mm settlement

For transient loadings, e.g. wind/seismic, settlement shall not be the design criteria and the SBC (safe bearing capacity) based on shear criteria shall be considered.

6.1.4 Permissible increase in SBC/Pile capacities (for compressive, shear and uplift/tension) shall be as per the Geo-Technical Data.

6.1.5 Under blast (due to hydrocarbon explosion load combinations the design bearing pressure of soil shall not exceed 2 (two) times the allowable static bearing pressure of soil. Pile capacity shall be similarly increased in blast condition to 1.5 times the permissible capacity under compression, tension and shear modes.

6.1.6 Grade of concrete to be used shall in general be as per the philosophy adopted for the entire project However, minimum cement content, type of cement & any remedial actions required for foundation due to aggressiveness of sub soil water shall be as per the Geo-Technical Data.

6.2 Anti Termite Treatment

No anti termite treatment shall be provided inside the unit areas. All buildings shall be provided with anti termite treatment as per IS: 8944 and IS: 6313.

6.3 Minimum Cover to Foundation Bolts

Minimum distance from the centerline of foundation/anchor bolt to edge of pedestal shall be the maximum of the following:

i) Clear distance from the edge of the base plate/base frame to the outer edge of the pedestal shall be minimum 50mm.

Copyright EIL – All rights reserved

ii) Clear distance from the face of pocket to the outer edge of the pedestal shall be 100mm.

iii) Clear distance from the edge of the sleeve or anchor plate to the edge of pedestal shall be 100mm.

6.4 Height of Pedestals

The minimum projection of pedestals supporting any steel structure/stanchion bases shall be 300/150mm above the high point of pavement/ finished grade/finished floor level whichever is higher, for outdoor and indoor located pedestals respectively. The maximum projection of pedestals for staircase/ladder shall be 200mm.

6.5 Grouting & Minimum Grout Thickness

The minimum thickness of grout shall be **25 mm** and not more than 50mm.

All anchor bolt sleeves/pockets and spaces under column bases, shoe plates etc. shall be grouted with free flow, non shrink (premix type) grout with 28-day minimum cube crushing strength of 40N/mm^2. Ordinary cement sand (1:2) grout shall only be used under the base plates of cross-overs, short pipe supports (not exceeding 1.5 m height) and small operating platforms (not exceeding 2 m height) not supporting any equipment.

Grouting requirement for machines and equipments are not covered here. The same shall be governed by equipment vendor's requirement.

7.0 FLOORING DETAILS FOR BUILDINGS & SHEDS

The specifications given hereunder shall be adopted for the non-suspended ground floor slabs for buildings & sheds as categorised in Table-2 only.

For outdoor pavements, Design basis of Gen. Civil shall be referred.

8.0 SPECIAL CONSIDERATIONS FOR RCC STRUCTURES

8.1 General/Design Methods

a) All buildings, structures, foundations, machine/equipment foundations, liquid retaining/storage structures, trenches, pits etc. shall be of RCC and designed based on the following IS Codes (latest revision with all amendments issued there to) in general and other relevant IS Codes applicable: IS: 456, 875, 1893, 1904, 2911, 2950, 2974, 3370, 4091, 4326, 4995, 4991, 4998, 5249, 6403, 8009, 13920.

b) Only limit state method as per IS: 456 shall be followed in the design unless otherwise specified elsewhere in this document for special structures.

c) Where the specified design depth of groundwater table so warrants all underground pits, tunnels, basements etc. (excluding appurtenances of storm water/effluent collection system, cable trench, pipe trench) shall be of leak-proof RCC construction using waterproofing compounds.

d) All liquid retaining/storage RCC structures shall be leak-proof and designed as uncracked section as per IS: 3370. However, the parts of such structures not

Copyright EIL – All rights reserved

coming in contact with the liquid shall be designed according to IS:456 except ribs of beams of suspended floor slabs & counter forts of walls (located on the side remote from the liquid) and roof which shall be designed as uncracked section. No increase in permissible stresses in concrete and reinforcement shall be made under wind or seismic conditions for such structures.

e) The walls and base slabs of liquid retaining/storage structures shall be provided with reinforcement on both faces for thickness greater than or equal to 150mm. In all liquid retaining structures, PVC water bars (minimum size 230mm wide, 5mm thick) shall be provided at each construction joint.

f) Hot/cold water basin and other primary framing members of Cooling towers or similar liquid retaining structures which remain constantly in contact with water (stored/sprayed) shall be designed as uncracked sections.

8.2 REINFORCEMENT BARS

High Strength Deformed TMT steel bars of grade Fe 500 (with corrosion inhibitors in concrete) conforming to IS: 1786 shall be used for all structures.

8.3 CONCRETE

Minimum grade of reinforced cement concrete to be used for different structures and foundations shall be **M30**. From Durability considerations the minimum cement content and maximum water-cement ratio shall be as under. However, the maximum cement content shall not exceed 450 kg/m^3.

For all stations/terminals

Type of cement	Plain concrete (M20)		Reinforced concrete (M30)		Exposure Condition
	Minimum cement content (kg/m^3)	Maximum water-cement ratio	Minimum cement content (kg/m^3)	Maximum water-cement ratio	
OPC/Fly ash based PPC/SRC(*)	250	0.50	320	0.45	**Severe**

OPC: Ordinary Portland cement, PPC: Portland Pozzalana Cement

*SRC: Sulphate Resistant Cement (if required as per soil recommendation for respective site)

75mm thick lean concrete of grade 1:5:10 shall be provided under all RCC foundations except under base slab of liquid retaining structures where **100 thick** concrete of mix 1:3:6 shall be used. The lean concrete shall extend **50mm** beyond the foundation for normal foundations and **75mm** under liquid retaining structures.

Copyright EIL – All rights reserved

Plain Cement Concrete (PCC) of grade M15 of minimum 150mm thickness shall be provided under all masonry wall foundations.

Plain cement concrete of grade M20 of minimum 40mm thickness shall be provided as damp proof course at plinth level of all masonry walls and to be coated with 3mm thick bitumen emulsion.

8.4 MINIMUM COVER TO MAIN REINFORCEMENT

The following minimum clear cover shall be provided for RCC works.

-	Slab (roof & floor), Canopy, Cantilever, Waist slab	45mm
-	Beam (roof, floor & tie),lintel	45mm
-	Column, Pedestal	50mm
-	Retaining Wall, Basement and Pit Wall.	
	a) Face in contact with earth	50mm
	b) Free face	45mm
-	Liquid retaining structure	
	a) Face in contact with liquid	45mm
	b) Face away from liquid but in contact with earth	50mm
	c) Free face	45mm
-	Foundation slab, base slab, plinth beam	50mm
-	Pile Cap	
	a) Bottom face	100mm
	b) Top face	50mm

8.5 MINIMUM THICKNESS OF STRUCTURAL CONCRETE ELEMENTS

The following minimum thickness shall be followed:

-	Footings (All types, with or without beams) (Note: Tapered footings shall not have thickness less than 150mm at the edges. Minimum average thickness shall not be less than 300mm)	300mm
-	Pile Cap	500mm
-	Basement	
	a) Walls	150mm
	b) Base slab with beams	200mm

Copyright EIL – All rights reserved

c)	Base slab without beams	300mm
-	Slab thickness in Raft foundations with beam & slab construction	150mm
-	Floor/Roof Slab, Walkway, Canopy Slab	120mm
-	Cable/Pipe Trench/Launder Walls & Base Slab	125mm
-	Parapet	75mm
-	Louvre / Fin.	100mm
-	Precast Trench Cover/Precast Floor Slab	125mm
-	Louvre (in contact with liquid)	125mm
-	Liquid Retaining / Leak proof Structure	
a)	Walls	150mm
b)	Base slab with beams	200mm
c)	Base slab without beams	300mm
-	Underground Pit	
a)	Walls	150mm
b)	Base slab with beams	200mm
c)	Base slab without beams	300mm
-	Blast resistant construction	AS/OISD-STD-163

9.0 SPECIAL CONSIDERATIONS FOR STEEL STRUCTURES

9.1 General/design methods

a) Design, fabrication and erection of the above work shall be carried out in accordance with the following IS Codes as applicable to the specific structures, viz. IS: 800, 801, 802, 806, 814, 816, 875, 1893, 9178, 9595, 6533, etc. Basic consideration of structural frame work shall primarily be stability, ease of fabrication/erection and overall economy satisfying relevant Indian Standard Codes of Practice. Simple and fully rigid design as per IS: 800 shall be used. Where fully rigid joints are adopted they shall generally be confined to the major axis of the column member

b) Structural elements continuously exposed to temperatures above 200^0 C shall be designed for reduced stress as per IS:800.

c) Crane gantry girders shall generally be of welded construction and of single span length. Chequered plate shall be used for gantry girder walkway flooring.

d) Steel staircases for main approaches to operating platforms shall have channels provided as stringers with minimum clear width of 750mm and slope of app. 41 degree. The vertical height between successive landings shall not be less than 2.6m

Copyright EIL – All rights reserved

nor exceed 4.0 meters. Treads shall be minimum 230mm wide made of grating (with suitable nosing) spaced equally so as to restrict the rise to maximum 200mm.

e) Hand rails, 1000mm high, shall be provided to all walkways, platforms, staircases. Toe plate (100mmx5mm) shall be provided for all hand railing (except for staircases). Spacing of uprights shall be 1500mm (maximum). Two types of hand railing shall be provided.

i) For Tech. structures, walkways, platforms (except platform around/on circular/horizontal vessels), and staircases: Top rail, mid-rail and upright shall be 32mm dia (NB) galvanised MS tubes.

ii) For platforms around circular vessels: Top rail shall be 32mm dia (NB) galvanised MS tubes but mid rail and upright shall be of structural steel.

f) Electro-forged hot dip galvanised MS Gratings shall be minimum 25 deep. The maximum size of voids in the grating shall be limited to 30mm x 100mm.The minimum thickness of galvanising shall be 120 microns.

g) Welded connections shall be adopted as far as practicable except for the removable members where bolted connections are required viz. (Galvanised) electrical switchyard structures and transmission towers. Structural connections shall have minimum two bolts of 16mm dia. unless otherwise limited by the size of members.

h) Minimum two nuts shall be used for all anchor bolts except for ladder, stair and handrail.

i) Structural section shall be conforming to IS:808 and/or IS:12778. RHS/SHS section conforming to IS:4923 shall be used. CHS section shall be conforming to IS:1161.

9.2 GRADE OF STEEL

Structural steel shall be of yield stress of 250 MPa conforming to grade A of IS: 2062. RHS/SHS/CHS shall conform to Yst 310/240.

9.3 FIREPROOFING OF STEEL STRUCTURES

Fire proofing of steel structures shall be by concrete (for structures supporting transfer line & two phase flow line above 6" diameter) and vermiculite (for other structures), wherever required as per OISD-STD-164 and shall be done for 2 hours fire rating as per EIL specification or as required as per TAC rules. Guniting method of fire proofing shall be applied for equipment skirts

9.4 Limiting permissible Stresses

- Permissible stresses in structural members shall be as specified in:

IS: 800	Hot rolled sections (excluding transmission towers and switchyard structures).
IS: 801	Cold formed light gauge sections
IS: 802	Code of practice for use of structural steel in overhead Transmission line towers & switchyard structures
IS: 806	Tubular structures

Copyright EIL – All rights reserved

- Permissible stresses in bolts shall be as specified in:

  IS: 800 Hot rolled sections
  IS: 801 Cold formed light gauge sections.
  IS: 802 Transmission towers & switchyard structures.

- Permissible stresses in welds shall be as specified in:

  IS: 801 Cold formed light gauge sections.
  IS: 816 Metal Arc Welding

9.5 Limiting Deflection

a) The limiting permissible vertical deflection for structural steel members shall be as specified below:

- Gantry girder for electric overhead crane (Capacity up to 50T) : L/750
- Gantry girder for electric over head crane (Capacity over 50T) : L/1000
- Gantry girder for manually operated crane : L/500
- Girder/beam for supporting dynamic equipment/hoist : L/450
- Grating/Chequered plate : L/200 or 6mm whichever is minimum
- Purlins supporting any type of roofing material under (dead load+live load) or (dead load+wind load) conditions : L/200
- Other structures/structural components : As specified in Relevant IS Codes

Where 'L' represents the span.

b) The limiting permissible horizontal deflection for multi storied steel structure/ building including flare stack shall be Height/325.

9.6 Minimum Thickness

The minimum thickness of various structural components (Hot rolled sections) shall be as given:

a) General Construction:

Trusses, purlins, side girts & bracings	6mm
Columns, beams	7mm
Gussets in trusses & girders	
i) upto and including 12m span	8mm
ii) above 12m span	10mm
Stiffeners	8mm
Base plates	10mm

Copyright EIL – All rights reserved

Chequered plate	6mm (on plain)
Grating	3mm

Structural members exposed to marked corrosive action shall be increased in thickness or otherwise suitably protected against corrosion.

The minimum thickness of structural components (except gratings & chequered plates) which are directly exposed to weather and inaccessible for repainting **shall be 8mm.**

b) Transmission Towers & Switchyard Structures:

The minimum thickness of various structural components shall be as per IS: 802.

The minimum thickness for rolled beams and channels shall be mean flange thickness regardless of the web thickness.

The minimum thickness of tubes shall be as specified in IS: 806.

9.7 PAINTING

Painting including shop primer to Structural Steel shall be as per painting specification attached elsewhere.

10.0 SPECIAL CONSIDERATIONS FOR MASONRY WORKS

10.1 General

Masonry works shall be of the class which is locally available in accordance with IS: 1077, IS: 1905, IS: 1597, IS: 12894 and other relevant IS Codes as applicable. All external brick masonry walls shall be of minimum 230mm thickness except for fire walls.

10.2 Cement Mortar

All masonry work shall be constructed in cement sand mortar 1:6 except half brick partition walls which shall be constructed in 1:4 cement sand mortar with two numbers of 6mm diameter MS bars provided at every fourth course properly anchored with cross walls or pillars.

11.0 DESIGN REQUIREMENTS FOR SPECIFIC APPLICATIONS

11.1 PIPE RACK & PIPE SUPPORTS

Design of pipe rack & pipe supports shall be as per document no. 8-76-0020

11.2 MACHINE FOUNDATIONS

Machine foundations shall satisfy the requirements of IS: 2974 and any other parameter as per machine vendor.

Copyright EIL – All rights reserved

12.0 SPECIFIC REQUIREMENT

Maintenance platform below Coolers shall be full RCC platform.

Sand Filling for Ring Wall foundation shall be either by river sand or crushed Stone Sand.

Copyright EIL – All rights reserved

TABLE-1

FOUNDATION DESIGN - FACTORS OF SAFETY

Type Of Structure	Minimum Factor Of Safety Against Overturning		Minimum Factor Of Safety Against Sliding		% Weight Of Overburden Over Projected Plan Area Of Footing
	With Wind Or Seismic	Without Wind Or Seismic	With Wind Or Seismic	Without Wind Or Seismic	
All Buildings/ Structures/Eqpts. in Units	1.5	2.0	1.5	1.5	100
Pipe Rack (Offsite)	1.5	2.0	1.5	1.5	50$
Flood Light Mast	1.5	-	1.5	-	50$
Retaining Wall	1.5	2.0	1.5	1.75	100
Over Head water Tank	1.5* / 2.0	-	1.5	-	50$
Flare Supporting Structure	1.5	-	1.5	-	50$
Blast Resistant Structures	1.5	2.0/1.2#	1.5	1.5/1.5#	100

* Empty condition

\# With blast pressure

$ In case area is paved, overburden shall be based on NGL (for area under filling) or 600mm below HPP whichever is lower. In case of unpaved area, it shall be w.r.t. FGL.

Minimum Factor of safety against UPLIFT shall be 1.2 for all structures. (Note: In case of sumps, lining weight shall not be included)

Copyright EIL – All rights reserved

TABLE – 2

FLOORING DETAILS FOR BUILDINGS & SHEDS

S No	Description		Flooring Type		
			I	II	III
1(a)	Sub Grade	Earth fill base compacted to 95% dry density.	✓	✓	✓
1(b)		Compacted layer of sand/boulder packing over thoroughly compacted Earth fill (in mm)	200 THK.	200 THK.	150 THK.
2(a)	Strl Grade Slab	Lean concrete 1:5:10 over sand layer (in mm)	50 THK.	50 THK.	50 THK.
		Strl. non suspended slab in M20 Grade concrete (Reinforced with 8mm dia bars @200 c/c both ways) over lean concrete.	150 THK.	150 THK.	100 THK.
2(b)		R/F placement	R/F placed centrally	R/F placed in two layers at top & bottom	No R/F required.
3	Finish	Floor finish	As per Arch Detail	As per Arch Detail	As per Arch Detail

Type I: Plant Buildings such as Sub-Stations, Control Rooms, Pump Houses, Utility Compressor Houses, Parking Areas, Stores, Porches.

Type II: Ware Houses, Workshops, Cement Godowns, Fire Stations, Process Compressor Houses.

Type III: Non Plant Buildings (viz. Administration, Laboratory, Canteen, Time Office, Gate House, Training Centre, Guest House, Residential buildings).

Notes:

1) Reinforcement steel shall be as per clause 8.2.

2) For Ware Houses & Work shops non suspended ground floor slabs with above specifications shall be provided using vacuum dewatering concrete system.

Copyright EIL – All rights reserved

PART –II : ARCHITECTURAL

CONTENTS

Title	Page No.
ENGINEERING DESIGN BASIS	
1.0 REFERENCED PUBLICATIONS……..	22
2.0 DESIGN PHILOSOPHY/ CRITERIA	
2.1 ARCHITECTURAL DESIGN……..	22
2.2 BUILDING REQUIREMENTS……..	22
2.3 BUILDING SERVICES……..	26
2.4 AESTHETICS……..27	
2.5 STRUCTURAL AND CONSTRUCTION ELEMENTS…27	
2.6 BUILDING ELEMENTS……..	27
2.7 SCHEDULE FOR ARCHITECTURAL FINISHES……32	

Copyright EIL – All rights reserved

ENGINEERING DESIGN BASIS

1.0 REFERENCED PUBLICATIONS

1. National Building Code of India
2. Factory Law
3. Local Municipality or any other Authority's Bye-laws as applicable.
4. TAC (Tariff Advisory Committee) Rules.
5. Bye-laws of Town & Country Planning Organisation
6. OISD Norms
7. BPE Norms
8. BIS Codes
9. Indian Electricity Rules
10. Any other applicable Law, Rules, Standard as referred in respective clause.

1.1 STANDARD SPECIFICATIONS CODES & PRACTICES

EIL Engineering design incorporates Codes and Standards as referred in the design philosophy of respective engineering disciplines as well as applicable EIL standards specifications.

2.0 DESIGN PHILOSOPHY/ CRITERIA

2.1 ARCHITECTURAL DESIGN

Architectural design of the buildings shall be in accordance with this design basis and references as stated above to meet the functional requirements.

2.2 BUILDING REQUIREMENTS

2.2.1 **List of buildings**:

Following buildings are envisaged in this project.

2.2.1.1 Non-Plant Buildings

1. Security Barracks and Guard Houses
2. Product Ware House
3. Central Ware House
4. Guest House
5. Construction Office Building
6. Canteen Building
7. Emergency DG House
8. Health Centre
9. Administrative/Training/ Medical centre
10. Central Laboratory Building
11. Polymer Service Building
12. NCU/GCU Service Building
13. Central Workshop
14. Central Warehouse
15. Weigh Bridge
16. Chemical Storage Building

Copyright EIL – All rights reserved

17. Gate Houses

The above list of Non Plant Building is subjected to finalization during detail engineering

Spatial requirement for non-plant buildings. shall be finalized looking into the functional requirements and its occupancy which shall be governed by Owner's specific requirement. Design shall be in accordance with Factory Act, NBC etc.

Requirement of services/utilities such as air conditioning, LAN etc. shall be finalized as per Owner's specific requirement.

2.2.1.2 Plant Buildings

1. Main Control Room
2. Satellite Rack Room
3 Sub Stations

The above lists of Plant Buildings are subjected to finalization during detail engineering.

Spatial requirements of these Plant Buildings shall mainly be decided based on the equipment/panel layout, activities to be performed in the building and consequent occupancy pattern. Sizes of various type of spaces shall be decided based on occupancy/ equipment/Panel layout, clearances, maintenance & safety requirements. The objective of spatial arrangement shall be to satisfy functional requirements, physical comfort, and safety regulations as well as aesthetics.

(a) Control Room Buildings & Satellite Rack Rooms for Process Units shall be designed as per OISD-STD 163, TAC building bye-laws and Factory Act. Control Room Buildings shall be centrally air-conditioned, single storied construction, designed to fully meet the Instrumentation, Electrical, HVAC, safety and other requirements.

Control Room Buildings shall broadly consist of Console Room, Rack Room, EC/ PLC Room, Computer Room, UPS Room, Battery Room, Operators' Rooms, Shift-in-Charge Rooms, Supervisor's Office accommodation, Instruments Calibration Room, Operators' Check and Change Room, Toilets (Ladies & Gents), A.C. Plant/ AHU Rooms, Clean Agent Storage Room etc.

Satellite Rack Rooms shall broadly consist of Rack Room, Room, UPS Room, Battery Room, A.C. Plant/ AHU Rooms, Clean Agent Storage Room etc. Operators' Rooms, Toilets (Ladies & Gents) may be provided if required.

Requirement of Blast resistant design and construction shall be finalized during detail engineering stage.

(b) Sub-Station buildings shall be designed as per OSID –STD 149; 173; IEA;IER; TAC building bye-laws, Factory Acts etc. Sub Stations shall be double storied having Cable Cellar at ground floor or single storied (having trenches for the cables) as per the Electrical requirements and Electrical Design Basis. Sub Station Buildings shall broadly consist of Switchgear Room, Operator's Room, Battery Room, Other Electrical Panels' Room, Pressurization Room etc. as per functional requirements and Electrical design basis. Toilets shall be provided as per requirement.

Copyright EIL – All rights reserved

2.2.1.3 Units

1. Process buildings/ sheds of DFCU unit (plant/equipment sheds, analyzer room etc. As required)
2. Process buildings/ sheds of PGHU unit (plant/equipment sheds, analyzer room etc. As required)
3. Process buildings/ sheds of BzEU unit (plant/equipment sheds, analyzer room etc. As required)
4. Process buildings/ sheds of BdEU unit (plant/equipment sheds, analyzer room etc. As required)
5. Process buildings/ sheds of LLDPE unit (additive house, extruder house, Bagging & palletization building, catalyst storage, teal house, storages, Analyzer room etc. As required)
6. Process buildings/sheds of HDPE unit (additive house, bagging building, extruder house, analyzer room, etc. As required)
7. Process buildings/ sheds of PP unit (polymerization building, catalyst/ mineral oil storage, extruder house, bagging/palletization & bulk loading building, ware-house, valve house, analyzer room etc. As required)
8. Process buildings/ sheds of BUTENE -1 unit (plant/equipment sheds, analyzer room etc. As required)

The above lists of buildings/sheds are subjected to finalization during detail engineering.

Buildings/ Sheds of Process Units shall be designed as per Factory Act & NBC incorporating special requirements of Licensors if any.

Ventilation and day-lighting shall be ensured by means of louvers/ window & ventilators and roof monitors. Necessary lifting devices shall be provided.

2.2.1.4 Utility Facilities

1. Buildings/ sheds for power receiving and distribution system utility package (as required for utility package)
2. Buildings/ sheds for raw water system utility package (as required for utility package)
3. Buildings/ sheds for DM water system utility package (as required for utility package)
4. Buildings/ sheds for cooling water system utility package (as required for utility package)
5. Buildings/ sheds for compressed air (instrument & plant) system utility package (as required for utility package)
6. Buildings/ sheds for fuel gas system utility package (as required for utility package)
7. Buildings/ sheds for Inert gas system utility package (as required for utility package)
8. Buildings/ sheds for Steam generation system utility package (as required for utility package)

Copyright EIL – All rights reserved

9. Buildings/ sheds for condensate & condensate polishing system utility package (as required for utility package)
10. Buildings/ sheds for emergency power system utility package (as required for utility package)
11. Buildings/ sheds for utility & product distribution piping utility package (as required for utility package)

The above lists of buildings/sheds are subjected to finalization during detail engineering.

Buildings/ Sheds of Process Units shall be designed as per Factory Act & NBC incorporating special requirements of Licensors if any.

Ventilation and day-lighting shall be ensured by means of louvers/ window & ventilators and roof monitors. Necessary lifting devices shall be provided.

2.2.1.5 Offsite Facilities

1. Buildings/ sheds for tankage/ storage facility (as required for offsite package)
2. Buildings/ sheds for resin silos and bagging facility (as required for offsite package)
3. Buildings/ sheds for effluent system (as required for offsite package)
4. Buildings/ sheds for chemical storage (as required for offsite package)
5. Buildings/ sheds for catalyst storage (as required for offsite package)
6. Buildings/ sheds for fire fighting system (as required for offsite package)
7. Buildings/ sheds for security & surveillance system (as required for offsite package)
8. Buildings/ sheds for loading and unloading system (as required for offsite package)

The above lists of buildings/sheds are subjected to finalization during detail engineering.

Buildings/ Sheds of Process Units shall be designed as per Factory Act & NBC incorporating special requirements of Licensors if any.

Ventilation and day-lighting shall be ensured by means of louvers/ window & ventilators and roof monitors. Necessary lifting devices shall be provided.

2.2.2 Day Lighting

Established level of illumination shall be maintained for all parts of the buildings by means of windows, ventilators etc. Provision of referenced publications like NBC part-VIII; Section-1; IS-2440-1975; IS-3646 (part II-1996); IS-7662 (part I-1974), Factory rule or other relevant rules etc. shall be adhered to in this regard. Openings shall be provided with shading devices to avoid glare. For the purpose of illumination, day lighting shall also be supplemented by artificial illumination particularly at fire-exit.

2.2.3 Ventilation

2.2.3.1 Natural Ventilation

Established level of ventilation in terms of air changes per hour shall be maintained for all spaces as per the provision of referenced publications like State Factory rules,

Copyright EIL – All rights reserved

NBC part-VIII Section-1, IS:3101-1975 (Industrial building), IS:3362-1975 (Residential buildings), IS-:7662 (Part I-1974) or other relevant code/ rules. Natural ventilation shall also be supplemented by mechanical or electrical means of ventilation in all human occupied areas. Sufficient no. of Glazed/Louvered windows/Ventilators shall be provided and supplemented by exhaust fans.

2.2.3.2 Mechanical ventilation

In addition to natural ventilation, if required Mechanical or electrical ventilation is provided depending on the type of building and its use. Refer Design Basis of Packaged Equipment for its requirement and applications.

2.2.4 Safety Requirement

Safety from fire and like emergencies shall be taken into account in building design as per NBC-Part IV; State Factory Rules and other relevant code/ rules. The buildings shall be provided with exits sufficient to permit safe escape of occupants in case of emergency. The exits shall be in terms of doorway, corridors, etc. to internal/ external staircase or to areas having access to the outside.

2.2.5 Site planning & Landscaping

Site planning of building shall take into account aspects like inter-relationship of the buildings with the whole system, movement pattern, traffic and road net-work, safety regulations, service network, fire safety, climatic and environmental aspects, site conditions like site dimension, contour, drainage, noise level, view, future expansion, visual aspects etc.

Main and service/ maintenance entrances of buildings shall be provided with vehicular access. All exit points shall also be provided with footpath/ vehicular access. Truck movement space in accordance with traffic pattern shall be provided for the building as per the location of hoisting bay/loading, unloading platform. Road network and open space around the buildings shall be designed considering movement and functioning of Fire tenders and cranes etc.

Suitable Landscaping treatment shall also be done around the important buildings. Such treatment shall generally consist of lawns, road side plantation and beautification of building entrance areas. Standard landscape elements such as earth contours, pavings, flower beds, hedges, shrubs, ground cover and ornamental trees shall be incorporated in landscape treatment. Necessary water supply/sprinklers shall also be provided.

2.3 BUILDING SERVICES

Following services shall be provided for all buildings as essential services.

2.3.1 Water Supply, Distribution and Drainage, Sanitary Services.

This service is essential for all human occupied buildings. The building shall have toilet and drinking water facility and accordingly water supply, distribution and drainage, sanitary services as per NBC- Part-IX: Section 1&2, Factory rules and or referenced publication. Drinking water provisions shall be provided within an enclosure separated from the toilets. Space for janitor shall be provided in the toilets. All service pipes showing on the external wall shall be suitably concealed or shall be provided within a shaft.

Copyright EIL – All rights reserved

2.3.2 Electrical Services

This service shall be provided as essential service for all the buildings. Electrical services for building shall consist of electrical supply, and distributions, electrical lighting installations, telephone network, fans, exhaust fans, lighting protection system etc., all accessories, cabling etc. including Emergency power supply, all as defined under Engg. Design Basis of Electrical.

2.3.3 Air Conditioning and Heating

Control Room Building, Administration Building, etc. shall be centrally air-conditioned. Accordingly A.C. Plant/ AHU etc. of the require capacity (depending on the requirement) shall be provided and suitably housed. Some designated rooms (as per Electrical requirement) in the Sub Station Buildings may be required to be air-conditioned. For this suitable window/ split/ package type units may be provided as per requirement w.r.to the Design Basis of Packaged Equipment.

2.4 AESTHETICS

Apart from the fulfillment of functional & safety requirement, aesthetic requirement of the building shall be taken care of in the design. Preliminary drawings indicating Architectural scheme shall be submitted for Owner's approval.

Architectural scheme shall be based on general principles of Aesthetics. Building facades shall reflect such principles like symmetry, balance, proportion, rhythm, light and shade etc.

Building Elements like canopies, overhangs & shading devices, gutters, roof projections, parapets, door; window/ ventilator composition, External wall/ facade shall be considered as contributory elements to aesthetics.

Architectural scheme including design of above mentioned elements shall be subjected to Owner/ PMC approval.

Minimum two alternative Architectural scheme of buildings as desired by PMC/ Owner shall be prepared and submitted for approval.

2.5 STRUCTURAL AND CONSTRUCTION ELEMENTS

The structural system shall be as specified in Engineering Design Basis (Structural).

2.6 BUILDING ELEMENTS

2.6.1 Plinth Protection

The building shall be provided with minimum 900 mm wide (100mm high from top of Approach Road Level) plinth protection around the building.

2.6.2 Finished Floor Level (FFL)

In general, FFL of the Building shall be determined with respect to top of approach road or pavement. Following schedule shall be adhered to for FFL of the building:

A. Control Room Building (Buildings having false flooring):
Top Road level of Approach road + 150 mm + Height of false flooring

Copyright EIL – All rights reserved

B. Sub Station Buildings:
(i) Top of approach Road level +300 mm (Cable Cellar floor)
(ii) Top of approach Road level +150 mm (Transformer bays) with pebbles
(iii) F.G.L. (+) approx. 1000 mm high from top of road (in case of single storey Substation Building with trenches as per electrical requirement.

C Plant Buildings (Unit area) floors (HPP) shall be maintained as per Design Basis of General Civil.

D. Other Buildings:
Top of approach Road level +300 mm to 450 mm and or as per functional requirement.

Notes:

1. In case of approaches with different top levels, the highest top level of approach road/ pavement shall be considered.

2. FFL shall be same throughout in a building.

3. FFL of external loading/unloading bays/ platforms, toilet, pantry, and kitchen shall be 10-15 mm lower than that of the building FFL to check ingress/spillage of water.

2.6.3 Steps/ ramps/ Stairs

Steps/ ramps shall be provided for access to the Building for pedestrian/ vehicular, equipment entry as per relevant code. Minimum 1000 mm wide platform shall be provided in between entrance door and steps/ramps. Following dimensions of the steps/ ramps shall be adhered to.

A	Stairs width	= 1500mm minimum
B.	Tread	= 300 mm minimum
C.	Riser	= 150 mm maximum
D.	Slope of Ramp	= Not steeper than 1:6 or as per requirement
E.	Ratio of Tread & Riser	= 2 Riser + Tread= 600 to 650 mm
F.	No. of risers per flight	= 15 Nos.
G.	Landing width	= 1500. minimum

2.6.4 Walls

Following schedule shall be adhered to for wall material and thickness:

A.	External, walls	= 230 mm. thk. Brick wall
B.	Internal partition wall	= 230/115 mm thk. Brick wall depending on the overall length and height of the wall (refer note below)
C.	Transformer Walls	= 200 thk. RCC or 355 thick (including plastering) fire walls as per Electrical requirements. (IER)
D.	Concrete wall (Blast resistant)	= As per structure design basis

Notes:

Copyright EIL – All rights reserved

1. 115 mm thk. brick partition walls (with nominal steel requirement as per structure design) shall be provided with 230 mm thk. brick pillars for stability.
2. Wherever conduits or pipes are required to be concealed within partition wall, the wall thickness shall be increased suitably.
3. Wherever, bricks are not commonly available, suitable alternative material shall be used after obtaining owner's approval.

2.6.5 Doors

Doors shall be provided for access, security and safety at all entry & exits of rooms, functional areas & the buildings. Air tight door shall be provided in pressurized area and in gaseous protection area. Fire check doors shall be with minimum two hours rating as per statuary requirement. Sizes of the doors shall be determined on the basis of the following schedule:

A. Equipment, Panel area: Size of max. equipment including packing.
B. Other areas: Volume of movement through door.
C. W.C., Bath Cubicle Door: 800 mm x 2100mm (wall opening size)
D. Minimum size of other doors: 1000mm x 2100mm (wall opening)

Notes:

1. Rolling shutters shall be provided for equipment entry for Switchgear Room/ Electrical Room, A.C. Plant Room etc.
2. Motor operated Rolling Shutters shall be provided in the main equipment entry door.

2.6.6 Windows/ ventilators

Windows/ ventilators shall be provided in all areas for natural lighting, ventilation and visibility at working level.

For the purposes of natural ventilation, total openable area of the windows/ventilators shall be as per Factory Act subjected to a minimum of 15% of the floor area to be ventilated.

For the purpose of natural lighting total glass area shall be minimum 15% of the floor area. However, in case of offices, work places etc. windows shall be provided for the full length of walls as per approved Architectural scheme. Areas accommodating panels/eqpts. shall be normally provided with ventilators at high level for unobstructed distributed lighting.

Wherever due to limitation of external wall area or any other reasons, stipulated area of window/ ventilation for ventilation cannot be provided, suitable mechanical devices shall be provided. For Workshop/Warehouse sheds etc. with roof sheeting etc. suitable monitor to be provided for ventilation.

Transparent roof light sheeting shall be provided in roofing of shed type structures for day lighting.

2.6.7 Canopy/ Overhang

Canopy/overhangs shall be provided at all entries & exits for rain & sun protection. Size of the canopy/ porch shall be decided w.r.to utility of the building and other aesthetic. Blast proof Control Rooms shall not have any projections with outer face of its walls except with false treatment for aesthetics of the building.

Copyright EIL – All rights reserved

2.6.8 Shading Devices

Shading devices shall be provided over all windows, openable ventilators for rain & sun protection. These devices shall be in form of horizontal projections, vertical projected fins or combination of both as per building facade treatment. Minimum projection shall be 600 mm.

2.6.9 Parapet

Parapets shall be of RCC for all buildings with minimum 500 mm high for non-approachable roof and 900 mm high for approachable roof.

2.6.10 Roof Gutter

Gutter with rain water pipes or R.C.C. shafts shall be provided for all the building for roof water drainage. Sizing of the gutter shall be based on area to be drained and number of outlets. Gutters shall be of RCC. For Workshop/ Warehouse shed with precoated roof sheeting, precoated sheets gutters may be provided and for big size of workshops/warehouse RCC shaft may be provided at the end of gutter.

2.6.11 Rain Water Pipes, Spouts

Rain water pipes shall be provided for roof water drainage. Number of rain water pipes shall be decided on the basis of roof area, slope and rainfall intensity as per NBC-IX Section 2. Rain water pipes shall be embedded in concrete. RCC or GI spouts may be used for drainage of chajja/small canopies of ground floor.

2.6.12 Air Lock Lobby

This shall be provided for all entries with centrally air-conditioned spaces.

2.6.13 Emergency Exits

Emergency exits shall be provided for the building as per State Factory Rules, NBC-Part IV and for individual functional spaces such as Console area, Electrical room etc. Emergency exits shall be located in such a manner that escape route is direct, unobstructed & without passing through any other functional areas to safe area.

2.6.14 Staircases

Staircases shall be provided for vertical circulation & emergency exits. Number of staircases shall be based on building sizes more than 500 Sq.M ground covered area shall have two stairs (NBC-Part IV). Emergency exit requirements shall be as per safety distance requirement. At least one no. staircase/ladder shall be provided for access to the flat roof top for maintenance.

2.6.15 Railings

Railings shall be provided in stairs, and in all unprotected openings in slabs as a safety device. Steel railings in loading/ unloading bay of shall be of removable type.

2.6.16 False Ceiling

Copyright EIL – All rights reserved

False ceilings shall be provided in the all air-conditioned areas for the purpose of reducing room volume and to hide air conditioned ducting etc. and also to maintain acoustic level inside any space.

2.6.17 False/Cavity flooring

False/ cavity flooring shall be provided to accommodate under floor cabling in Instrumentation areas like Console Room, Rack Room, Computer Room etc. Extent of false/ cavity flooring shall be as per Instrumentation requirements.

2.6.18 Transformer Gate

Steel gate of suitable size in front of transformer bays in substations building may be provided as per electrical requirement.

Copyright EIL – All rights reserved

2.7 SCHEDULE FOR ARCHITECTURAL FINISHES

2.7.1 GENERAL

For the purposes of schedule of Architectural finishes, buildings are categorised into following types. colour Scheme for all Architectural items shall be as approved by the Owner.

Type	Buildings
Type A	Important buildings like Administration Building / Training / Medical centre, Main Gate/ Guard House
Type B	Control Rooms, Satellite Rack Room, Sub Stations
Type C	Non plant buildings like Guest house, Canteen Building, Health Centre, Central Laboratory Building, Gate House (other than main gate/ guard house) etc.
Type D	Non plant buildings like Service Buildings, Security Barracks, Product Ware House, Central Ware House, Construction Office Building, Central Workshop, Central Warehouse, NCU/GCU Service Building, Weigh Bridge, Chemical Storage Building etc. & other non plant buildings not categorized under any other group
Type E	Utility/ storage/ Process Buildings/ Sheds like DG Shed, Pump Houses, Compressor House, Process Building/Sheds, Cement Godown, Storage Shed, Analyzer Room etc.

Note:

In case of conflict between licensor/ process/ safety/ statutory requirement and this schedule of Architectural finishes, the former shall override.

Copyright EIL – All rights reserved

2.7.2 EXTERNAL FINISHES

2.7.2.1 External wall, RCC Surfaces

A. Type "A" Buildings

- Composite Aluminum Panel & structural glazing

B. Type "B" Buildings

- Sand stone cladding

C. Type "C" Buildings

- Plain cement plaster and texture coating ('Heritage' or 'Spectrum')

D. Type "D" Buildings

- Plain cement plaster and Acrylic paint

E. Type "E" Buildings

- Plain cement plaster and waterproof cement paint

2.7.3 INTERNAL FINISHES

2.7.3.1 Floor finishes:

A. Entrance Lobby, Reception , lounge, Waiting area etc :

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite stone	o Granite stone	o Vitrified tiles	o Kota stone	o Kota stone

B. Office and associated areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E
o Vitrified tiles	o Vitrified tiles	o Vitrified tiles	o Ceramic Tiles	o Kota stone

C. Circulation area (Corridor, passage, etc.):

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite stone	o Granite stone	o Vitrified Tiles	o Kota stone	o Kota stone

Copyright EIL – All rights reserved

D. Kitchen, Pantry & Dining hall etc. :

Type-A	Type-B	Type-C	Type-D	Type-E
o Vitrified Tiles	o Vitrified Tiles	o Vitrified Tiles	o Ceramic Tiles	o Kota stone

E. Toilet, Drinking water area etc. :

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite Stone	o Granite Stone	o Vitrified Tiles	o Ceramic Tiles	o Ceramic Tiles

Note: In Sub Station building flooring of Toilet/ drinking water shall be of Ceramic Tiles

F. Staircase.

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite Stone	o Granite Stone	o Marble Stone	o Kota Stone	o Kota Stone

Note: In Sub Station building flooring of staircase shall be of Kota stone

G. Battery Room & Chemical Handling areas (All type of Buildings).:

- o Chemical resistant Epoxy coating

H. Electrical Room, Pressurisation Room, AC Plant, Loading / Unloading bays, Equipment handling areas, Storage areas, Switchgear, MCC, Ware House, Work Shop, Process/ utility Sheds etc. (All type of buildings):

- o Heavy duty cement concrete flooring**.**

(Vacuum dewatering flooring in large Rooms/ areas)

I. Console, Rack room , UPS Room , areas housing instrumentation equipments requiring under-floor cabling (All type of buildings):

- o Raised Access/ cavity/ false flooring :
  With High pressure laminate finish

Copyright EIL – All rights reserved

2.7.3.2 Internal wall finishes:

A. Entrance Lobby, Reception , lounge, Waiting area etc :

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite stone cladding	o Granite stone cladding	o Marble stone cladding	o POP punning & Plastic emulsion paint	o Oil bound distemper

B. Office and associated areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E
o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o Oil bound distemper

C. Circulation area (Corridor, passage, etc.) :

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite stone cladding up to 1500mm height, POP punning & Plastic emulsion paint above	o Granite stone cladding up to 1500mm height, POP punning & Plastic emulsion paint above	o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o Oil bound distemper

Note : In Sub Station building wall finish of Circulation area shall be Oil bound distemper

D. Kitchen, Pantry & Dining hall etc. :

Type-A	Type-B	Type-C	Type-D	Type-E
o Ceramic tile dado	o Ceramic tile dado	o Ceramic tile dado	o Ceramic tile dado	o Ceramic tile dado

E. Toilet, Drinking water area etc. :

Type-A	Type-B	Type-C	Type-D	Type-E
o Granite stone dado	o Granite stone dado	o Ceramic tile dado	o Ceramic tile dado	o Ceramic tile dado

Copyright EIL – All rights reserved

Note: In Sub Station building cladding in Toilet etc. shall be of Ceramic Tile dado

F. Staircase.

Type-A	Type-B	Type-C	Type-D	Type-E
o Textured coating	o Textured coating	o Plastic emulsion paint	o Plastic emulsion paint	o Oil bound distemper

Note: In Sub Station building Staircase wall finish shall be Oil bound distemper.

G. Battery Room & Chemical Handling areas (All type of Buildings):

- o Acid resistant tiles/ epoxy coating over cement plaster up to 2500 height & oil bound distemper above 2500 height.

H. Electrical Room, AC Plant, Loading / Unloading bays, Equipment handling areas, Storage areas, Switchgear, MCC, Ware House, Work Shop, Process/ utility Sheds etc. (All type of buildings):

- o Oil bound distemper.

I. Rack room , UPS Room (All type of buildings):

- o POP punning with plastic emulsion paint

J. Console Room :

- o Granite stone dado

2.7.3.3 Internal ceiling finishes:

A. Entrance Lobby, Reception , lounge, Waiting area etc :

Type-A	Type-B	Type-C	Type-D	Type-E
o Gypsum board panel false ceiling	o Aluminum panel/ strip false ceiling	o Gypsum board panel false ceiling	o Gypsum board panel false ceiling	o Oil bound distemper

B. Office and associated areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E
o Mineral fibre false ceiling	o Aluminum panel/ strip false ceiling	o Mineral fibre false ceiling	o Mineral fibre false ceiling	o Oil bound distemper

Copyright EIL – All rights reserved

C. Circulation area (Corridor, passage, etc.) :

Type-A	Type-B	Type-C	Type-D	Type-E
o Gypsum board panel false ceiling	o Aluminum panel/ strip false ceiling	o Gypsum board panel false ceiling	o Gypsum board panel false ceiling	o Oil bound distemper

D. Other AC areas etc., where false ceiling required :

- o Gypsum board false ceiling

E. Other area not indicated above etc. :

Type-A	Type-B	Type-C	Type-D	Type-E
o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o POP punning & Plastic emulsion paint	o Oil bound distemper

F. Electrical Room, AC Plant, Loading / Unloading bays, Equipment handling areas, Storage areas, Switchgear, MCC, Ware House, Work Shop, Process/ utility Sheds etc. (All type of buildings):

- o Oil bound distemper

2.7.4 DOORS

A. Entrance/ exit Doors

Type-A	Type-B	Type-C	Type-D	Type-E
o Powder coated Aluminium glazed shutter	o Powder coated Aluminium glazed shutter	o Powder coated Aluminium glazed shutter	o Powder coated Aluminium glazed shutter	o Pressed steel

B. Doors in circulation area of all type of Buildings

- o Glazed, powder coated Aluminum door

Copyright EIL – All rights reserved

C. Office area doors

Type-A	Type-B	Type-C	Type-D	Type-E
o TW frame, block board TW veneer finish flush shutter	o Powder coated Aluminium glazed shutter	o Pressed steel frame block board laminated finish flush shutter	o Pressed steel frame block board laminated finish flush shutter	o Pressed steel frame block board laminated finish flush shutter

D. All Electrical Room, A.C. Plant Room, Battery Room doors of all type of Buildings

- o Pressed steel frame with Pressed steel shutter

E. Toilet doors

Type-A	Type-B	Type-C	Type-D	Type-E
o TW frame, block board TW veneer finish flush shutter	o TW frame, block board TW veneer finish flush shutter	o Pressed steel frame block board laminated finish flush shutter	o Pressed steel frame block board laminated finish flush shutter	o Pressed steel frame block board laminated finish flush shutter

F. Fire check/ resistant doors

Irrespective of above schedule, Fire check doors (minimum 2 hours rated) shall be provided wherever required as per OISD/ Statutory requirements.

1. Fire check doors In Control Room / Satellite Rack Room Building

   A. Main entrance/ entry to Console :
      - o Glazed steel Fire check door

   B. Other Rooms :
      - o Solid type steel fire check door (with 300x300 vision panel)

2. Fire check doors In Administration Building

   A. Main entrance/ entry/ circulation area :
      - o Glazed steel Fire check door

   B. Other Rooms :

Copyright EIL – All rights reserved

- Wooden,TW veneered fire check door (with 300x300 vision panel**)**

3. Fire check doors In other Buildings

A. Main entrance/ entry/ circulation area :
- Glazed steel Fire check door

B. Other Rooms :
- Solid type steel fire check door (with 300x300 vision panel)

Rolling shutters shall be provided in equipment areas like Switchgear/ MCC Room, Workshop, Ware House etc. where opening size for door exceeds 3000 x 3000mm. Doors/windows/ventilators shall be complete with all fittings & fixtures for easy smooth operation & locking facility.

2.7.5 WINDOWS & VENTILATORS

Type-A	Type-B	Type-C	Type-D	Type-E
o Glazed, Powder coated Aluminium	o Glazed, Powder coated Aluminium	o Glazed, Powder coated Aluminium	o Glazed, Powder coated Aluminium	o Glazed, steel

2.7.6 ROOF TREATMENT

- Atactic Polypropylene modified bituminous waterproofing membrane .

2.7.8 ROOFING / CLADDING (sheds/workshop)

- Precoated, profiled colour coated galvanised steel sheet roofing/ cladding

2.7.9 SANITARY FITTINGS & FIXTURES

A. Water Closet (European type) :

Type-A	Type-B	Type-C	Type-D	Type-E
o Wall hung type, coloured (premium luxury model)	o Wall hung type, coloured (premium luxury model)	o Wall hung type, coloured (premium luxury model)	o Pedestal type, coloured	o Pedestal type, coloured

Copyright EIL – All rights reserved

B. Wash Basins :

Type-A	Type-B	Type-C	Type-D	Type-E
o Round, coloured, with electronic sensor over granite counter (premium luxury model)	o Round, coloured, with electronic sensor over granite counter (premium luxury model)	o Round, coloured, with electronic sensor over granite counter (premium luxury model)	o Round, coloured, over granite counter	o Wall hung type

C. Urinals :

Type-A	Type-B	Type-C	Type-D	Type-E
o With electronic sensor (premium luxury model)	o With electronic sensor (premium luxury model)	o With electronic sensor (premium luxury model)	o Standard Wall hung type	o Standard Wall hung type

D. Plumbing fixtures (stop/ bib / pillar cocks, flash valves etc.):

Type-A	Type-B	Type-C	Type-D	Type-E
o Stainless steel (premium luxury model)	o Stainless steel (premium luxury model)	o Stainless steel (premium luxury model)	o CP Brass	o CP Brass

Copyright EIL – All rights reserved

JOB SPECIFICATION (GENERAL CIVIL)

RAW WATER TREATMENT PLANT (MEMBRANE BASED FILTRATION SYSTEM)

PROJECT : DAHEJ PETROCHEMICAL COMPLEX

OWNER : ONGC PETRO additions LTD.

PMC : ENGINEERS INDIA LTD.

JOB NO. : 6987

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	19.06.2013	ISSUED FOR BIDS	NS	YKD	AK/ RBB

Copyright EIL – All rights reserved

1.0 JOB SPECIFICATION: GENERAL CIVIL WORKS

The specification given below in the following clauses shall be followed in addition to the requirements given in the Design Basis for General Civil works given in section C-3.0 attached with this package.

2.0 LIST OF STANDARD SPECIFICATIONS

SL No	Description	Specification no	Rev.
1	Standard Specification For Earthwork For U/G Piping	6-65-0006	3
2	Standard Specification For Classification Of Soil For Earthwork In Site Grading	6-65-0016	3
3	Standard Specification For Road And Flexible Pavements(Up to WBM Layer)	6-65-0018	6
4	Standard Specification For Concrete Pavements	6-65-0019	3
5	Standard Specification For Pipe Culverts And ERC/IRC Crossing etc.	6-65-0021	3
6	Standard Specification For U/G And A/G GI Pipeline System Water Services	6-65-0027	4
7	Standard Specification For Fabrication And Laying Of Underground Piping.	6-65-0030	4
8	Standard Specification For Miscellaneous Civil And Structural Work For U/G Piping And Other Civil Works	6-65-0035	2
9	Standard Specification For Acid Proof Tile Lining	6-65-0062	3
10	Standard Specification For Portable Fire Extinguisher	6-66-0004	0
11	Std. Spec for Safety Shower & Eye Wash	6-66-0038	2
12	Std. Specification For Tape Coating Of Underground Piping	6-79-0011	1
13	Standard specification for surface preparation and protective coating (new construction)	6-79-0020	0

3.0 LIST OF STANDARDS

SL No	Description	Standard no	Rev.
1	Abbreviations And Legends	7-65-0001	3
2	Cable Crossings Under Road (PVC Pipes)	7-65-0006	3
3	Detail of pipeway bridge spans 3500 & 2000	7-65-0007	4
4	Cable Crossings Under Road (R.C.C. Pipes)	7-65-0009	3
5	Pipe Culvert For Storm Water Drainage	7-65-0103	3
6	Box Culvert Type I, II, III And IV	7-65-0104	4
7	Conc. Bedding And Encasement For Pipes.	7-65-0213	4
8	Valve Pit Type-1 For Dia. ≤3"	7-65-0220	4
9	Chequered Plate Details (For Masonry Valve Pit Type-I, Type-II, Type-III & Type-IV	7-65-0224	1
10	Details Of Neutralization Pit	7-65-0310	3
11	Typ. Detail Of Acid /Alkali Proof Lining	7-65-0412	2

4.0 ADDENDUM TO STANDARDS / SPECIFICATIONS

4.1 ADDENDUM TO EIL STANDARD SPECIFICATIONS (General Civil)

Following Addendum to General Civil standard specifications is enclosed herewith. The standard specification shall be read in conjunction with the following addendums.

Copyright EIL – All rights reserved

i. For concrete works, all specification shall be modified to the extent as given in IS456: 2000 (latest edition).

ii. Brick-work used for General Civil work shall be of minimum class designation 5.0 conforming to IS 1077.

iii. For reinforcement, all specification shall be modified to the extent as given below:
High strength deformed (HSD) TMT steel bars of minimum grade Fe 500, conforming to IS:1786 shall be used.

iv. **EIL STD. SPECIFICATION NO. 6-65-0006 Rev. 2**
(Std. specification for earthwork for U/G piping)
Clause no. 4.4: second line – Replace "1:5:10 Plain Cement Concrete" by "M20 grade Plain Cement Concrete".

v. **EIL STD. SPECIFICATION NO. 6-65-0035 Rev. 1**
(Std. specification for miscellaneous civil & structural work for U/G piping and other civil works)
Clause no. 10.0: Replace "1:3:6 grade cement concrete" by "M-20 grade plain cement concrete".
Replace "1:2:4 grade cement concrete "by M30 grade plain cement concrete".

vi. **EIL STD. SPECIFICATION NO. 6-65-0044 Rev. 2**
(Std. specification for U/G sewer system-HDPE pipes)
Clause no. 6.1: First line and third line – Replace "1:5:10 Plain Cement Concrete" by "M20 grade Plain Cement Concrete".

vii. **SPECIFIC REQUIREMENTS TO STANDARD SPECIFICATIONS**
All payment clauses shall be deleted from all standard specifications attached with the bid document.

4.2 ADDENDUM TO EIL STANDARDS (General Civil)

Following Addendum to General Civil standards is enclosed herewith. The standards shall be read in conjunction with the following addendums.

i. For reinforcement, all standards shall be modified to the extent as given below:
High strength deformed (HSD) **TMT steel bars of minimum grade Fe 500**, conforming to IS: 1786 shall be used.

ii. **Brick-work** used for General Civil work shall be of minimum **class designation 5.0 conforming to IS 1077.**

iii. **RCC M35** shall be used for all manholes, catch basins, box-culverts etc. all underground structures containing water/oily wastes.

iv. The **clear cover over all reinforcement** for concrete structure (walls, beams, columns, slabs) **below grade & plinth level shall be minimum 65mm**.

Sl No	Std. No.	Rev. No.	Title	Existing Description	Revised Description
1.	7-65-0007	4	Detail of pipeway bridge spans 3500 & 2000	Lean Conc. 1:5:10 RCC M30 Thickness: Wall = 300/350mm Bottom slab= 250/350mm Top slab=350mm	Lean Concrete 1:5:10 RCC M35 Thickness: Wall = 325/375mm Bottom slab= 275/375mm Top slab=375mm

Copyright EIL – All rights reserved

Sl No	Std. No.	Rev. No.	Title	Existing Description	Revised Description
					Minimum Clear Cover over reinforcement=65mm
2.	7-65-0310	3	Detail of Neutralization Pit	Lean Conc. 1:5:10 PCC 1:2:4 Concrete M30 Thickness: Wall = 100mm Bottom slab= 100mm	Lean Concrete 1:5:10 PCC M20 Concrete M35 Thickness: Wall = 175mm Bottom slab= 175mm Minimum Clear Cover over reinforcement=65mm

5. LIST OF DRAWINGS: GENERAL CIVIL

The following job drawings are attached and the same shall be followed:

Sl No	Description	Drawing no	Rev.
1	Overall Plot Plan	6987-000-16-47-0-001	4
2	RCC Pavement Details	6987-000-16-47-3-029	0
3	Overall Layout of Storm Water Drain & Culvert (Sheet 5 of 7)	161115-00-C-GAD-1-004	3
4	Overall Layout of Drinking Water System (Sheet 2 of 2)	161115-00-C-GAD-0-008	3
5	Scope Drawing for General Civil works for RWTP PH-I (Part-A & Part-B) Package	6987-017-16-47-0203	B
6	Equipment Layout for RWR/ FWR & Pump House Area-38	1161115-00-P-EQL-0-231	4
7	Equipment Layout for RWR/ FWR & Pump House Area-38	1161115-00-P-EQL-0-232	4
8	Raw / Fire water reservoir Plan at Bottom Slab	1161115-00-S-GAD-0001	2
9	Raw / Fire water reservoir Plan at Bottom Slab	1161115-00-S-GAD-0002	2
10	Raw / Fire water reservoir Plan at Top Slab	1161115-00-S-GAD-0003	2
11	Raw / Fire water reservoir Plan at Top Slab	1161115-00-S-GAD-0004	2
12	Raw/ Fire Water Reservoir Section & Details (2 Sheets)	1161115-00-S-GAD-0005	2
13	Raw / Fire water reservoir RCC Detail of Top Slab & Bottom Slab & Details	1161115-00-C-RCC-0006	3
14	Bedding / Backfilling for under/around underground piping	6987-000-16-47-4-501	1

Copyright EIL – All rights reserved

JOB SPECIFICATIONS

STRUCTURAL

PACKAGE: EPCC - 16

BID DOC. No. : RS/6987-017-PA-TN-8001/1000

UNIT : RAW WATER TREATMENT PLANT-MEMBRANE FILTRATION BASED

PROJECT : DAHEJ PETROCHEMICAL COMPLEX

OWNER : ONGC PETRO additions LIMITED (OPaL)

PMC : ENGINEERS INDIA LIMITED

JOB NO. : 6987

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	18/06/2013	ISSUED WITH BID PACKAGE	AM	AH	PJS

Copyright EIL – All rights reserved

STRUCTURAL

CONTENTS

1.0 GENERAL 3

2.0 DESIGN CRITERIA - GENERAL 7

3.0 DESIGN REQUIREMENT FOR SPECIFIC APPLICATIONS 7

3.1 MACHINE FOUNDATIONS 7
3.2 TANK FOUNDATIONS 9
3.4 SHED TYPE STRUCTURES 9

4.0 MATERIAL REQUIREMENTS 10
4.1 GENERAL 10
4.2 WATER 10
4.3 AGGREGATE (FOR CONCRETE) 10
4.4 SAND (FOR MASONRY & FILLING) 11
4.5 CEMENT 13
4.6 STEEL 13
4.7 BRICK 14
4.8 ADMIXTURES 15
4.9 WATER BARS (WATER STOPS) 16
4.10 BITUMEN/BITUMINOUS MATERIALS 16
4.11 PVC PIPES 17
4.12 ANTI-TERMITE COMPOUNDS 17
4.13 POLYSULPHIDE SEALANTS 17

5.0 CONSTRUCTION REQUIREMENTS 18

6.0 SPECIFIC REQUIREMENTS 21

6.1 GENERAL 21
6.2 REVIEW OF DESIGN AND APPROVED FOR CONSTRUCTION (AFC) DRG 22

Copyright EIL - All rights reserved

1.0 GENERAL

1.1 The design considerations given hereunder establish the minimum basic requirements of reinforced cement concrete (RCC) structures, structural steel works and masonry structures. All structures shall be designed for satisfactory performance and functions for which the same are to be constructed.

a) All codes referred in this document pertain to BIS (Bureau of Indian Standards) publications and bearing the prefix IS.

b) Whenever any reference to BIS code is made, the same shall be taken as the latest revision (with all amendments issued there to) on the notified date of submission of tender.

c) Apart from the BIS codes mentioned in particular in the various clauses of this document, all other relevant codes related to the specific job under consideration and/or referred to in the above-mentioned codes, shall be followed wherever applicable. Reference to some of the codes in the various clauses of this document does not limit or restrict the scope of applicability of other relevant codes.

d) In case of any variation/contradiction between the provisions of BIS codes and the requirements given hereunder, the provisions given in this document shall have precedence over all others. In absence of relevant BIS codes, reference to corresponding British/American codes may be made (in that order of preference).

All designs, detailing and construction shall strictly conform to the enclosed standards, specifications and 'Specific Requirements'. Only if relevant information is not available in this document, reference to relevant BIS code shall be made.

1.2 The Contractor shall do the structural designing of all structures and prepare complete set of civil and structural drawings needed for correct and accurate construction. The design shall be strictly in accordance with 'Design Criteria' given herein.

1.3 Detailed list of drawings/documents [including design calculations, design drawings, bar bending schedules (for RCC works) and fabrication drawings (for structural steel works)] and structure-wise quantity statements (showing anticipated, released and balance quantities of concrete, structural steel and piles) shall be prepared by the Contractor and submitted monthly for review by Owner/Owner's representative. This list shall also indicate the document/drawing category (approval, review or information as applicable) together with the scheduled and actual dates of submission of the documents.

1.4 Before proceeding with design and drawing preparation the Contractor shall submit detailed general philosophy of design of various parts of (all) the structures and equipment foundations along with explanatory sketches for review by Owner/Owner's representative. Only after the review and incorporation of comments on the general philosophy, as offered during the review, the Contractor shall submit any design document and/or drawing for review or

Copyright EIL - All rights reserved

information or issue the same for construction. Design and detailing of the structures and foundations shall fulfill all functional requirements for which the same is intended and it shall be ensured that adequate accesses, clearances, clearing of interferences, provision of cutouts, etc. have been provided to make the structure/foundation fully operational.

1.5 The design and AFC drawings shall strictly adhere to the reviewed design basis and architectural/ structural general arrangement and shall incorporate all the comments/ suggestions given by Owner/Owner's representative without any extra cost to the Owner and any implication of time-schedule for completion of works.

1.6 Construction of units/structures identified for design/drawing review (as referred in Specific Requirements attached in this document) by Owner/owner's representative shall not be taken up at the site till these documents are reviewed by Owner/owner's representative and comments/suggestions given by Owner/ owner's representative are incorporated. For all other foundations and structures the Contractor shall directly submit the AFC drawings to Engineer-in-Charge and construction of such works shall be taken up immediately. Requisite number of prints of design and drawings for such foundations/ structures shall also be simultaneously sent to Owner/owner's representative for their information and record. In the event Owner/owner's representative offers any comment on documents/drawings of *Information category* it shall be ensured by the Contractor that these comments are duly incorporated in the documents/ drawings and revised set of document/drawing is issued to site for construction and simultaneously to Owner/owner's representative for records.

Wherever review is carried out the same shall be restricted to following:

a) Conformance of general arrangement of the structure to already reviewed design philosophy and design basis.

b) Overall framing of the building/conceptual foundation system.

c) Detailed design and drawings including input/ output of computer analysis and design vis-à-vis actual drawing.

Irrespective of the identified structures requiring review, the Contractor shall submit complete sets of design and drawings of all structures/foundation systems.

1.7 (i) Structural design/ drawings for any structure/ foundation shall be submitted for review only if referenced input (e.g. architectural drawing, piping GAD, equipment data sheet, vendor drawing, etc.) have been reviewed by the concerned Owner's specialist in approval/review code-2 or code-1.

(ii) To facilitate an overall systematic review the Contractor shall submit the design and drawings for each independent building/structure, together with a copy of the referenced reviewed input data, in one lot.

1.8 Submission of all identified documents including design calculations and drawings for review and/or information/record to the Owner/Owner's

Copyright EIL - All rights reserved

representative by the Contractor shall be in requisite (as mentioned elsewhere) number of prints. To ensure accuracy, correctness and completeness of documents before submission to Owner/Owner's representative, the Contractor shall ensure that all such submitted designs and drawings are complete in all respects, thoroughly checked, stamped **APPROVED FOR CONSTRUCTION (AFC),** and signed APPROVED by the Contractor's own responsible Civil/structural graduate (minimum) engineer (irrespective of the fact that the same are prepared in the Contractor's own design office or by an approved agency).

Incomplete, unchecked, unsigned and unstamped documents/drawings and designs shall not be accepted for review/construction and shall be returned forthwith.

1.9 The accuracy/correctness of all designs and drawings shall be the sole responsibility of the Contractor and any delay/loss/damage incurred by the Owner in respect of any mistake/discrepancy/anomaly in such designs and drawings shall be entirely borne by the Contractor.

1.10 Owner/Owner's representative reserves the right to review any/all or none of the designs and drawings. Review by Owner/Owner's representative shall not relieve the Contractor of his responsibility for correct design and execution of the works.

1.11 All revisions shall be clearly marked and clouded for easy identification. Subsequent review of such revised documents shall be limited to revision as clouded.

1.12 All fabrication/erection drawings and bar bending schedules shall be prepared by the Contractor and shall be directly issued for construction to his work site. Also, six copies of such drawings together with design calculations for all splices, joints and gusset plates shall simultaneously be submitted to Owner/owner's representative at site (Resident Construction Manager) for review. The Owner/owner's representative at site at his discretion may review all or some or none of these designs & drawings.

Wherever such review is carried out the same shall be restricted to the following:

a) Structural layouts, orientation, elevation of structural members.

b) Section/size of members.

c) Adequacy of few critical connections and joints for their required strength.

1.13 Internationally accepted commercial software viz. STAAD, STAADPRO, COSMOS, GT STRUDL, NISA only shall be permitted for analysis and design. STAAD shall not be allowed for use in dynamic analysis of machine foundations.

In case software packages other than listed above are intended to be used for analysis and design, the same shall be informed in writing to Owner/owner's representative. Calculations and relevant computer files containing input and detailed output (also refer clause 1.14) shall be submitted by the Contractor for checking and validation of the software package. Only after getting written

Copyright EIL - All rights reserved

approval from Owner/owner's representative, to this effect, such intended software be put to use for detailed analysis and design.

1.14 Soft copies of all input files and the following documentation as hard copy shall be submitted for computer aided analysis and design:

(i) Complete print out of input and output files.

(ii) Relevant sketches with node and member numbering, loading, etc.

(iii) Summary of member end forces, support reactions, stress ratio, deflections, etc.

Verification of the foundation loading data for all equipments/ structures/ stacks etc., which form part of the comprehensive packages supplied by respective vendors, shall be entirely the responsibility of contractor. Contractor shall ensure that wind/ seismic loadings are strictly in line with the basic wind pressure/ site spectra curves enclosed with this Bid package.

Reviewing of designs/ drawings is not obligatory on the part of Owner/ Owner's representative and complete correctness/ soundness of the designs/drawings and their execution at the site shall be the sole responsibility of the Contractor irrespective of the fact whether the same has been reviewed by Owner/ Owner's representative or not. Any defect observed during construction or till the defect liability period of works' shall be rectified and removed by the Contractor. The Contractor shall carry out whatever modification or reconstruction is needed for the purpose, to the entire satisfaction of the Engineer-in-Charge/ Owner without any extra cost and/or time implication to the Owner.

Copyright EIL - All rights reserved

2.0 DESIGN CRITERIA - GENERAL

All structural design shall be carried out as per Design Basis doc no 6987-00-16-48-DB-01.

FOUNDATIONS

NGL (Natural ground level) and FGL (Finished ground level) shall be marked on all drawings showing foundation/sub-structure details and related design documents.

Machine/static equipment foundations shall be separated from adjoining parts of buildings, other foundations and floor/pavement slabs. Joints at floor/pavement slabs shall be suitably sealed.

Foundations and structures for machines subject to vibrations shall be so proportioned that the amplitude and frequency of the foundation/structure are within the permissible limits as per relevant BIS codes (or as required by the machine vendor).

Structures supported on RCC strip footings shall be provided with suitable tie beams connecting all footings at foundation level. Minimum width of footing shall be 1000 mm.

Raft foundations shall be designed as per IS: 2950.

Masonry walls shall be supported on continuous plain cement concrete mats/plinth beams. Top of plinth beams shall be located minimum 300mm below the finished grade level. Fouling of plinth beams with cable trenches, drains, pipe ducts, service lines etc. shall not be acceptable.

For the design of foundations for vertical vessels and process columns under hydro test condition minimum 25% wind load shall be considered acting on the equipment.

3.0 DESIGN REQUIREMENT FOR SPECIFIC APPLICATIONS

3.1 MACHINE FOUNDATIONS

Machine foundations shall satisfy the following requirements:

a) The minimum grade of concrete to be used shall be as per clause 8.3 of Doc. No. 6987-00-16-48-DB01.

b) Minimum reinforcement as per requirements of IS:2974 shall be provided unless required otherwise by design.

c) All units of the foundation system, except foundation raft shall be provided with symmetric reinforcement on opposite faces, even if not required by design considerations.

Copyright EIL - All rights reserved

d) The soil stress below foundations under dead loads shall not exceed 80% of the allowable soil bearing capacity, or safe load on pile, for static loading.

e) The combined center of gravity of the machine and foundation system shall, as far as possible, pass through the center of area of the foundation raft or centroid of the pile group. Where unavoidable, eccentricity shall be less than 5% for block foundations and 3% for frame foundations.

f) Foundations shall be so designed that natural frequency of the foundation system shall not resonate with the following:

i) Operating speed of the motor.
ii) Operating speed of the machine.
iii) 2 x Operating speed of the machine.
iv) Critical speed of the machine (for centrifugal machines).

Natural frequency of the foundation shall preferably be ± 20% away from the above-mentioned frequencies. However, amplitudes of vibration of the foundation block shall always be checked to be within permissible limits.

g) Amplitudes of vibration shall be less than values specified by the machine manufacturer. If not specified, provision of IS:2974 shall be followed.

h) The foundation and its superstructure shall be separated from adjacent foundations and platforms. Clear air gaps shall be provided in the superstructure to avoid transmission of vibration to adjacent structures. Special note shall be given on the drawing in this respect, and suitable details shown as required.

i) Foundations resting partly on rock and partly on soil shall preferably be avoided. However, if unavoidable, the soil area shall be replaced by lean concrete (1:4:8). However, Owner/owner's representative concurrence shall be obtained for such cases.

j) Foundations shall not rest on previously backfilled or sensitive soils.

k) For frame foundations, base raft shall be cast in a single concreting operation. A properly designed construction joint shall be provided between the base slab and columns. The entire superstructure of columns and upper deck shall be cast in a continuous concreting operation.

l) If height of the frame columns above raft level exceeds 8.0m, an additional construction joint at the junction of columns/top-deck may be provided.

m) Block foundations shall be cast in a single concreting operation.

Copyright EIL - All rights reserved

3.2 TANK FOUNDATIONS

Storage tanks shall be supported on ring wall type/ sand pad foundations as per approved Geo Tech recommendation.

3.4 SHED TYPE STRUCTURES

Roofs of all shed type structures shall have 1:3 slope. MS wind ties (40mm x 6mm) painted as per painting specifications shall be provided over roof sheeting on the last purlin towards eaves and the first purlin at ridge, on each slope of the roof. Cladding shall be provided on all sides starting at 3 meter height from FFL/HPP and continuing up to roof level. Provision for equipment entry and drop out area shall also be made as per approved equipment layout.

Daylight, natural ventilation and rain protection shall be ensured by providing continuous louvers and roof monitors along the longitudinal sides of the shed. Louvers shall be provided at various levels of the cladding to act as necessary air inlet/outlet, and for daylight and rain protection. One louver shall be provided at 3.5metre height from FFL/HPP, for rain protection of the opening below. Similarly, one louver shall be provided at eaves level for ventilating the stagnant air, at that level. Sufficient number of louvers shall also be provided at all intermediate working and equipment levels for achieving proper day-lighting and ventilation in the sheds as per Factory Act and National Building Code of India.

Rain water gutters and PVC pipes shall be provided for proper roof drainage. Gutters shall be of Mild Steel sheets (minimum 3mm thick) painted as per painting specifications.

Foundation system shall be based on approved Geo Tech recommendation.

3.5 FLOOR GRATING

Floor gratings shall be fabricated from mild steel and shall be minimum 25mm thick. These shall be made from electro-forging process. The maximum size of voids in the grating shall be limited to 30x100mm. Deflection shall not be more than 6mm or span/200, whichever is lower. Floor gratings shall be hot dip galvanized in accordance with IS:2629 and tested as per IS:2633 and IS:6745. Quantity of zinc coating shall be minimum 900 g/m2 of surface area (0.12mm uniform thickness).

It shall be mandatory that a prototype of the grating fulfilling the following is demonstrated satisfactorily to the Owner/owner's site representative prior to placement of bulk order(s):

a) above defined requirements.

b) the unfused joints are not in excess of 5% of the total joints. If unfused joints found are in excess of 5%, the prototype shall stand rejected and a fresh prototype shall be prepared with revised welding parameters clearing the requirement of unfused joints limited to 5% of the total joints.

Copyright EIL - All rights reserved

c) the projection of secondary member above the main member is not more than 1.5mm.

d) the unfused 5% joints of b) above are welded by SMAW/GMAW process.

e) the joints are able to sustain a minimum pull out load of 1.2 times the allowable shear capacity of the secondary member.

f) gratings shall be subjected to a third party inspection as per Owner/owner's representative approval.

4.0 MATERIAL REQUIREMENTS

4.1 GENERAL

The minimum requirements of various materials to be used in Civil and Structural works are as below:

4.2 WATER

Water used in construction for all civil & structural works shall be clean and free from injurious amounts of oil, acids, alkalies, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The pH value of water sample shall be not less than 6. Potable water will be considered satisfactory. All requirements of IS:456, have to be met.

Tests on water samples shall be carried out in accordance with IS:3025 and these shall fulfill all the guidelines and requirements given in IS:456.

Water for curing shall be of the same quality as used for concreting and masonry works.

4.3 AGGREGATE (FOR CONCRETE)

4.3.1 General

- Coarse and fine aggregates for Civil and Structural Works shall conform in all respects to IS:383 (Specification for coarse and fine aggregates from natural sources for concrete). Aggregates shall be obtained from an approved source known to produce the same satisfactorily. Aggregates shall consist of naturally occurring (crushed or uncrushed) stones, gravel and sand or a combination thereof. These shall be chemically inert, hard, strong, dense durable, clean and free from veins, adherent coatings, injurious amounts of alkalies, vegetable matter and other deleterious substances such as iron pyrites, coal, lignite, mica, shale, sea shells etc.

- Aggregates which may chemically react with alkalies of cement or might cause corrosion of the reinforcement shall not be used.

Copyright EIL - All rights reserved

- The maximum quantities of deleterious materials in the aggregates as determined in accordance with IS:2386 - Part II (Methods of Test for aggregates for concrete), shall not exceed the limits defined in IS:383.

4.3.2 Coarse Aggregates

- Coarse aggregates are the aggregates, which are retained on 4.75mm IS Sieve. It shall have a specific gravity not less than 2.6 (saturated surface dry basis).

- These may be obtained from crushed or uncrushed gravel or stone and may be supplied as single sized or graded. The grading of the aggregates shall be as per IS:383 or as required by the mix design, to obtain densest possible concrete.

4.3.3 Fine Aggregates

- Fine aggregates are the aggregates which pass through 4.75mm IS sieve but not more than ten percent (10%) pass through 150 micron IS sieve. These shall comply with the requirements of grading zones I, II and III of IS:383. **Fine aggregates conforming to grade zone IV shall not be used for reinforced concrete works**.

- Fine aggregates shall consist of material resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or gravel sand. Sand from sea shores, creeks or river banks affected by tides, shall not be used for filling or concrete works.

4.3.4 Sampling and Testing

The Contractor shall carry out all tests including mix designs of concrete, at the start of work as well as during any stage of construction as per the requirement. Tests shall be carried out in accordance with IS:516-Methods of test for strength of concrete and IS:2386-Methods of test for aggregates for concrete. The method of sampling shall be in accordance with the requirements given in IS:2430.

4.3.5 Storage of Aggregates

- Storage of all types of aggregates at the site of work shall be as specified in IS: 4082. Aggregates shall in no case be stored near excavated earth or directly over ground surface.

- Fine aggregates delivered at the site in wet condition or becoming wet due to rain or any other means, shall not be used for at least 24 hours. For the use of such aggregates the contractor shall adjust the water content in accordance with IS:2386 to achieve the desired mix.

4.4 SAND (FOR MASONRY & FILLING)

4.4.1 Sand for Masonry Mortars

- The sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these. The sand shall be hard, durable, clean and free

Copyright EIL - All rights reserved

from adherent coatings and organic matter and shall not contain the amount of clay, silt and fine dust more than specified in IS:2116

- The sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shells in such form or in such quantities as to affect adversely the hardening, strength or durability of the mortar.

- The maximum quantities of clay, fine silt, fine dust and organic impurities in the sand, when tested in accordance with IS:2386, shall not be more than 5% by mass in natural sand, or crushed gravel sand or crushed stone sand. For organic impurities, when determined in accordance with IS:2386, colour of the liquid shall be lighter than that indicated by the standard solution specified in IS:2386.

4.4.2 Grading of Sand

The particle size grading of sand for use in mortars shall be within the limits as specified below:

Grading Of Sand For Use In Masonry Mortars

IS Sieve Designation IS:460 (Part I)	Percentage Passing By Mass	Reference To Method
4.75 mm	100	IS:2386 (Part-I)
2.36 mm	90 to 100	
1.18 mm	70 to 100	
600microns	40 to 100	
300 microns	5 to 70	
150 microns	5 to 15	

In case of sand whose grading falls outside the specified limits due to excess or deficiency of coarse or fine particles, this shall be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of natural sand particles or crushed stone screening which are by themselves unsuitable. The various sizes of particles of which the sand is composed shall be uniformly distributed throughout the mass.

4.4.3 Sampling and Testing

The method of sampling shall be in accordance with IS:2430. The amount of material required for each test shall be as specified in relevant parts of IS:2386. All tests shall be carried out in accordance with the relevant parts of IS:2386.

If further confirmation as to the satisfactory nature of the material is required, compressive test on cement mortar cubes (1:6) may be made in accordance with IS:2250 using the supplied material in place of standard sand and the strength value so obtained shall be compared with that of another mortar made with a sand of acceptable and comparable quality.

Copyright EIL - All rights reserved

4.4.4 Sand for Filling

Sand for filling shall meet the requirements of IS:383 and shall be natural sand, hard, strong, free from any organic and deleterious materials. Sand obtained from sea shores, creeks or river banks affected by tides, shall not be used for filling. Fine aggregates suitable for concreting works shall be suitable for filling also. No sand below grading zone-III as per IS:383 shall be allowed for filling.

4.5 CEMENT

Unless otherwise specifically called for, cement[1] for RCC and PCC/lean concrete works shall be one of the following:

53 grade ordinary Portland cement	IS:12269
43 grade ordinary Portland cement	IS:8112
Portland slag cement	IS:455
Portland Pozzolana cement (fly ash based)	IS:1489 (Part-1)
Portland Pozzolana cement (calcined clay based)	IS:1489 (Part-2)
Sulphate resisting Portland cement	IS:12330
High alumina cement	IS:6452

4.6 STEEL

4.6.1 General

All steel bars, sections, plates, and other miscellaneous steel materials, etc. shall be free from loose mill scales, rust as well as oil, mud, paint or other coatings. The materials, construction specifications such as dimensions, shape, weight, tolerances, testing etc, for all materials covered under this section, shall conform to respective BIS codes.

4.6.2 Reinforcement Bars

High strength deformed (HSD) steel bars of minimum grade Fe 500, conforming to IS:1786 T.M.T.(with corrosion inhibitors in concrete) bars shall be used for all structures. 16 gauge SWG wire shall be used for binding reinforcement bars.

4.6.3 Structural Steel

Structural steel sections shall conform to following BIS codes:

---

[1] The type of cement selected shall be appropriate for the intended use.

Copyright EIL - All rights reserved

Steel tubes for structural purposes	IS:1161
Mild Steel Tubes, tubular and other wrought steel fittings	IS:1239
Steel for general structural purposes (Grade A).	IS:2062
Hollow steel sections for structural use.	IS:4923

4.6.4 **Miscellaneous Steel Materials**

Miscellaneous steel materials shall conform to the following BIS codes:

Expanded Metal Steel Sheets for General purposes.	IS:412
Steel for General Structural Purposes- Specification.	IS: 2062
Hexagonal head bolts, screws & nuts of product Grade C.	IS:1363
Cold formed light gauge structural steel sections.	IS:811
Technical supply conditions for threaded steel fasteners.	IS:1367
Plain washers	IS:2016
Steel wire ropes for general engineering purposes	IS:2266
Thimbles for wire ropes.	IS:2315
Bulldog grips.	IS:2361
Mild Steel Tubes, tubular and other wrought steel fillings. (For Hand rail tubular sections)	IS:1239
Drop forged sockets for wire ropes for general engineering purposes.	IS:2485
Steel chequered plates.	IS:3502
Hexagonal bolts and nuts (M42 to M150).	IS:3138

4.6.5 **Anchor Bolts**

Material for Anchor Bolts such as MS bars, washers, nuts, pipe sleeves and plates etc. shall be as per relevant BIS codes mentioned above under Clauses 4.6.4.

4.7 BRICK

Bricks for masonry works shall conform to IS:1077 - Specification for common burnt clay building bricks and shall be variety of class 5.0 (with minimum compressive strength of 5.0 N/mm^2). Physical requirements, quality, dimensions, tolerances etc. of common burnt clay building bricks shall conform to the requirements of IS:1077.

Copyright EIL - All rights reserved

Bricks shall be hand-moulded or machine-moulded and shall be made from suitable soils. The bricks shall have smooth rectangular faces with sharp corners and shall be well burnt, sound, hard, tough and uniform in colour. These shall be free from cracks, chips, flaws, stone or humps of any kind.

Testing of the bricks shall be done as per IS:5454 and IS:3495. Water absorption shall not be more than 20% by its dry weight when soaked in cold water for 24 hours.

Locally available bricks of non modular size (230x115x75mm) in place of bricks of modular size (190x90x90mm) can be used in case the bricks satisfy the other requirements of IS:1077 (corresponding class as defined above).

4.8 ADMIXTURES

General Requirements for Admixtures

- All concrete admixtures shall comply with the following Indian standards:

Specification for integral cement water proofing compounds. IS:2645

Specification for other admixtures for concrete. IS:9103

In case of non-availability of any IS code for testing and acceptability criteria, relevant American, British or German Code shall be applicable.

- No admixture shall impair the durability of the concrete nor combine with the ingredients to form harmful compounds nor increase the risk of corrosion of reinforcement. Use of admixtures shall not reduce the dry density of concrete. Once the proportion of admixtures have been established, strict check shall be maintained not to alter the proportions of ingredients and water-cement ratio of the Design Mix during execution.

- The chloride contents in admixtures shall not exceed 2% by mass of the admixture or 0.03% by mass of the cement.

- Admixtures which do not meet the requirements stipulated in this document shall not be used.

Water Proofing Compounds

- The permeability of the specimen with the admixture shall be less than half of the permeability with a similar specimen without the use of these compounds. These compounds shall be used in such proportion as recommended by manufacturer but in no case it shall exceed 3% by weight of cement.

- The initial setting time of the cement with the use of these compounds shall not be less than 30 minutes and final setting time shall not be more than 10 hours. Tests shall be carried out in accordance with IS:4031.
- Compressive strength of the specimen at 3 days shall not be less than 160kg/cm^2 nor 80% of the 3 days compressive strength of mortar cubes prepared with same

Copyright EIL - All rights reserved

cement and sand only, whichever is higher. Similarly compressive strength at 7 days shall not be less than 220 kg/cm^2 nor less than 80% of the 7 days compressive strength prepared with the same cement and sand only, whichever is higher. The test to determine the compressive strength shall conform to IS:4031.

Bipolar Concrete Penetrating Corrosion Inhibiting Admixture

Refer Doc. No. 6987-000-16-48-4201

4.9 WATER BARS (WATER STOPS)

PVC water bars shall be used in reinforced concrete construction of liquid retaining structures or any other structure to safeguard them from hydrostatic pressure and water leakage and any relative movement between two parts of the structure due to thermal loading shrinkage or differential movement of foundations. These shall be preformed and shall provide a permanent water tight seal along the entire joint in the poured concrete structures. These shall also be flexible enough to withstand deflection/ displacements at joints arising due to variation of temperatures or settlement of foundations.

Performance requirements of PVC water bars shall meet the requirements of IS:12200. These shall be of an approved make and of ribbed/serrated/plane type with a bulb at the centre. The thickness and width of water bars shall in no case be less than 5mm and 150mm respectively. However, for concrete sections greater than 300mm thick, the width of water bars shall not be less than 230mm.

4.10 BITUMEN/BITUMINOUS MATERIALS

Bitumen to be used for various types of work shall meet all the requirements of relevant BIS codes as given below:

Specification of Paving Bitumen.	IS:73
Specification for bitumen mastic for flooring (Grade IV)	IS:1195
Specification for Bitumen felts for water proofing and damp proofing.	IS:1322
Specification for Bituminous compounds for water proofing and caulking purposes.	IS:1834
Specification for preformed fillers for expansion joint in concrete pavements and structures.	IS:1838
Specification for bitumen mastic for use in water proofing of roofs	IS:3037
Specification for bitumen primer for use in water proofing and damp proofing.	IS:3384
Specification for Bitumen Mastic for Tanking and Damp proofing.	IS:5871
Specification for Glass fibre base coal tar pitch & bitumen felts	IS:7193

Copyright EIL - All rights reserved

Code of practice for damp proofing using bitumen mastic	IS:7198
Specification for bitumen Mastic, Anti Static and electrically conducting grade.	IS:8374

Tests and acceptable criteria shall be as per relevant BIS codes.

4.11 PVC PIPES

PVC Pipes shall conform to the requirements of IS:4985.

4.12 ANTI-TERMITE COMPOUNDS

Chloropyrifos emulsifiable concentrates (1%) conforming to IS:8944 shall be used for treatment of soil for protection of buildings against attack by subterranean termites.

4.13 POLYSULPHIDE SEALANTS

All Polysulphide Sealants shall conform to IS:12118. Test conditions and requirements shall be as given in the above referred BIS code.

Copyright EIL - All rights reserved

5.0 CONSTRUCTION REQUIREMENTS

All concrete works shall be carried out as per the provisions of IS:456, IS:3370, IS:2974 and other relevant BIS Codes. Concrete mix proportioning and design mix; sampling and strength test of concrete, production and control of concrete, tolerances and placing of reinforcement and for cover; transporting, placing, compacting and curing etc, inspection and testing of structure (including requirement of non-destructive testing) shall be as specified in IS:456.

Continuous concreting shall be done for structures supporting dynamic equipment as per the provisions of IS:2974.

The damp proof course shall be laid in two layers of equal thickness and each layer given two coats of hot bitumen on top (grade A90/S90 conforming to IS:73) at the rate of 1.7 kg/m^2. Dry sharp sand shall be sprinkled evenly over the top layer of bitumen before hardening.

Form work and stripping of form work shall be as per the provisions of IS:456.

Assembly of reinforcement in RCC structures shall conform to IS:456.

Fabrication of all structural steel works shall be carried out as per the provisions of IS:800/801/802/806 and other relevant BIS codes. Fabrication shall include cleaning, straightening, cutting, bending, holding, bolting, welding, machining, painting, marking, assembling, erecting, inspecting and testing etc. Welding procedure and welder qualification shall be as per IS:800 and/or referenced BIS codes only.

Erection of all structural steel works including supply of plant & equipment, storing and handling, setting out, field connections, field welding and security during erection shall conform to IS:800/801/802/806.

All masonry works shall be carried out as per the provisions of IS:1597/2212/4326 and other relevant BIS codes.

Necessary embedment like insert plates, anchor fasteners, bolts, rungs etc. are to be done in concrete, wherever required.

The limits of dimensional tolerances for all works shall be as given below:

For Plain and Reinforced Cement Concrete Structures:

(a) Deviation from specified dimensions of cross section of columns and beams. - 6mm to +12mm

(b) Deviation from dimensions of footings (see Note below)

(i) Dimensions in plan -12mm to +50mm

(ii) Eccentricity 0.02 times the width of the footing in the direction of deviation but not more than 50 mm.

Copyright EIL - All rights reserved

(iii) Thickness ±0.05 times the specified thickness.

Note: Tolerances apply to cast-in-situ concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.

(c) Deviation in length (major dimension of single unit)

up to 3m	± 6mm
3m to 4.5m	± 9mm
4.5m to 6m	±12mm
additional deviation for every subsequent 6m	± 6mm

(d) Deviation in straightness or bow (deviation from specified line) for a single or continuous member), e.g, beam, column or slab edge.

Up to 3m	6mm
3m to 6m	9mm
6m to 12m	12mm
additional for every subsequent 6m	6mm

(e) Deviation in squareness shall be measured taking the longer of two adjacent sides as the base line.

The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds 6mm. For this purpose, any error due to lack of straightness shall be ignored. Squareness shall be checked with respect to the straight lines that are most nearly parallel with the features being checked. When the nominal angle is other than 90 degrees, the included angle between check lines shall be varied accordingly.

(f) Deviation in twists shall be within a limit such that any corner shall not be more than the limit given below from the plane containing other three corners:

Up to 600mm wide and up to 6m in length	6mm
over 600mm wide and for any length	12mm

(g) Maximum deviation in flatness from a 1.5m straight edge placed in any position on a nominally plain surface shall not exceed 6mm.

For Steel Structures:

(a) Columns and tower-type structures

- Deviation of column axes at foundation top level with respect to true axes.

i) In longitudinal direction	±5mm

Copyright EIL - All rights reserved

ii) In lateral direction ±5mm

- Deviation in the level of bearing surface of columns at foundation top with respect to true level. ±5mm

- Out of plumb (verticality) of column axis from true vertical axis measured at top:

i) Up to and including 30m height ±H/1000 or ±25mm whichever is less.

ii) Over 30m height ±H/1200 or ±35mm whichever is less.

- Deviation in straightness in longitudinal & transverse planes of column at any point along the height . ±H/1000 or ±10mm whichever is less

- Difference in the erected positions of adjacent pairs of columns along length or across width of building prior to connecting trusses/beams with respect to true distance. ±5mm

- Deviation in any bearing or seating level with respect to true level ±5mm

- Deviation in difference in bearing levels of a member on adjacent pair of columns both across & along the building ±5mm

Note 1) Tolerance specified for out-of-plumbness should be read in conjunction with 'Deviation in straightness....' & 'Difference in the erected positions.....'.

Note 2) 'H' is the column height in mm.

Note 3) Tolerance limits as given under clause (a) above for steel structures are applicable to concrete columns/pedestals also.

Construction of all other items of works shall conform to relevant Indian Standards and sound engineering practices.

The Contractor shall be responsible for the complete safety pertaining to all construction works.

Before starting the piping work over the pipe rack, the contractor shall provide a hanging scaffolding, about one meter below the entire pipe rack first tier elevation, to provide an elevated working platform leaving the ground free, to provide protection from the falling material and to act as a safe working platform for the mechanical work at the first tier

Copyright EIL - All rights reserved

6.0 SPECIFIC REQUIREMENTS

6.1 GENERAL

Apart from the conditions mentioned in the Design requirements given in the document, the following shall be strictly adhered to.

Cable/pipe trenches & precast slab covers shall be designed to withstand the load of hydra-crane. Seating surface of the slab shall be at least 100mm wide with structural ISA50x50x6 edge protection embedded through out the length of the trench.

Only steel shuttering shall be used for civil construction.

Contractor shall make necessary arrangement for placing the anchor bolts in position before concreting. Whenever there are more than four foundation bolts, these shall be fixed by using template. In case bolts are not available at site at the time of casting of foundation, proper pockets shall be left as per direction of the Engineer-in-charge.

Contractor to ensure isolation of structures/equipments with difference of temperature for free expansion while providing interconnecting platform and for connection to the stair structure.

Contractor shall ensure lateral stability by providing box/built up sections for columns wherever it is not feasible to provide vertical bracing in either direction.

All designs, detailing & construction shall strictly conform to enclosed standards, specifications & drawings. However drawings marked “Issued for Information only” are for only guidance to the contractor.

Contractor shall furnish the BULK MTO for cement and High Strength Deformed TMT bars (*diameter wise*) and Structural Steel (*section wise*) within 45 days from the date of receipt of LOI/TOI. It shall also be updated at 50% & 90% stages of engineering progress and shall be submitted to owner/owner’s representative for information.

Sequence of construction is to be shown on the AFC drawings by indicating construction joints wherever required.

Walk way of minimum 900 mm width shall be provided for maintenance purpose, throughout the pipe rack along with electrical cable tray.

The minimum diameter of reinforcement bar for slabs, beam stirrups and column ties shall be 8 mm and for footing slabs and vertical walls it shall be 10 mm. The maximum spacing of these bars shall be restricted to 300 mm c/c.

No equipment shall be directly supported on suspended floor slab. Suitable arrangement of beams shall be provided underneath to support the equipments.

The foundation design shall be based on approved Geotechnical investigation recommendations. Geotechnical investigation shall be in scope of the bidder.

Copyright EIL - All rights reserved

Contractor shall depute his concerned Civil-Structural design engineer to owner/owner's representative review office as and when required for review of his documents. During such reviews involving computer aided analysis/ design/ drafting of structures, the Contractor shall make his own arrangement of Personal Computer (PC) in the form of Lap-top in the premises of owner/owner's representative review office. This is required to expeditiously resolve all the comments including those involving the use of PC by Contractor in his submission. The Contractor shall ensure that these PC's are fully operational along with necessary software already loaded including the input/output/drawing files of the structures being reviewed. The Contractor shall revise and re-submit the analysis/design and drawings as required during review.

Side face reinforcement shall be provided in open/pile foundations and beams as per Cl. No.26.5.1.3 of IS:456

Bursting reinforcement in pile caps shall be provided as per Cl.No.6.9.4.2 of SP34.

Minimum bottom cover in pile caps as mentioned in Doc. No. 6987-00-16-48-DB01 shall be read as 125 mm.

6.2 REVIEW OF DESIGN AND APPROVED FOR CONSTRUCTION (AFC) DRAWINGS

Complete structural design and AFC drawings for the structures mentioned in section A-4.2.6 shall be got reviewed by owner/owner's representative in detail before taking up any construction activity at the work site:

For all other works/buildings/structures, requisite number of prints (as mentioned elsewhere) of design calculations and AFC drawings shall be sent simultaneously to owner/owner's representative for information and to site for construction.

Submission of typical review category documents shall be taken up prior to corresponding information category documents. Owner/owner's representative comments on typical review category documents shall be duly taken care in information category documents as well before issuing them for construction.

The contractor shall furnish the quantities of different grades of concrete, reinforcement and structural steel in the respective AFC drawings. Bar Bending schedule for all RCC drawings shall be submitted by the contractor along with the AFC drawings.

Copyright EIL - All rights reserved

JOB SPECIFICATION (ARCHITECTURAL)

RAW WATER TREATMENT PLANT (Membrane based Filtration System)

PROJECT : DAHEJ PETROCHEMICAL COMPLEX

OWNER : ONGC PETRO additions LTD.

PMC : ENGINEERS INDIA LIMITED

JOB NO. : 6987

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	17.06.13	ISSUED FOR BIDS	AG	SD	JKB

Copyright EIL – All rights reserved

CONTENT

1.0 SPECIFIC DESIGN REQUIREMENT

2.0 ARCHITECTURAL FINISHES

3.0 SPECIFICATION OF ARCHITECTURAL FINISHES

Copyright EIL – All rights reserved

1.0 SPECIFIC DESIGN REQUIREMENT

A. Design basis

The Buildings/ Sheds shall be designed on the basis of following documents. In case of any irrevocable conflict, the most stringent provision or Owner/ PMC's decision shall be followed.

1. Engineering design basis (6987-00-16-48-DB-01, Part-II)
2. Process specification, drawings, recommendations
3. National Building Code of India
4. State Factory Rules
5. BIS (Bureau of Indian Standards) Codes
6. Indian Electricity Rules
7. Local Municipality/ any other Authority Bye-Laws as applicable.

B. Requirement of Buildings

Requirement of Buildings shall be in accordance with the list included in Scope of Supply/Works (6987-074-16-49-SOW-01) and scope of work/ specifications of other disciplines

C. Specific requirement of Buildings

1. Shed for filtration skid

Shed for filtration skid shall be of steel structure construction with pre coated, pre profiled steel sheet roofing and cladding.

3 m high, 230mm thick brick wall shall be provided enclosing chemical storage area.

Poly-carbonate sheeting shall be provided in roof to maintain required natural lighting inside the shed.

Necessary louvers in side cladding and roof monitors or air driven roof air extractors shall be provided for ventilation.

Reference shall be made to scope of work and specification of Environment & other disciplines for details of spaces within the shed etc.

Size of Shed for filtration skid shall be finalized on the basis of reviewed equipment layout, functional, maintenance and safety and statutory requirement.

2. Shed for combo unit

Shed for combo unit shall be of steel structure construction with pre coated, pre profiled steel sheet roofing and cladding.

Poly-carbonate sheeting shall be provided in roof to maintain required natural lighting inside the shed.

Copyright EIL – All rights reserved

Necessary louvers in side cladding and roof monitors or air driven roof air extractors shall be provided for ventilation.

Reference shall be made to scope of work and specification of Environment & other disciplines for details of spaces within the shed etc.

Size of Shed for combo unit shall be finalized on the basis of reviewed equipment layout, functional, maintenance and safety and statutory requirement.

3. Shed for MCC Room

Shed for MCC Room shall be of steel structure construction with pre coated, pre profiled steel sheet roofing and cladding.

This shall be weather tight, closed type structure.1000mm high 230mm thick brick wall shall be provided around external periphery. Balance height of the room shall be provided with side cladding.

Necessary Doors, windows, ventilators shall be provided.

Both Mechanical ventilation (by means of exhaust fans) & natural ventilation (by means of windows/ ventilators, air driven roof air extractors) shall be provided.

Poly-carbonate sheeting shall be provided in roof to maintain required natural lighting inside the shed.

Necessary trenches in floor shall be provided.

Finished floor level shall be decided based on trench depth so that water ingress in trenches are prevented.

Reference shall be made to scope of work and specification of Electrical & other disciplines for details of spaces within the shed etc.

Size of Shed for MCC Room shall be finalized on the basis of reviewed equipment layout, functional, maintenance and safety and statutory requirement.

2.0 ARCHITECTURAL FINISHES :

Architectural finishes shall be in accordance with engineering Design Basis (Architectural) except for specific Architectural finishes indicated in this job specification.

RO shed shall be “E” type building for this purpose (refer engg design basis).

Architectural finishes of other buildings, if any, shall be in accordance with Engineering Design basis.

A. Schedule of exterior finishes

1. Shed for Filtration Skid, Combo unit, MCC room

Copyright EIL – All rights reserved

- Plain cement plaster and water proof cement paint on brick wall

- Metal (pre coated, pre profiled steel sheet) cladding and roofing with all accessories

B. Schedule of interior finishes

1. Shed for Filtration Skid, Combo unit, MCC room

Area	Flooring	Wall
General Shed area, MCC Room, Areas housing machinery/ equipment etc.	Heavy duty Flooring	Oil bound distemper over cement plaster
Chemical storage & handling area	Acid/ alkali resistant PPG lining/ tiling	Acid/ alkali resistant epoxy coating upto 2500 height Oil bound distemper over cement plaster

C. Doors, windows, ventilators

1. Doors
   - Pressed steel frame with pressed steel shutter doors (powder coated) / Rolling Shutters. Rolling shutters shall be motor operated.

2. Windows & Ventilators
   – Powder coated Steel, glazed (5mm thk. Toughened glass) window & ventilators. Ventilators shall be composite type having fixed glazing and steel louvers also.

   Irrespective of above, If required for functional, process, storage, maintenance, safety etc. purposes, required specific finishes shall be provided wherever required

Copyright EIL – All rights reserved

3.0 SPECIFICATION OF ARCHITECTURAL FINISHES

Note:

1. In case of any conflict with specifications mentioned elsewhere, Owner/ PMC's decision shall be final

2. For specifications not covered herewith shall be prepared by contractor and submitted for Owner/ PMC approval. The work shall be executed in accordance with approved specifications.

3.1 GENERAL

(a) For any aspect of item not covered in the document, the contractor shall follow instructions of the engineer-in-charge and execute the work as per relevant IS codes/ recommendations of approved manufacturer/ good engineering practice without any cost or time implication to Owner/PMC. Contractor shall refer only to the relevant part of the specifications given below as per the Building Finishes described before.

(b) All materials shall be of first quality conforming to the specifications & IS or equivalent with IS marks and shall be obtained from the approved Manufacturer. The Contractor shall get the materials approved by the Engineer - In - Charge before ordering & procurement. The Contractor shall furnish necessary certificates etc. as asked by the Engineer - In - Charge. Further to that he shall get the materials tested from approved test house if asked by the Engineers - In - Charge & submit the test certificate at his own cost for which no extra payment shall be made to him. The Engineer - In - Charge shall have the right to reject all or any of the materials intended to be used and such materials shall be immediately removed from the site by the Contractor at his own cost without any claim for compensation etc. due to such rejection.

(c) Workmanship shall be to the satisfaction of the Engineer- In- Charge. The contractor shall follow the specifications, relevant Codes & Manufacturer's guidelines for achieving desired level of workmanship as per specification & good engineering practice. Any executed work not conforming to the specification or not to the satisfaction of the Engineer -In-Charge shall be rectified by the Contractor as directed by the Engineer -In-Charge. No extra payment shall be made to the Contractor for such rectification. The contractor shall use only first quality approved material for all items.

(d) All specifications of various finishing items include construction supervision; supply of all materials, labours, tools tackles, scaffoldings etc. and are applicable for all heights, locations etc.

(e) For specifications of construction water, sand, cement, bricks/ stone, aggregates etc. reference shall be made to the Civil/ Structural specifications attached in the bid document.

(f) All specialised items of work (e.g. Composite Aluminium panel, Structural/ Curtain Glazing, Aluminium Doors and Windows, Waterproofing, Insulation, Pre-coated roof sheeting/ cladding, False ceiling, False Flooring, Partitioning and Panelling,

Copyright EIL – All rights reserved

Expansion joint sealing etc.) shall be got executed by the Contractor only through authorised applicators/ sub contractors of approved manufacturer/ vendor. The contractor shall submit list of such authorised applicators/ sub contractors for approval before execution of such items.

3.2 FLOOR FINISHING

Reference shall be made to the following Indian Standards for any further information etc. not covered in the specification. In case of any conflict/contradiction, provision of specification shall override.

IS: 777	Specification for glazed earthenware wall tiles.
IS: 2571	Code of practice for laying in situ cement concrete flooring.
IS: 4631	Code of practice for laying of epoxy resin floor toppings.
IS: 5491	Code of practice for laying in situ granolithic concrete floor topping.
IS: 4441	Code of practice for use of silicate type Chemical resistant mortars.
IS: 4443	Code of practice for use of resin type chemical resistant mortar.

3.2.1 Cement Concrete Flooring

Cement concrete flooring shall be laid in average 25mm thickness over sub base (as per structural drawings/ specifications) and shall generally conform to IS: 2571. The flooring shall be laid in panels and shall consist of:

(a) 25 mm thick base course of M-20 grade cement concrete (with 6mm and down size stone aggregate) laid on the sub-base in panels (each panel not exceeding 1 Sq. Mtr. in area) in desired shape and pattern. The panels shall be bound by 3x20mm PVC strips panel dividers; fixed in position with their top at proper level maintaining the required levels, slopes, linearity etc. as required. Base course shall be laid in alternate panels. Before laying the base course, neat cement slurry @ 2.75Kg. of cement per Sq. Mtr. of area shall be applied (brushed) over the prepared sub base surface. Cement concrete shall be placed in position and beaten with trowel, including tamping and finishing smooth. Finishing of the surface shall follow immediately after completion of laying of base. The bed for flooring shall be prepared either level or sloped as per drawings and as instructed by Engineer-in-charge.

(b) Neat cement @ 2.75Kg. per Sq. Mtr. mixed with water to form a thick slurry applied over the base course (when the concrete is green), spread over the surface, pressed twice by means of iron floats; once when the slurry is applied and second time when the cement starts setting. The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly upto a radius of 25mm unless otherwise mentioned.

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

3.2.2 Cement Concrete Granolithic Flooring

Cement concrete granolithic flooring shall be laid in overall ***40mm*** thickness over sub base (as per structural drawings/ specifications) and shall generally conforming to IS:5491 in workmanship. The flooring shall be laid in panels and shall consist of:-

(a) 25mm base Course (Under layer) of M-20 grade Concrete (shall generally conform to Civil structural specifications) laid over sub base in panels (each panel not

Copyright EIL – All rights reserved

exceeding 1 Sq. Mtr. in area) in desired shape and pattern. The panels shall be bound by 3x30 PVC strips panel dividers; fixed in position with their top at proper level maintaining the required levels, slopes, linearity etc. as required. Base course shall be laid in alternate panels. Before laying the base course, neat cement slurry @ 2.75Kg. of cement per Sq. Mtr. of area shall be applied (brushed) over the prepared sub base surface. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints. Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

(b) 15mm thick Wearing top layer of cement mortar 1:3 (1 cement: 3 course sand by volume) which shall be laid within 15 minutes of laying the first layer. The cement and aggregates for the top layer shall be mixed dry. After mixing, sufficient quantity of washed sand and water shall be added to make the mix plastic but not flowing. The top and bottom layer shall firmly grip together. The base course shall be free of excessive moisture before starting the floor finishing. Use of dry cement, cement sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture shall not be permitted.

(c) While the concrete is still green, cement @ 2.75 kg per Sq.M of floor area shall be mixed with water to form a thick slurry and spread over the surface. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting. The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly upto a radius of 25mm unless otherwise mentioned.

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

3.2.3 Heavy Duty Cement Concrete Flooring

Heavy duty Cement concrete flooring shall be laid in overall 50mm thickness over sub base (as per structural drawings/ specifications); shall generally conform to IS: 5491 in workmanship. The flooring shall be laid in panels and shall consist of:-

(a) Base Course (Under layer) 35mm thick of cement concrete (1 cement: 1.5 coarse sand: 3.5 stone aggregates of 10mm to 6mm size by volume) laid over sub base in panels (each panel not exceeding 1 Sq. Mtr. in area) in desired shape and pattern. The panels shall be bound by 3x40mm PVC strips panel dividers; fixed in position with their top at proper level maintaining the required levels, slopes, linearity etc. as required. Base course shall be laid in alternate panels. Before laying the base course, neat cement slurry @ 2.75Kg. of cement per Sq. Mtr. of area shall be applied (brushed) over the prepared sub base surface. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints. Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

(b) Wearing Top layer/ Finishing layer shall be of cement, hardener and stone aggregate mix of 15mm thickness laid over the base course. Unless otherwise mentioned, one part of approved quality hardener and four parts of cement by weight shall be mixed dry. This dry mixture shall be mixed with stone grit of 6mm and down size in the ratio of 1 hardener and cement mixture : 2 stone grit by volume. Just enough water shall then be added to the mix.

Copyright EIL – All rights reserved

The mixture so obtained shall then be laid on the base course within 2 to 4 hours of latter's laying. It shall be firmly pressed into bottom concrete so as to have a good bond with it. After the starting of initial setting, the surface shall be finished smooth and true with steel floats.

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

3.2.4 Cement Plaster Skirting

Cement plaster skirting shall be laid with cement mortar (1 cement: 3 coarse sand by volume) shall be of 18mm thickness. The surface on which the skirting is to be applied shall be prepared and skirting shall be laid. The junction between flooring and wall shall be rounded off to a radius of 25mm if not otherwise mentioned.

While the mortar is still green, cement @ 2.75Kg per square metre shall be mixed with water to form a thick slurry and applied over the mortar. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting. The flooring shall be cured for 7 days.

3.2.5 Tile Work (Glazed/ Ceramic/Vitrified Porcelain)

Glazed ceramic tiles shall conform to IS: 13753. Ceramic tiles for flooring shall be matt finished and non slip type. All tiles shall be decorative type of approved shade, pattern, texture and design and of approved manufacturer. The sizes of the ceramic tiles shall generally be 300x300x8mm for flooring and 100x200x6mm or 300x200x6mm for walls (dado). Vitrified tiles shall conform to EN 176. The sizes of Vitrified Porcelain tiles shall be as per approved manufacturer's standards/ as approved by owner. Pigments to be admixed with mortar for grouting the joints shall conform to Table -1 of IS: 2114. The tiles shall be laid over a coating of approved neoprene based adhesive (as per manufacturer's specification) laid on base floor/ wall plaster. The joints of the tiles shall be flush pointed with cement paste (white cement and pigment conforming to IS:2114, Table-l) matching the shade of colours. The tile work shall be suitably cured.

3.2.6 Kota Stone Flooring/ skirting/ dado

Stone Flooring shall be laid in minimum 40mm overall thickness over sub base (as per structural drawings/ specifications). The Kota Stone slabs shall be of selected quality and shade, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. These shall be machine cut to the requisite size and thickness and chisel dressed. For flooring and skirting/ dado/ riser the thickness of the stone slabs shall be 25mm and 18mm respectively. Skirting shall normally be 125mm high unless specified otherwise.

The slabs shall have smooth top (exposed) face before being laid. Before starting the work, the contractor shall get the samples of slabs approved by Engineer-in-charge. Each slab shall be machine cut to the required size and shape and fine chisel dressed at all edges to full depth and machine rubbed to a smooth surface finish. All angles and edges of the slabs shall be true square and free from chippings giving a plane and smooth surface.

Copyright EIL – All rights reserved

For steps, joints in Kota stone shall be permitted only when width/ length is more than 0.6/ 2 metre. For flooring minimum size of Kota stone slab shall be 450mm x 450mm and shall be of uniform size.

Preparation of base shall include making it rough, cleaning thoroughly and applying neat cement slurry @ 2.75 kg of cement per Sq.M. of area to receive the mortar. Cement mortar shall be 15mm thick !:6 (1 cement: 6 Coarse sand by volume) for flooring and 12mm thick 1:3 (1 cement: 6 Coarse sand by volume) for skirting. The mortar shall be laid for fixing one slab at a time. The slab shall be washed clean before laying. It shall be laid over cement mortar bedding on top, pressed, tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be corrected by adding fresh mortar at hollows and depressions. The mortar then shall be allowed to harden and cement slurry of honey like consistency @ 4.4.kg of cement per Sq. M shall be spread over the mortar. The edges of the slabs shall be buttered with white cement (with necessary pigment) grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it is properly bedded in level. The joints shall be as fine as possible. Surplus cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10 mm under the plaster/skirting. The finished surface shall be true to levels and slopes as instructed by the Engineer-in-Charge. Cut size may be used along periphery as required. Curing, as required shall be done.

Grinding shall be commenced when the joints are properly set. Unevenness at the meeting edges of slabs shall be removed by fine chiselling. Grinding shall be done by machines except for skirting and small areas. First grinding shall be done with Carborundum stones of 48 to 60 grade grit fitted in the machine. Water shall be properly used during grinding. When the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of cement mixed with pigments to match with colour of the Kota stone. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with Carborundum stone of 120 grit. Grinding and curing shall follow again.

Final grinding shall be with Carborundum of grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water, oxalic acid powder shall then be dusted at 35 gms/sq. m. on the surface rubbed with machine fitted hessian bobs or rubbed hard with woollen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any stone slab is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

3.2.7 Marble Stone Flooring & cladding

The Marble Stone slabs shall be minimum 18-19mm thickness of selected quality (grade- I) in approved design, pattern and shade and shade of ***Indo Italian Marble*** *(20%)* in combination with ***White Makrana Marble*** *(80%).* It shall be hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. The slabs shall be machine cut to the requisite dimensions. Dimension of slabs shall be

700mm to 2500mm in length and 300mm to 1000mm in width. Skirting shall normally be 125mm high unless specified otherwise. Pigments, wherever required, to be admixed with mortar or position and tapped with wooden mallets till it is properly bedded in level. The joints shall be as fine as possible. Surplus white cement on the surface of the slab shall be removed for grouting the joints shall conform to Table -1 of IS: 2114.

Copyright EIL – All rights reserved

The slab shall be washed clean before laying. Due care shall be taken to match the grains of slabs which shall be selected judiciously having uniform pattern of veins/ streaks or as directed by the Engineer-In-Charge.

Laying in floor :

Marble Stone Flooring shall be laid in minimum 40mm overall thickness over sub base (as per structural drawings/ specifications). Preparation of base shall include making it rough, cleaning thoroughly and applying neat cement slurry @ 2.75 kg of cement per Sq. Mtr. of area to receive the mortar. It shall be laid over cement mortar (20mm thick 1:6 ,1 cement: 6 Coarse sand by volume) bedding, pressed, tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be corrected by adding fresh mortar at hollows and depressions. The mortar then shall be allowed to harden and cement slurry of honey like consistency @ 4.4.kg of cement per square metre shall be spread over the mortar. The edges of the slabs shall be buttered with white cement with or without pigment grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it is properly bedded in level. The joints shall be as fine as possible. Surplus cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10 mm under the plaster/skirting. The finished surface shall be true to levels and slopes as instructed by the Engineer-in-Charge.

The slabs shall be laid in patterns as per drawings and size. Cut size may be used along periphery as required. The joints shall be uniform and in perfect line.

Laying in skirting/ dado/ risers :

The slabs shall be held in position by suitable temporary measure such as wooden/ bamboo supports, temporary hook etc. as approved by Engineer-In- Charge. The outer face of the slabs shall be checked for plane and plumb and corrected. The joints shall be as fine as possible and shall be filled with neat cement paste/ grout with white cement and pigment to match the colour of the slabs. The joints shall thus be left to harden and then the rear gap between the slabs and backing surface shall be packed with cement mortar of specified mix and thickness. Temporary supports shall be removed after the mortar filling in the gap has acquired sufficient strength. The top line of the skirting/ dado/ risers shall be truly horizontal and joints truly vertical.

Polishing and Finishing:

Unevenness at the meeting edges of slabs shall be removed by fine chiseling.

The day after the tiles are laid all joints shall be cleaned with a wire brush to a depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shade of the stones.

Grinding shall be commenced after a minimum period of 7 days when the stones and the joints are properly set. Grinding shall be done by machines. First grinding shall be done with carborundum stones of 60 grade grit fitted in the machine. Water shall be profusely during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. The second grinding shall be done with carborundum stone of 120 grit. Final grinding shall be done the day after the second grinding with carborundum stone of 320 grit using water in abundance. The surface shall be washed clean with water, oxalic acid powder shall then be dusted at 33 gms/sq. m. on the surface rubbed with machine fitted hessian bobs or rubbed hard with

Copyright EIL – All rights reserved

woollen rags. The surface shall then be washed clean and dried with a soft cloth or linen. If any stone is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

3.2.8 Granite Stone Flooring and cladding

The Granite Stone slabs shall be pre-polished (mirror-polish), hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes minimum 18-19mm thickness of selected premium quality (grade- I) and texture/ shade of owner's choice.

Laying, finishing of Granite stone shall be similar to Marble stone laying & finishing

3.2.9 Epoxy Coating:

Epoxy floor coating shall be pigmented (approved shade) made of a solvent based, two pack system with epoxy resins and amine curing agents, chosen to withstand high degrees of chemical and abrasive action as per approved manufacturer's specification and shall consist of:-

Screed:

The screed shall be provided in flooring and shall consist of a solvent free combination of epoxy resin, modified amine hardeners filled with specially graded and selected chemically inert aggregates of high strength. The system shall include an epoxy resin primer and screed which are both supplied in pre-weighed units ready for on-site mixing and application. The thickness of screed shall be minimum 3mm thick. The primer shall be applied by brush and shall be allowed to become tacky. The screed shall be prepared as per manufacturer's specification and laid evenly over the base floor by trowel. In case of flooring, the finished, cured screed shall have a slightly granular texture.

Finishing Coat:

An epoxy resin sealing coat in two coats @ 125 gms./sq.m. (minimum) per coat shall form the topping coat over the screed in case of flooring and over plastering in case of vertical surfaces. The epoxy resin topping shall be applied at least 24 hours after the laying of the screed. This topping shall be applied by brush or sprayed to a specified thickness in two coats with 3-5 hours interval between them. Care shall be taken to finish the topping perfectly smooth and devoid of any bubbles and unevenness. The newly laid floor shall be protected from dust or moisture and allowed to be used only after a minimum lapse of 48 hours.

The surface on which the epoxy coating is to be done shall be sound, clean and dry in order to achieve maximum adhesion with the primer coating of epoxy resin as per approved manufacturer's specification.

3.3 DOORS AND WINDOWS

3.3.1 Aluminium Glazed Doors, Windows and Ventilators

Aluminium glazed doors/ windows/ ventilators shall be made of extruded tubular/ box electrostatically powder coated (min. 30 microns) Aluminium sections conforming to IS: 733 and IS : 1285 of 'HINDALCO' or 'JINDAL" or approved equivalent

Copyright EIL – All rights reserved

manufacturer with 5.5mm toughened glass conforming to I.S.: 2553 fixed with rubber lining or EPDM gasket and extruded anodised aluminium beading.

Extruded aluminium sections used for various applications shall be of appropriate sections, weight etc. having minimum weights as specified in the manufacturer's catalogue and approved by PMC.

The frames shall be fixed to masonry by means of Aluminium lugs fixed to the frame by counter sunk brass machine screws and grouted with M-20 grade concrete in minimum 150 x 150 x 50 mm sized hole in the masonry. In case of RCC, the frames shall be fixed with 12mm dia dash fasteners in case of concrete. Any steel item coming in contact with Aluminium shall be galvanised.

Aluminium glazed doors shall be provided with cup pivots (of aluminium alloy conforming to IS designation NS-4 of IS 737 and IS designation of A-5-M of IS: 617) riveted to outer and inner frames to permit to swing through an angle of 85 degree.

Following hardware shall be provided for the doors.

1. Heavy duty & hydraulically operated double or single action adjustable door closer conforming to IS: 6315

2. 250mm and 150mm long, 10mm dia Aluminium tower bolts as per IS: 204 one each for each shutter.

3. Brass body 6 lever mortise lock as per IS : 2209

4. Aluminium door handle for each shutter for each side.

(Note: All Aluminium fittings/ fixtures shall be of same finish as that of doorframe & shutter)

Side hung window shutters shall be fixed to the frame with Aluminium alloy friction hinges and shall be complete in all respects including accessories, fittings fixtures of same finish as that of window frame & shutter, handles of cast aluminium conforming to IS designation A-5-M of IS: 617 mounted on a handle plate riveted to opening frames, Aluminium Tower bolts, peg stays for ventilators etc. Wherever specified, decorative aluminium safety grills of approved design shall be provided which shall be screwed to the main frame.

3.3.2 Steel Doors

Steel doors shall consist of:

(a) Pressed steel door frame of overall 125x 65mm size conforming to IS : 4351 and made of 16 SWG pressed steel sheet bent to required shape using bending machine to form solid/ true mitred edges/ corners, stiffened with 50 x 5mm thick MS flat spacers welded to the frame facing the wall/ column @ 600mm c/c maximum vertical spacing. The frame shall be fixed to the masonry by means of 300 x 25 x 6 mm thick MS hold fast welded to the spacer and grouted with M-20 concrete in minimum 350 x 100 x 100 mm sized hole in the masonry. In case of concrete, the frames shall be fixed by 96mm long, 12 mm dia metallic counter sunk type dash fasteners through the frame & spacers. Provision for hinges, locking arrangement and other hardware shall

Copyright EIL – All rights reserved

be provided in the frame by machine cutting of required size cutouts in the frame and welding/ screwing to 3 mm thick MS pad plates already welded over the cutout from behind. The frame shall be thoroughly cleaned of rust, mill scale, dirt, oil etc. and then finished with 2 or more coats of approved quality synthetic enamel paint of approved shade over a priming coat of approved red oxide zinc chromate primer. The hollow frame shall be packed with PCC to fill the cavity without gap.

(b) Pressed steel door shutter shall be made with 18 gauge steel sheets formed by machine bending in the form of hollow box (overall 40mm thick) welded at meeting of the sheets with pad plate of 3mm thick MS flat all along the perimeter. The shutter

shall be braced with channel shaped 35mm wide horizontal stiffeners by folding 16 gauge MS sheets @ 500mm c/c fixed by flush riveting. 3mm thick MS pad plates shall be welded inside at required locations for fixing of hardware. The cavity inside shall be packed with rigid PU foam/ phenolic foam or glass wool insulation to fill into the box cavity without gap.

For double shutters, an MS angle (25x 45x 3mm thick) shall be welded to one of the shutter providing a minimum 25mm wide rebate for the other shutter at the meeting point.

The shutters shall be fixed to the door frame by means of heavy duty MS butt hinges of 150mm size conforming to IS : 1341 @ 500mm c/c maximum.

Each door shutter shall have following accessories.

1. Spring loaded pressure die cast zinc alloy door stopper.
2. Heavy duty, MS aldrop 400mm long for double shutter & 300mm long for single shutter.
3. 12mm dia, 300mm long pressure die cast zinc alloy handles on both sides.
4. 12mm dia, 250mm long MS tower bolt at top and 12 mm dia 150mm long at bottom.
5. 3- way spring loaded locking & latching system.
6. 150mm x 300mm Vision panel with 16 gauge MS beading bent to ‘Z’ shape & 4mm thick plain glass conforming to IS: 2853.
7. All steel doors shall be provided with heavy duty overhead door closer with adjustable spanners, metal screws etc confirming to IS: 3564

The entire shutter including all accessories, fittings & fixtures etc. shall be painted with 2 or more coats of approved quality synthetic enamel paint of approved shade over a coat of approved quality red oxide zinc chromate primer.

3.3.3 Steel Rolling Shutter

MS rolling shutters shall conform to IS: 6248 and shall be constructed with interlocking lath sections formed out of cold rolled 0.9mm thick, 80mm wide steel strips for shutter width upto 3.5 M, or 1.25mm thick, 80mm wide steel strips for shutter width beyond 3.5 M, joint less MS channel section of 3.15mm thickness for guide, MS girders & bottom rail, shutter suspension stud with pulley & cage, top rolling springs, locking arrangement etc. all complete as per manufacturers approved drawings. The entire shutter including all accessories shall be painted with 2 or more coats of approved quality & shade synthetic enamel paint over a coat of approved

Copyright EIL – All rights reserved

quality red oxide zinc chromate primer. All the damaged surfaces of wall, columns, plastering etc. shall be made good.

Electrically operated Rolling shutters with all accessories, electrical motor, cabling etc. as per approved manufacturers design shall be provided in Substations equipment entry.

Wherever specified the Rolling shutters shall be grill type or partly grill & partly solid type or fully solid type depending on ventilation requirement.

3.4 PLASTERING & WALL CLADDING

3.4.1 Plain Cement Plaster

Plain Cement plaster shall be provided in following thickness:

a. 12mm thick in 1:4 cement mortar for all plumb of the internal masonry walls & RCC Columns coming in line (flush) with this side of wall.

b. 15mm thick in 1:4 cement mortar for rough side of internal masonry walls RCC Columns coming in line (flush) with this side of wall.

a. The external plastering shall be with waterproof compound (cement mortar mixed with approved acrylic waterproof compound @ 1 Kg. per 50 Kg. of cement) 18mm thick cement plaster in 1:4 cement mortar for all external surfaces as indicated.

d. 6mm thick in 1:4 cement mortar for all RCC ceiling, beam etc. However if the undulation in ceiling is beyond 6mm thick plaster, extra thickness of plaster shall be applied without any extra cost to give a smooth and fair surface to the satisfaction of Engineer-In-Charge.

3.4.2 Sand face plaster

The plastering work shall include preparation of background surface which shall consist of cleaning of all dust, loose mortar droppings, traces of algae, efflorescence or any other foreign matter by water or by brushing, roughening up of smooth surfaces by wire brushing or hacking, trimming of projections whenever necessary. The surface shall be washed off and well wetted before applying the plaster.

For external plaster, the plastering shall be started from top floor and carried downwards. Internal plastering shall start with ceiling. Plastering shall be applied evenly in specified thickness. The entire surface shall be finished smooth by means of trowel or wooden float.

All the brick/stone masonry and RCC joints shall be provided with 20 gauge chicken wire mesh stretched tight and fixed with G.I. type nails before plastering.

20mm x 10mm grooves (horizontal and vertical) shall be provided in perfect straight line & plumb in plastering as per drawings and instructions of Engineer- In - Charge.

Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period the plaster shall be suitably protected from all damages at the contractor's expense by such means as approved by the Engineer-in-charge. The date of execution of plastering shall be marked on the plastering to ensure the proper duration of curing.

Copyright EIL – All rights reserved

The plastering shall include all scaffolding, damage rectification etc. complete.

3.5 ROOF TREATMENT/ WATERPROOF COATING

3.5.1 APP Bituminous membrane Water proofing

Material:

The water proofing membrane shall have a non-woven polyester membrane coated on both side with APP (Atactic polypropylene) modified bitumen. It shall have a Black finish with a very thin polyethylene foil on both sides It shall be in rolls of 1x10m for continuous laying on large lengths. When installed, it shall form an impervious, flexible blanket, which accepts normal structural movement without breaking or cracking.

Workmanship:

Preparation of surface:

The roof surface (or screed) shall be thoroughly cleaned with a wire brush and all foreign matter etc. shall be removed. Well-defined cracks on the surfaces shall be cut to a 'V' section, cleaned and filled up flush with a paste of filling compound and cement in the ratio of 1:2. The finished surface shall be perfectly dry and any dampness should be allowed to evaporate.

Laying:

The membrane shall be laid on the perfectly dry prepared surface by torching-on method with a gas torch. All joints shall have an overlap of 75mm which shall be torch sealed. The overlap shall be done in a manner, which does not hinder water flow along the roof slope. The membrane shall be finished with bituminous base aluminium paint. The waterproofing shall be continued up to the parapet/wall for a minimum of 600mm over the finished roof surface. It shall be continued into rain water pipes by at least 100mm.

Cement Screed:

Plain cement concrete (1:2:4) of 25mm min. thickness with 24 SWG chicken wire mesh shall be laid to slope in panels not exceeding 6 m.sq. area per panel over the roof slab. The joints between panels shall be raked out neatly (after stipulated curing period) to a min. 6mm x 6mm V-groove and filled up with an approved quality sealant compound. Drain outlet shall be provided for all spouts/ rain water pipes by suitable rounding, filling and sloping of PCC. At the junction of the roof and parapet or any other vertical surface, a fillet of 75mm radius shall be formed in cement mortar (1 cement: 4 coarse sand).

A guarantee of 10 years shall be provided by the manufacturer against the performance of the finished waterproof coating.

3.6 WHITE/ COLOUR WASHING, PAINTING, POLISHING ETC.

Reference shall be made to the following Indian Standards for further information etc. not covered in the specification. In case of conflict/ contradictions provisions of the specification shall override.

Copyright EIL – All rights reserved

IS: 6278	:	Code of practice for white washing and colour washing.
IS: 2395	:	Code of practice for painting concrete, masonry and plaster surfaces.
IS: 712	:	Specification for building limes.
IS : 55	:	Specification for Ultramarine blue for paints.
IS: 63	:	Specification for whiting for paint and putty.
IS: 5411	:	Specification for plastic Emulsion paint for interior use.
IS: 2338	:	Code of practice for finishing of wood, and wood based materials.
IS: 5410	:	Cement paint, colour as required.
IS: 384	:	Brushes, paints and varnishes, flat.
IS: 486	:	Brushes, sash, tool, for paints and varnishes.
IS: 110	:	Ready mixed paint, brushing, grey filler enamels for use over primers.
IS: 426	:	Paste filler for colour coats.
IS: 345	:	Wood filler, transparent liquid.
IS: 3585	:	Ready mixed paint, alum. brushing priming water resistant for woodwork.
IS: 426	:	Paste filler for colour coats.
IS: 106	:	Ready mixed paint, brushing, priming for enamels, for use on metals.

All materials required for the execution of painting work shall be obtained direct from approved manufacturers and shall be brought to the site in makers drums, bags etc. with seals unbroken.

In case of ready mixed paints, thinning if necessary, the brand of thinner shall be as per recommendations of the manufacturer.

Paint shall be applied by brushing or spraying. Spray machine used may be of high pressure type or low pressure depending on the nature and location of work. The paint containers, when not used shall be kept close and free from air.

After the finishing of work, the adjacent surfaces not intended to be washed/ distempered/painted/polished, shall be thoroughly cleaned of all paint patches and shall be finished in accordance with surface finishing of such surfaces.

3.6.1 Oil Bound Distempering

The oil bound distempering work shall consist of:-

Preparation of surface:

The surface shall be thoroughly brushed free from dust, dirt, grease, mortar droppings, other foreign matter and shall be made smooth by sand papering. In case of distempering over existing distempered surface, the existing distempering shall be scrapped by steel scrappers leaving a clean surface. All nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with distemper of colour to be used. The surface then shall be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly. The surface affected by moss, fungus, algae, efflorescence shall be treated in accordance with IS: 2395. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water including filling up the undulation and then sand papering the same after it

Copyright EIL – All rights reserved

is dry. Scaffolding wherever required shall be erected in such a way that no part of the scaffolding shall rest against the surface to be painted.

The primer coat:

The primer coat shall be alkali resistant primer or distemper primer and shall be of the same manufacture as oil bound distemper.

Base preparation

After the Primer coat, the base preparation shall include applying two or more coatings of oil based putty in paste form made from chalk powder mixed with linseed oil, white zinc, varnish etc. as per manufacturer's recommendations. After each coat of putty, sandpapering of the surfaces shall be done.

Application of Distemper

After the base preparation coats have dried, the surface shall be lightly sand papered and dusted off avoiding rubbing off of the primer coat. The distemper shall conform to IS: 428 and shall be diluted with water or any other prescribed thinner recommended by the manufacturer. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed by immediate vertical strokes, which together shall constitute one coat. The subsequent coats shall be applied after at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks drops etc. Application of a coat in each room shall be finished in one operation.14 cm double bristled distemper brushes shall be used. After each days work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry.

Surfaces of doors, windows, floors etc. shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes.

3.6.2 Plastic Emulsion Paint

The Plastic Emulsion paint work shall consist of

Preparation of surface:

The surface shall be thoroughly brushed free from dust, dirt, grease, mortar droppings, other foreign matter and shall be made smooth by sand papering. In case of plastic emulsion paint work over existing distempered/ emulsioned surface, the existing distempering/ emulsion shall be scrapped by steel scrappers leaving a clean surface. All nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with plastic emulsion of colour to be used. The surface then shall be rubbed down again with a fine grade sand paper and made smooth. A coat of plastic emulsion shall be applied over the patches. The surface shall be allowed to dry thoroughly. The surface affected by moss, fungus, algae, efforescense shall be treated in accordance with IS: 2395. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water including filling up the undulation and then sand papering the same after it is dry. Scaffolding wherever required shall be erected in such a way that no part of the scaffolding shall rest against the surface to be painted.

The primer coat:

Copyright EIL – All rights reserved

The primer coat shall be alkali resistant primer or emulsion primer and shall be of the same manufacture as plastic emulsion paint.

Base preparation:

After the Primer coat, the base preparation shall include applying two or more coatings of oil based putty in paste form made from chalk powder mixed with linseed oil, white zinc, varnish etc. as per manufacturer's recommendations. After each coat of putty, sandpapering of the surfaces shall be done.

Application of Plastic Emulsion Paint**:**

After the base preparation coats have dried, the surface shall be lightly sand papered and dusted off avoiding rubbing off of the primer coat. The plastic emulsion paint shall conform to IS: 5411 (Part- I) and shall be diluted prescribed thinner recommended by the manufacturer. Minimum two coats of plastic emulsion paint shall be applied with brushes in horizontal strokes followed by immediate vertical strokes, which together shall constitute one coat. The subsequent coats shall be applied after at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks drops etc. Application of a coat in each room shall be finished in one operation.14 cm double bristled distemper brushes shall be used. After each days work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry.

Surfaces of doors, windows, floors etc. shall be protected from being splashed upon. Such surfaces shall be cleaned of splashes.

3.6.3 Plaster Of Paris Punning

Plaster of Paris punning shall be applied over roughened plastered surfaces. Superior quality Plaster of Paris of approved make shall be mixed with water to obtain paste like consistency and shall be applied on walls, ceiling etc. in sufficient thickness to give an absolutely smooth, plumb and straight surfaces.

3.6.4 Painting of Wood Surfaces (Synthetic Enamel Paint)

Preparation of wood surface shall conform to IS: 2338 (Part-1) in general. All woodwork shall be dry and free from any foreign matter. Nails shall be punched well below the surface. The surface shall be smoothened off with abrasive paper used across the grain prior to painting, with the grain prior to the staining. Any knots, resinous or bluish sap wood, cutting out of which is not justified shall be covered with red lead conforming to IS: 103.

Plywood and block board shall be treated in the same manner as for wood work.

Particle boards surface shall be filled with a thin brushable filler and finished as for solid wood. Painting of wood surfaces shall consist of:

Priming:

Priming shall be in accordance with IS: 2338 (Part I and II). Dirt or any other extraneous material on the surface shall be removed and the priming shall be applied by brushing. Priming shall be done on all exposed and unexposed surfaces.

Copyright EIL – All rights reserved

Unless specified otherwise all joinery work intended to be painted shall receive at least 2 coats of primer. Type of primer shall be in accordance with Table-1 and Table-2 of IS: 2338 (Part-II).

Stopping and Filling:

Stopping and filling shall be done after priming. Stopping shall be made to the consistency of stiff paste and shall be used to fill holes and cracks. Filler shall be used to level up slight irregularities of the surface. Filler shall be applied with a putty knife and subsequently rubbed down to a level surface with abrasive paper. The filler coat shall be allowed to fully flatten and harden before subsequent coat is applied.

Application of Undercoat:

Under coat shall be applied after the surface has been primed, stopped and filled, and rubbed down to a smooth surface. Under coat may be brushed or sprayed. After drying the coat shall be carefully rubbed down and wiped clean before the next coat is applied. The type of undercoat shall be depending upon the finishing and in accordance with Table 1 and Table-2 of IS: 2338 (Part II).

Finishing:

The finishing paint shall be two or more coats of synthetic enamel paint and shall be applied either by the brush or by spraying to give a uniform, smooth and glossy finish. Reference shall be made to the Table-1 and Table-2 of IS: 2338 (Part-II)

3.6.5 Painting of Steel and Other Metal Surface

Reference shall be made to IS: 2524 and IS: 1447.

The surface, before painting, shall be cleaned of all rust, scale, dirt and other foreign matter with wire brushes, steel wool, scrappers, sand paper etc. The surface shall then be wiped finally with mineral turpentine which shall then be removed of grease etc. The surface then shall be allowed to dry.

In case of GI surface, surface so prepared shall be treated with Mordant solution (5 litre for about 100 sq.m.) by rubbing the solution generously with brush. After about half an hour, the surface if required shall be retouched and washed down thoroughly with clean cold water and allowed to dry.

Approved quality primer and paint in specified numbers of coats shall be applied as per manufacturer's recommendations either by brushing or spraying. Each subsequent coat shall be applied only after the preceding coat has dried.

3.6.6 Waterproof Cement Paint

The surface shall be thoroughly cleaned of all dirt, dust, mortar dropping and other foreign matter before paint is to be applied. Surfaces already white/colour washed shall be broomed down to remove all dust, dirt, loose scales of lime wash or other foreign matters.

Scaffolding, Preparation of Surface shall be same as white wash. The surface so prepared shall be thoroughly wetted with clean water before the paint is applied.

Waterproof cement paint of approved make shall be mixed with water and stirred to obtain a thick paste, which shall then be diluted to brushable consistency. The

Copyright EIL – All rights reserved

proportion of mixture shall be as per manufacturer's recommendation. The paint shall be mixed in such quantity, which can be used up within an hour of mixing to avoid setting and thickening of the paint.

The surface shall be treated with minimum two coats of waterproof cement paint. No less than 24 hours shall be allowed between two coats and subsequent coats shall be applied only after the preceding coat has become hard to resist marking by subsequent brushing. The finished surface shall be even and uniform in shade without patches, brush marks, paint drops etc. Cement paints shall be applied with a brush with relatively short stiff hog or fibre bristles.

Curing shall be started after the paint has hardened. Curing shall be done by sprinkling with water two or three times a day. This shall be done between coats and for at least two days following the final coat.

Surfaces of doors, windows, floors etc. shall be protected from being splashed upon. Such surfaces shall be cleaned of paint splashes.

3.6.7 Textured Coating

The textured coating shall consist of twin pack fine grade wall coating system; with fine grade silica granules/ dry flakes made of special grade of china clay / granite type flakes of 'Heritage' or equivalent in approved shade and texture; mixed in-situ with 100% acrylic polymer bonding agent. The textured coating shall be applied over plastered surfaces. The granules/ flakes etc., bonding material, mixing, method of application surface preparation etc. all shall be as per manufacturer's recommendations and specifications.

3.6.8 Acrylic based Exterior Emulsion Paint

Exterior wall / surfaces shall be thoroughly cleaned of dust, loose paint and fungus with the help of wire brush, water and sandpaper. Special attention shall be paid to the top of parapets, cills and other horizontal surfaces where fungus is most likely to grow. The surface affected by moss, fungus, algae, efflorescence shall be treated in accordance with IS: 2395. All cracks shall be filled up with white cement or cement – sand mixture.
Scaffolding, preparation of surface shall be same as for water proof cement paint.

The first primer coat shall be applied on the prepared surface. Two subsequent coats shall be applied over the primer coat. Each coat shall be applied after the previous coat has dried completely. The coverage of paint and application shall be strictly as per manufacturer's specifications.

3.7 ROOFING

3.7.1 Precoated Galvanised Steel Sheet Roofing/ Cladding

The base metal of the roofing shall be Cold rolled in high tensile Galvalume Steel of 550 MPA yield stress conforming to IS:513, IS:14246 and ASTM A446 Grade E. The substrate shall have hot dip metallic coating of aluminium- zinc alloy (150 grams per sq. mtr. total on both sides, coating class AZ150 as per per ASTM A792). The bottom unexposed surface shall then be coated with alkyd backer of minimum 7 microns. Top

Copyright EIL – All rights reserved

exposed surface shall have SMP (Silicon Modified Polyester) paint system Minimum 20 microns top coat applied over 5 microns primer. The top coat shall be in specified colour.

The precoated galvalume steel sheets shall meet the following performance standards

Pencil Hardness	: F minimun
Formability	: 2-3 t
Specular Glass (60 deg) (ASTM D523)	: 20- 35%
Impact Resistance	: Greater than 10J
Salt spray test	: 750 hours
QUV-Wealterometer Test	: 1000 light hours
Humidity Test	: 1000 hours
Temperature Resistance	: 100□C
Fire performance	: Class I

The SMP coated steel sheet in standard colour under normal well washed conditions of exposure shall not show any cracking, flaking or peeling of paint film for at least 10 years. Colour change during service, determined according to ASTM D2244 should not exceed 5E hunter lab units on light colours.

The profiles shall have a depth of not less than 28mm and pitch of 190mm.Overall sheet thickness shall be minimum 0.50mm. Minimum weight of the sheet shall be 5.2 kg/ Sq.M

All roofing accessories like ridge, gutters, north light curves etc. shall be fabricated out of precoated sheet of same thickness (as for roof sheeting) and as per manufacturer's specifications. Metallic Fasteners and Fixing accessories shall be corrosion proof (polyester polymer coated). Self drilling screws/ fasteners with integral washers and EPDM seals, and nylon colour caps and joint sealants shall be provided for fixing of sheets as per approved manufacturer's specifications. Non metallic fasteners shall be of neoprene. Sealants shall be natural cure type and of cold setting variety.

Wind ties shall be of 40 mm x 6 mm flat iron section and other size as specified. These shall be fixed at the two eaves end of the sheet. Fixing shall be done with the same loose bolts which secure sheets to the purlins. Slot holes shall be cut in the wind ties to allow for temperature variations. The wind ties shall be painted with two or more coats of synthetic enamel paint of same shade as that of sheeting over a coat of approved primer.

3.7.2 C.I. Rain Water Pipes

C.I. rain water pipes shall be 100mm dia or 150mm dia (as specified/ indicated in drawings); shall conform to I.S:1729. The pipes shall be provided complete with necessary clamps, connections, bends, Tees, other accessories (as per approved manufacturers specifications) and shall be jointed with spurn yarn and cement mortar 1:2 (1 cement: 2 fine sand by volume). Embedded rain water pipes shall be suitably embedded/ encased in masonry/ cement concrete (M-20) with nominal reinforcement.

3.10.2 Plinth Protection

Copyright EIL – All rights reserved

The plinth protection shall consist of a layer (150mm thick) of compacted sand and over that 100mm thick M-20 grade concrete top layer laid to slope. The top concrete layer shall be trowel finished, cured etc. complete. The work also includes carrying out the necessary excavation, disposal of surplus earthwork etc.

3.10.3 Cinder Filling

All the sunk R.C.C slabs shall be provided with cinder filling comprising of:-

(a) Plastering the R.C.C. slab top, sides etc. with 18mm thick cement plaster 1:6 (1 cement: 6 sand by volume) mixed with approved waterproof compound @3% of cement by weight and finishing with a floating coat of neat cement slurry @ 2.75 kg. per sq. Mtr, finishing, curing etc. The work includes preparation of base surface as described in Plastering item.
(b) Filling with Cinder concrete 1:10 (1 cement : 10 cinder of 12mm and down grade) including consolidating, finishing, curing etc. complete.

3.10.4 Sealing of Expansion Joints

All expansion joints (25mm wide) of the building shall be sealed with premium grade Silicon sealant (SILPRUF of GE Silicons or equivalent) consisting of the following:-

(a) The surfaces over which it is to be applied shall be totally dried and cleaned of all dirt, oils, mortar droppings, all loose material etc. by vigorous wire brushing and wherever necessary by grinding and blast cleaning (sand or water).

(b) A backup material or joint filler tapes (as per approved manufacturers specifications) shall be fixed in the expansion joint.

(c) A coat of primer as per approved manufacturers specifications (specially developed for use with Silicon sealant material) shall then be applied over the surface.

(d) Silicon sealant shall be applied by means of cartridge- type caul gun, either hand or air pressure activated. The sealant shall be applied in a continuous operation, horizontally in one direction and vertically from bottom to top of joint opening. The sealant shall be applied in excess so that a positive pressure adequate to properly fill and seal the joint is created. The sealant shall be struck with light pressure to spread the material against the back up material and the joint surfaces properly. The sealant shall be tooled to slightly conclave surface. As the work progresses, the excessive sealant shall be removed. The masking tape shall be removed immediately after tooling. The sealant shall be cured as per approved manufacturer's recommendations.

Entire work shall be carried out as per as per approved manufacturers specifications and recommendations.

3.10.5 Anti Termite Coating

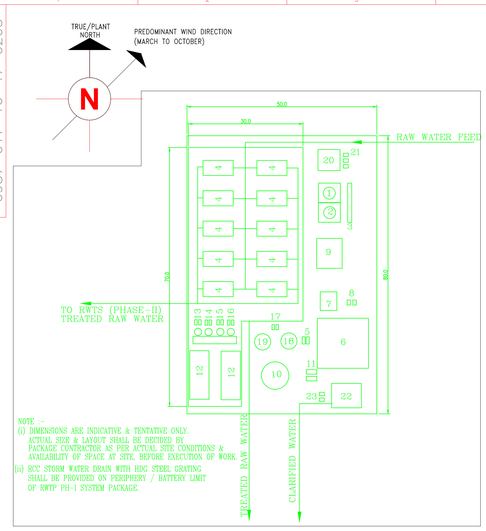
All woodwork (frames, panels etc. including hidden/ embedded portions of wooden members shall be provided with anti- termite coatings of approved quality aldrine-chlorinated phenol compound conforming to IS: 401. Three or more coats as required @ 3 Sq. Mtr. per coat per Kg. covering capacity shall be applied before applying the finishing (painting, polishing, lamination etc. as specified) coats.

Copyright EIL – All rights reserved

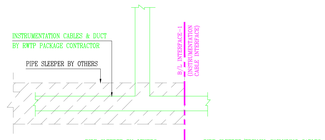
The drawing, design and details given on this format are the property of ENGINEERS INDIA LIMITED. They are merely loaned on the borrower's express agreement that they will not be reproduced, copied, distributed or used, except in the limited way permitted by a written consent given by the lender to the borrower for the intended use.

यह ड्राइंग इस प्रपत्र, तत्संबंधित विवरण के डिज़ाइन तथा अन्य जानकारी इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। ये सभी जानकारी, या इसके किसी भाग को अन्य किसी को या किसी अन्य प्रयोजन के लिए इंजीनियर्स इंडिया लिमिटेड की पूर्व लिखित सहमति के बिना प्रकाशित, पुनरुत्पादित, प्रतिलिपि किया जाना या और किसी प्रकार से उपयोग में लाया जाना पूर्णतः प्रतिबंधित है।

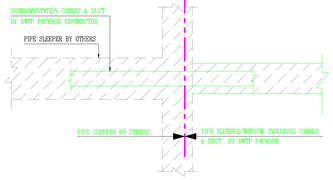
6987-017-16-47-0203



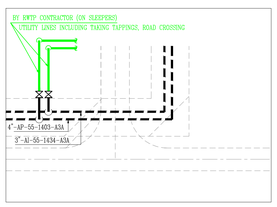
DETAIL-X
INDICATIVE EQPT. LAYOUT



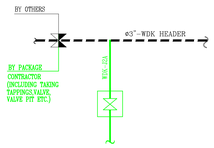
BATTERY LIMIT INTERFACE-1
(FOR INSTRUMENT CABALS & DUCT)



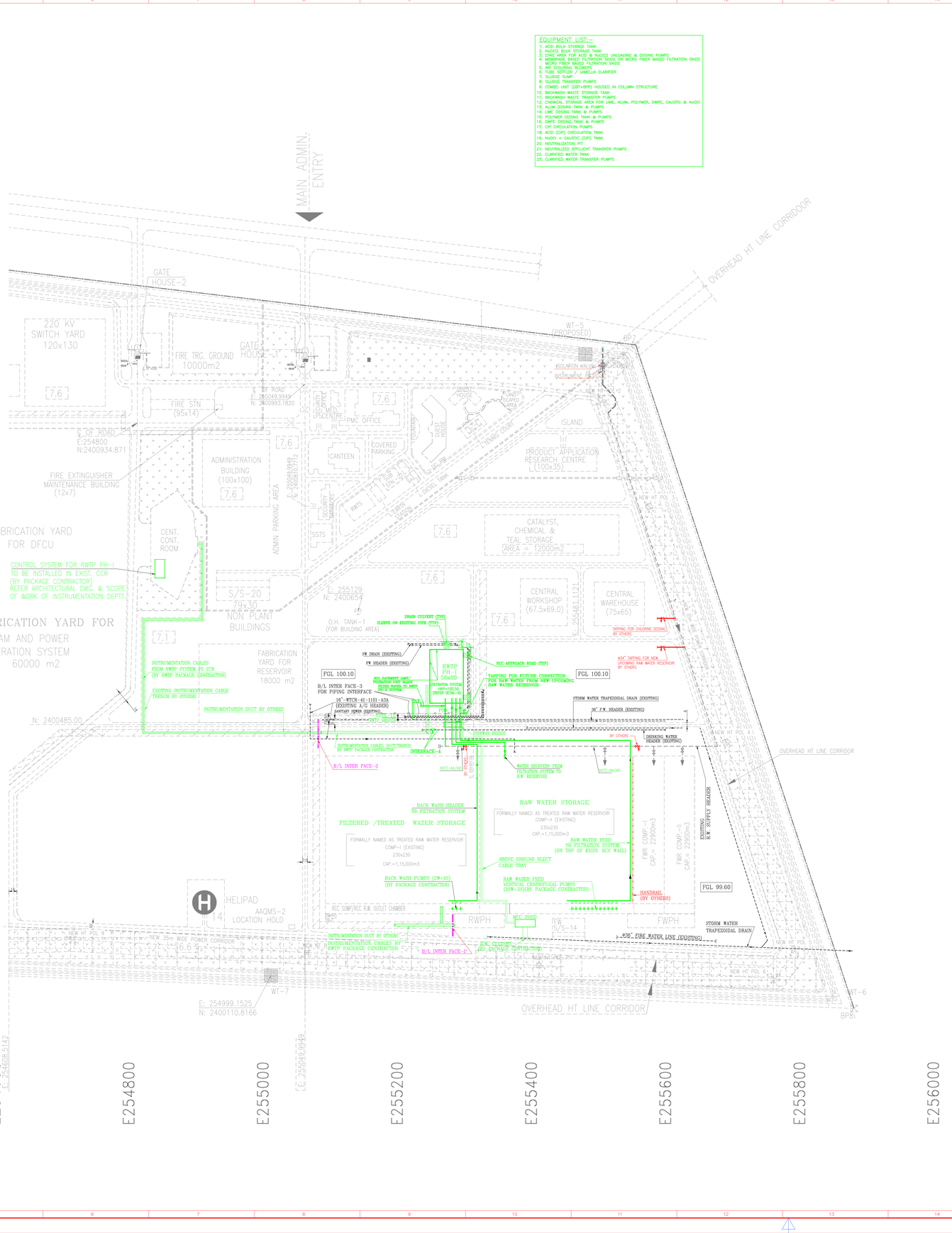
BATTERY LIMIT INTERFACE-2
(FOR INSTRUMENT CABALS & DUCT)



BATTERY LIMIT INTERFACE-3
(FOR PIPING INTERFACE)



BATTERY LIMIT INTERFACE-4 (FOR DRINKING WATER)
(THE EXACT LOCATION SHALL BE DECIDED DURING DETAILED ENGINEERING IN CONSULTATION WITH OTHER CONTRACTOR)



EQUIPMENT LIST:-

1. ACID BULK STORAGE TANK
2. NaOCl BULK STORAGE TANK
3. ACID, NaOCl & CAUSTIC DOSING UNLOADING & DOSING PUMPS
4. MEMBRANE BASED FILTRATION SKIDS OR MICRO FIBER BASED FILTRATION SKIDS
5. MICRO FIBER BASED FILTRATION SKIDS
6. AIR SCOURING BLOWERS
7. TUBE SETTLER / LAMELLA CLARIFIER
8. SLUDGE SUMP
9. SLUDGE TRANSFER PUMPS
10. COMBO UNIT (GBT+BFP) HOUSED IN COLUMN STRUCTURE
11. BACKWASH WASTE STORAGE TANK
12. BACKWASH WASTE TRANSFER PUMPS
13. CHEMICAL STORAGE AREA FOR LIME, ALUM, POLYMER, DWPE, CAUSTIC & NaOCl
14. ALUM DOSING TANK & PUMPS
15. LIME DOSING TANK & PUMPS
16. POLYMER DOSING TANK & PUMPS
17. DWPE DOSING TANK & PUMPS
18. CIP CIRCULATION PUMPS
19. ACID (CIP) CIRCULATION TANK
20. NaOCl + CAUSTIC (CIP) TANK
21. NEUTRALIZATION PIT
22. NEUTRALIZED EFFLUENT TRANSFER PUMPS
23. CLARIFIED WATER TANK
24. CLARIFIED WATER TRANSFER PUMPS

REF. DWG. NO.	REFERENCE DRAWING TITLE
6987-000-16-47-0001	OVERALL PLOT PLAN

NOTES :-

1. ALL DIMENSIONS, COORDINATES & LEVELS ARE IN METERS. UNLESS OTHERWISE SPECIFIED.
2. IN OPaL COMPLEX, LEVEL 100.00 CORRESPONDS TO LEVEL 7.50m ABOVE MEAN SEA LEVEL (MSL).
3. LEVEL SWITCH/ LEVEL TRANSMITTERS ETC. ALL LOGICS/ INTERFACES/ INSTRUMENTATIONS, CONTROLS SHALL BE PROVIDED AS PER INSTRUMENTATION AND PROCESS PHILOSOPHY OF THE PACKAGE.
4. NUMBER OF LINES & LINE SIZES SHOWN HERE ARE THE MINIMUM ONLY. PACKAGE CONTRACTOR TO CHECK & UPDATE THE LINE SIZES AS PER HYDRAULIC CALCULATIONS/ DESIGN REQUIREMENTS CONFORMING TO ALL PROCESS REQUIREMENTS.
5. LINE SIZES OF MCF (MINIMUM CIRCULATION FLOW) HEADERS SHALL BE DESIGNED AND FINALISED BY PACKAGE CONTRACTOR BASED ON MCF OF PUMPS.
6A. EXISTING Ø34" R.W. SUPPLY HEADER SHALL BE BLINDED & BLOCKED AT LOCATION WHERE RAW WATER ENTERS IN R.W. STORAGE (i.e. FORMALLY NAMED AS EXISTING TREATED R.W. RESERVOIR COMP-II) IN SUCH A WAY THAT RAW WATER SHALL NOT GO FURTHER IN TO FILTERED WATER STORAGE (i.e. FORMALLY NAMED AS EXISTING TREATED R.W. RESERVOIR COMP-I).
6B. EXISTING Ø34" RAW WATER SUPPLY HEADER SHALL BE BLINDED & BLOCKED AT LOCATION WHERE FILTERED WATER ENTERS IN TO FILTERED WATER STORAGE IN SUCH A WAY THAT FILTERED WATER SHALL NOT GO FURTHER INTO RAW WATER STORAGE.
7. ALL PIPING MATERIAL SHALL CONFORM TO APPROVED PMS ONLY. FOR U/G RAW WATER PIPE HEADER SHALL BE OF A91A PMS.
8. UNDERGROUND CS PIPES SHALL BE PROVIDED WITH CORROSION PROTECTION COATING AS PER RELEVANT SPECIFICATIONS. ABOVE GROUND PIPING SHALL BE PAINTED AS PER PAINTING SPECIFICATIONS.
9. CONTRACTOR TO PROVIDE PROPER ACCESS/PLATFORM TO OPERATE ALL VALVES, INSTRUMENTS ETC. AS PER OPERATIONAL AND FUNCTIONAL REQUIREMENTS.
10. BEFORE DETAILED ENGINEERING, PACKAGE CONTRACTOR SHALL CONDUCT SURVEY WORK FOR EXISTING TREATED R.W.RESERVOIR COMP-II, TREATED R.W. RESERVOIR COMP-I, RCC R.W. OUTLET CHAMBER/ SUMP & PH AREA. PACKAGE CONTRACTOR SHALL COLLECT ALL REQUIRED DATA/INFORMATION FOR INSTALLATION, ERECTION, EXECUTION, TESTING AND COMMISSIONING WORKS OF PUMPS, PIPING AND OTHER ASSOCIATED WORKS.
11. ALL EQUIPMENTS INCLUDING RAW WATER FEED PUMPS, BACK WASH PUMPS, PIPING & FITTING WORKS ETC. ALL COMPLETE SHALL BE PROVIDED AS PER PROCESS SPECIFICATIONS, P&ID/PFD, INDICATIVE LAYOUT, DATA SHEETS ETC.
12. ALL ROAD CROSSINGS LIKE: STORM WATER CULVERTS/SLEEVES FOR FIRE WATER HEADER & OTHER U/G CROSSINGS ACROSS APPROACH ROADS ELECT./INST. CABLE CROSSINGS TO PACKAGE FACILITIES ARE IN THE SCOPE OF PACKAGE CONTRACTOR. EVEN THOUGH THE SERVICES MAY NOT BE IN PACKAGE CONTRACTOR'S SCOPE. THE SAME SHALL BE SUITABLY DESIGNED AND PROVIDED PACKAGE CONTRACTOR.
13. ELECTRICAL CABLES (FROM MCC TO RWTP) FOR RWTP SKID ARE PROPOSED TO BE LAID IN ABOVE GROUND TRAYS, CROSSING OVER THE RESERVOIR TOP.
14. INSTRUMENTATION CABLES & DUCT (FROM RWTP SYSTEM TO CCR) AND THEIR SCOPES SHALL BE PROVIDED AS PER INSTRUMENTATION INPUT, SPECIFICATION.
15. FOR PLANT AIR / INSTRUMENT AIR, RWTP PACKAGE CONTRACTOR SHALL TAKE TAPPING FOR PLANT OF ITS OWN FROM RESPECTIVE SERVICE HEADER (OF U&O CONTRACTOR) ALONG WITH ISOLATION VALVE / BATTERY LIMIT VALVE.
16. DISCHARGE HEADER FROM EACH PUMPS (RAW WATER FEED & BACK WASH) SHALL HAVE INDIVIDUAL ISOLATION VALVE, CHECK VALVE, ALL PIPING & FITTING ETC.
17. RAW WATER FEED PUMPS, BACK WASH PUMPS SHALL BE INSTALLED ON EXISTING RCC RAW WATER OUTLET CHAMBER AS PER ALL DETAILS APPROVED BY STRUCTURAL DEPTT.
18. SCHEMATIC SCHEME DRG. (NO. 6987-017-16-47-0204) SHOWING THE CONCEPTUAL SCHEME FOR COMPLETE RAW WATER SYSTEM (i.e. RWTP PH-I SYSTEM, RWTP PH-II SYSTEM & NEW UPCOMING RAW WATER RESERVOIR SYSTEM) FOR OPaL COMPLEX IS ATTACHED FOR REFERENCE. COLORED PRINT OF THIS DRG SHALL BE REFERRED. IF THERE ARE ANY CONFLICT BETWEEN SCHEMATIC SCHEME DRG. (NO. 6987-017-16-47-0204) AND SCOPE DRG. OF RWTP PH-I DRG. (NO. 6987-017-16-47-0203) REGARDING ANY SCOPE, THEN SCOPE SHOWN IN SCOPE DRG. OF RWTP PH-I DRG. (NO. 6987-017-16-47-0203) SHALL GOVERN.
19. RCC PAVEMENT SHALL BE PROVIDED FOR APPROACH ROAD AND OTHER AREAS WITHIN SCOPE LIMIT AS PER SCOPE OF WORK, SPECIFICATIONS AND DRAWINGS INCLUDING PROPER DRAINAGE SYSTEM. RCC PAVEMENT SHALL BE PROVIDED AS PER DRG. NO. 6987-000-16-47-0029.
20. EXISTING STORM WATER DRAINS, ROADS & OTHER SERVICES, IF DAMAGED DURING CONSTRUCTION, SHALL BE RECONSTRUCTED BY PACKAGE CONTRACTOR AT ITS OWN AND SHALL RE-MAKE THEM GOOD.
21. ALL TEMPORARY APPROACHES, HARD STAND ETC. REQUIRED FOR ERECTION PURPOSE SHALL BE PROVIDED BY PACKAGE CONTRACTOR.
22. ALL RCC APPROACH ROADS TO RWTP PH-I PACKAGE SYSTEM SHALL BE DESIGNED FOR CRANE MOVEMENT & IRC CLASS AA LOADING.
23. SPILL CONTAINMENT CURB WALL WHEREVER REQUIRED SHALL BE PROVIDED AS PER REQUIREMENT.
24. STORM WATER DRAINS FROM ISBL SHALL BE CONNECTED TO THE MAIN EXISTING STORM WATER DRAINS (OSBL) BY PACKAGE CONTRACTOR.
25. WIDTH OF THE APPROACH ROAD SHALL BE MINIMUM 7.5m. (THE ACTUAL WIDTH SHALL BE AS PER DETAILED ENGINEERING). THE LOCATION OF APPROACH ROAD SHOWN HERE ARE INDICATIVE. TOTAL NO. OF APPROACH ROADS, LOCATION AND WIDTH SHALL BE DECIDED DURING DETAILED ENGG. BASED ON EQUIPMENT LAYOUT, OPERATION AND MAINTENANCE REQUIREMENT AND CONSTRUCTION / ERECTION SCHEME.
26. ENTIRE WORK SHALL BE EXECUTED AS PER BID DOCUMENT. NO DEVIATION IS ACCEPTABLE.
27. LOCATION OF BATTERY LIMIT FOR UNDERGROUND, ABOVE GROUND PIPING, CABELS ETC., SHOWN IN THIS DRAWING ARE TENTATIVE. THE EXACT LOCATIONS AND ELEVATIONS SHALL BE FINALISED DURING DETAILED ENGINEERING WHICH MAY VARY FROM PRESENT BATTERY LIMIT CONDITIONS. CONTRACTOR TO FOLLOW FINAL BATTERY LIMIT CONDITIONS, WITHOUT ANY TIME AND COST IMPLICATION. CONTRACTOR SHALL PROVIDE SERVICES AS PER REQUIREMENT WITHIN SCOPE OF WORK.
28. RAW WATER FEED LINE (FROM RAW WATER FEED PUMPS) SHOULD BE SUPPORTED ON EXISTING RCC WALL (PARTITION WALL BETWEEN TREATED RAW WATER RESERVOIR & FIRE WATER RESERVOIR) ONLY TO AVOID THE EXTRA LOADING ON RCC SLAB OF TREATED RAW WATER RESERVOIR. SUPPORTING ARRANGEMENT SHALL BE AS PER APPROVED STRL DRG.
29. THE SCOPE LIMIT OF RWTP PH-I WORKS ALSO INCLUDES ALL PIPING, ELECTRICAL, INSTRUMENTATION, MECHANICAL AND CIVIL WORKS AS SHOWN IN GREEN COLOURS CONTINUOUS LINE IN SCOPE DRG ALTHOUGH THEY ARE LOCATED OUTSIDE THE FILTRATION UNIT BLOCK.
30. FOR FACILITATE THE RWTP PH-I SYSTEM, IF THERE ARE ANY REQUIREMENT TO HOOK-UP / TIE-UP OF SERVICES WITH EXISTING RAW WATER RESERVOIR SYSTEM OR WITH EXISTING Ø34" RAW WATER HEADER, THE PACKAGE CONTRACTOR SHALL GET PRIOR APPROVAL FROM OWNER / ENGINEER IN CHARGE BEFORE THE WORK.
31. ALL PIPES OF WATER SERVICES / UTILITIES ETC. SHALL CROSS THE ROAD THROUGH SUITABLE ARRANGEMENT LIKE PIPEWAY CULVERT / PIPEWAY BRIDGE ETC.

THE WORD "PACKAGE CONTRACTOR" MEANS "RWTP PH-I PACKAGE CONTRACTOR"

FOR SUBGRADE PREPARATION OF PAVEMENT, APPROACH, GEOTECHNICAL'S RECOMMANDATION/REPORT SHALL BE FOLLOWED

LEGEND :-

- BY PACKAGE CONTRACTOR
- EXIST. FACILITIES BY OTHERS
- FT — FLOW INSTRUMENT
- CONTROL VALVE
- ISOLATION VALVE WITH SPECTACLE BLIND FLANGE ASSEMBLY (BY OTHERS ON EXISTING 34" HEADER)
- RCC APPROACH ROAD (BY PACKAGE CONTRACTOR)
- PIPE SLEEPER (BY PACKAGE CONTRACTOR)
- PIPE SLEEPER (BY OTHERS)

REV.	DATE	REVISIONS	BY	CHKD	APPD	PEMPC
D	22.07.13	COMMENTS INCORPORATED & REISSUED FOR BIDS	Anil	YKD	AK	
C	18.07.13	ISSUED FOR COMMENTS	Anil	YKD	AK	
B	19.06.13	ISSUED FOR BIDS.	SONU	NS/YKD	AK	
A	14.06.13	ISSUED FOR COMMENTS.	SR	NS/YKD	AK	

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

ONGC PETRO additions LIMITED
VADODARA, INDIA

दहेज पैट्रोकेमिकल्स कॉम्प्लेक्स | DAHEJ PETROCHEMICAL COMPLEX

SCOPE DWG. FOR GENERAL CIVIL WORKS FOR RWTP PH-1 (PART-A & PART-B) PACKAGE

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
NTS	6987	017	16	47	0203	D

3-1641-0500 REV.2 A0-1189 x 841