

TENDER DOCUMENT FOR
CONSTRUCTION OF HOSPITAL BUILDING
(MOTHER & CHILD BLOCK – NSMIMS)
AT PALATHARA, KOLLAM

CIVIL & STRUCTURAL AND MEP TENDER

CLIENT	ARCHITECT
NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES AT PALATHARA,KOLLAM	M/S ABHILASH ARCHITECTS, NEAR ART OF LIVING ASHRAMAM, THOPPILKADAVU, KOLLAM
PMC	MEP CONSULTANT
SSAN CONSALTANCY 2 nd FLOOR,No.F, CCHCS, YMCA CROSS ROAD, CALICUT-673 001	BHAVANI 31/1342D, LAL SALAM ROAD PONNURUNNI, VYTILLA. P.O. COHIN-682 019

ANNEXURE I

TENDER NOTICE AND DOCUMENT

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NOTICE INVITING TENDER

No :

Dated:

Competitive Sealed item-rate tenders are invited by the undersigned for and on behalf of **NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES , PALATHARA, KOLLAM** in two separate sealed covers with the following headings superscribed on them **Prequalification Documents for Proposed Hospital Project At Palathara, Kollam “Priced Tender for Proposed Hospital Project at Palathara, Kollam”** from eligible Civil work contractors with necessary expertise in Civil works and necessary financial resources, so as to reach the undersigned on or before the time and date specified below. The details regarding the work may be obtained from office of the Project Management Consultants or **M/s NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES, N.H bypass, Palathara, Kollam - 691 577**

- | | |
|---|--|
| 1. Name of work | : CONSTRUCTION OF HOSPITAL BUILDING |
| 2. Proposed Contract Value | : 14 crores (excluding GST) |
| 3. Cost of Tender Document | : ₹ 5,000 + 18% GST |
| 4. Location of work | : Palathara, Kollam |
| 5. Period of Completion of work | : 1 year (365 days) |
| 6. Last Date & Time of receipt of Tender | : 15 th November, 2021 (11 am) |
| 7. Earnest Money Deposit (EMD) | : ₹ 20,00,000 |
| 8. Date of opening Tender (Technical Bid) | : 15 th November, 2021 (2 pm) |
| 9. Pre Bid Meeting | : |

Prequalification Criteria - Documents Required (Documentary Proof to be submitted)

1. The tenderer should have an annual turnover of Rs 10 crores each in the previous three financial years
2. The tenderer should have completed at least one single Civil & MEP Contract of Rs 15 Crores during the previous three financial years (completion certificate required)
3. Earnest Money Deposit for Rs 20,00,000./- (DD in favour of Client)
4. Bio data of the Partners / Directors, key personnel along with details regarding the works executed during last 5 years
5. Audited balance sheet of the firm for the previous financial year.

On the Date of opening the cover containing technical bids will be opened and Bid security submitted will be verified. The list of bidders who submitted bids will be announced through a Minutes of meeting. The evaluation of bids will be conducted later.

EMD's of unsuccessful tenderers shall be returned within a week of opening of the tender and that of the successful tenderer on issuance of the work order

The undersigned reserves the right to reject any or all tenders without assigning any reasons thereof.

Pre-Qualification Criteria - Documents Required (For MEP sub-contractors) – To be included along with the Pre qualification documents of Principal Contractor

Principal Contractor should submit their list of MEP subcontractors and the same approved by Client/Architect/Consultant during the PQ stage / bid negotiation stage. The MEP subcontractors nominated by the Principal Contractor shall have the minimum Prequalification criteria - Minimum three similar sized completed works (shopping malls, hospitals, four star or above rated hotels); each MEP services costing not less than the amount equal to **INR 1,00,00,000**. Bidder should be a profit-making firm and should not have made losses in the last two financial years out of last five financial years. Bidders should submit completion certificate/testimonial of above said works to client or client's representative, architect or consultant for approval. Client or client's representative reserves the right to verify the authenticity of the documents submitted by the contractors. Client or client's representative also reserve the right to reject any or all application, split the work and cancel the process without assigning any whatsoever reason may be. Even though the bidders meet the above qualifying criteria, they are liable to be disqualified if they have

- Made misleading or false representation in the forms, statements and attachments in proof of the qualification requirements
- Records of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history or financial failures etc.

Part I- INSTRUCTIONS TO THE BIDDERS

1. GENERAL

1.1. Scope of the Bid

1.1.1. NS MEMORIAL INSTITUTE OF MEDICAL SCIENCE Invites bids from Contractors registered with Kerala Public Works Department or Central PWD or Other Central or State Government Departments or State or Central Public Sector Undertakings or other registered company etc. for the Work detailed in the Notice Inviting Tender (NIT).

1.1.2. Throughout these bidding documents:

- a) The terms 'in writing' means communicated in written form and delivered against receipt;
- b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and any reference to masculine gender shall whenever required include feminine gender and vice versa
- c) "Day" means calendar day.
- d) The terms "bid" and "tender" and their derivatives "Bidder/tenderer, bid/tender, bidding/tendering etc.," are synonymous.
- e) The term "Employer" shall mean NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES, PALATHARA, KOLLAM. Employer will carry out its functions and obligations through appointed officers who have been delegated powers for the same.
- f) The "Tender Inviting Authority", "Accepting Authority" and the "Agreement Authority" mean the authority who has invited and received bids for the Work and has executed agreement for execution on behalf of the Employer. The Tender Inviting Authority, Accepting Authority and the Agreement Authority shall be one and the same unless otherwise specified.
- g) "Contract Price" means price approved by the Employer after bidding and stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.
- h) The bid invited shall be of item rate contract.

1.2. Eligible Bidders

- 1.2.1. A Bidder shall be a registered contractor with Kerala Public Works Department or Central PWD or Other Central or State Government Departments or State or Central Public Sector Undertakings, or a limited company / proprietorship having registered office in Kerala. etc. in the required category as specified in the NIT.
- 1.2.2. The Bidder shall have successfully completed at least one similar work costing more than 15 cores described in the NIT during the last three years. A certificate to this effect from the agreement executing authority of the completed similar shall invariably be submitted along with the tender documents failing which the tenders will not be accepted. The certificate should contain the details such as name of work, agreement number, estimated cost, Contract Price, date of start and completion as per agreement, completed amount of work etc.
- 1.2.3. The bidder should have a minimum annual turnover of Rs 5 Crores in the three previous years.
- 1.2.4. For the specialized work (MEP) the bidder can associated with experienced Sub Contractor having experience in the 3 similar size projects (Shopping Malls, Hospitals, Four star hotels) each MEP service costing not less than Rs. 1,00,00,000/- (ONE Crores). Sub- contractor experiencers will be also considered for evaluation.

- 1.2.5. Bidder should have a profit-making firm for the last three financial years.
- 1.2.6. Only those Bidders having a valid and active registration, on the date of bid submission, shall submit Bids.
- 1.2.7. Ineligible Bidder or Bidders who do not possess valid & active registration, on the date of bid submission, are strictly advised to refrain themselves from participating in this tender.
- 1.2.8. **In addition to the eligibility criteria detailed in the Notice Inviting Tender (NIT), eligibility criteria detailed in the Prequalification document shall apply for evaluation for pre-qualification. The Price bids of prequalified Bidders shall only be opened.**
- 1.2.9. A firm/Bidder shall submit only one bid in the same bidding process, either individually as a Bidder or as a partner in a joint venture or consortium. A Bidder (either as a firm or as an individual or as a partner of a firm) who submits or participates in more than one bid will cause all the proposals in which the Bidder has participated to be disqualified.
- 1.2.10. Joint ventures, Consortium Partnership firms of two or more registered contractors are permitted subjected to the conditions set out in the prequalification criteria.
- 1.2.11. The Bidder shall bear all costs associated with the preparation & submission of its bid and site visits, and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

1.3. Site visit

- 1.3.1. The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. He shall examine the site condition and satisfy himself of the availability of materials at nearby places, difficulties which may arise during execution before submitting the bids. The costs of visiting the Site shall be at the Bidder's own expense.

2. BIDDING DOCUMENT

2.1. Content of Bidding Documents

- 2.1.1. The bidding documents shall consist of the following unless otherwise specified
 - a) Notice Inviting Tender (NIT)
 - b) Instructions to Bidders
 - c) General and special Conditions of Contract
 - d) Technical Specifications
 - e) Form of Bid, Appendix to Bid, agreement format
 - f) Bill of Quantities
 - g) Drawings
- 2.1.2. The Bidder is expected to examine carefully all instructions, Conditions of Contract, Contract Data, Forms, Terms, Technical Specifications, Bill of Quantities, Annexure and Drawings in the Bid Document. Failure to comply with the requirements of Bid Document shall be at the Bidder's own risk.

2.2. Clarification of Bidding Documents and Prebid meeting

- 2.2.1. A prospective Bidder requiring any clarification of the bidding documents shall contact the office of the Tendering Authority on any working day between 10 am and 5pm.
- 2.2.2. In case the clarification sought necessitates modification of the bid documents, being unavoidable, the Tender Inviting Authority may affect the required modification and inform the bidder through, corrigendum in pursuance to clause 2.3 of this bid document. Meeting to answer questions received late, but questions and responses will be transmitted in accordance with the following:

- a) Minutes of the meeting including the text of the questions raised and the responses given together with any responses prepared after the meeting will be published and intimated as corrigendum.
- b) Any modification of the tender documents which may become necessary as a result of the pre-bid meeting shall be made by the Tender Inviting Authority exclusively through the issue of an addendum
- c) Nonattendance at the pre-bid meeting will not be cause for disqualification of a Bidder.
- d) Nonattendance at the pre-bid meeting will not be cause for escape from any bid requirements whatsoever.

2.2.3. A Pre-Bid Meeting shall be conducted

2.3. Amendment to bidding documents

- 2.3.1. Before the deadline for submission of bids, the Tender Inviting Authority may modify the bidding document by issuing addendum.
- 2.3.2. Any addendum thus issued shall be a part of the bidding documents. If the addendum thus published does involves major changes in the scope of work, the Tender Inviting Authority may at his own discretion, extend the deadline for submission of bids for a suitable period to enable prospective Bidders to take reasonable time for bid preparation taking into account the addendum published.

3. PREPARATION OF BID

3.1. Language of the Bid

- 3.1.1. All documents relating to the bid shall be in the English language.

3.2. Documents Comprising the Bid

3.2.1. The bid submitted by the Bidder shall comprise the following

- a) **Bid Security.**
- b) **Duly filled-complete Bid document with all the required certificates copies in the appropriate covers as required in the Bid**
- c) **Copy of Registration Certificate, experience certificates, Bank certificates etc. duly attested.**
- d) **Priced Bill of Quantities (inclusive of GST)**
- 3.2.2. The relevant CPWD/MoRTH specifications, ASTM and other relevant codes, BIS/IS codes, relevant sections of the National Building Code, shall be considered as part of this bid documents though individual copies are not attached along with the bid documents.
- 3.2.3. Bidders shall not make any addition, deletion or correction in any of the bid documents. If tampering of documents is noticed during tender evaluation, the bid will be rejected.
- 3.2.4. **The EMD, PQ documents, and financial Bid shall be in three independent sealed covers.**

3.3. Bid Prices

- 3.3.1. The Bidder shall bid for the whole work as described in the Bill of Quantities.
- 3.3.2. For item rate tenders, the Bidder shall fill in rates in figures and should not leave any cell blank. The line item total in words and figures.
In the price BOQ, for some items provided with 'RO', the bidder shall quote rate only, that rate quoted shall not be considered for evaluation purpose. Contractor has to operate such

- items if required during the execution as per the direction of Engineer in charge.
- 3.3.3. **The rates quoted by the Bidder shall include cost of all materials and conveyance, labour charges, scaffolding hire charges of plant and machinery, overheads and all incidental charges for execution of the contract. The rate quoted shall also include all statutory taxes as on the date of submission of the tender and such taxes shall be paid by the contractor.**
- 3.3.4. **The quoted rates shall also include expenses towards all Quality Control tests prescribed as per the relevant codes and practices.**
- 3.3.5. All taxes including GST shall be payable by the Contractor in respect of this. However, in respect of GST, wherever legally applicable the same shall be paid by the contractor to the concerned department on demand and it will be reimbursed to him by the Employer on production of receipts/vouchers and after satisfying that it has been actually and genuinely paid by the contractor.
- 3.3.6. All taxes, royalty, octroi and other levies payable by the contractor under the contract, or for any other cause as of the date 28 days prior to the deadline for submission of bids shall be included in the rates, prices and total of bid price quoted by the contractor. The bid prices shall also cater for any change in tax pattern during the tenure of work. No material will be issued by the employer for executing the building works under this contract. The rates and prices quoted by the Bidder shall remain firm during the entire period of contract.

3.5. Bid Validity

- 3.5.1. Bids shall remain valid for the period of 120 (one hundred and twenty) days from the date of opening of the Price Bid. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.
- 3.5.2. In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request the Bidders to extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing or by e mail. A Bidder may refuse the request without forfeiting his bid security. A Bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of his bid security for the period of the extension and in compliance with Clause 3.6 in all respects

3.6. Bid Security

- 3.6.1. The Bidder shall furnish, as part of his Bid, a Bid Security for an amount as detailed in the Notice Inviting Tender (NIT).
- 3.6.2. The Bid Security of the unsuccessful Bidder shall become refundable as promptly as possible after finalization of the tender as per clause 3.6.3.
- 3.6.3. The Bid Security of the successful Bidder will be discharged when the Bidder has furnished the required Performance Guarantee and signed the agreement. The Bid Security may be forfeited:
- a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity including extended period of validity; or
 - b) if any modification is affected to the tender documents or
 - c) In the case of a successful Bidder, if the Bidder fails within the specified time limit to Sign the Agreement or Furnish the required Performance Guarantee or the Bid Security deposited with the Employer will not carry any interest.

3.7. Alterations and additions

- 3.7.1. The bid shall contain no alterations or additions, except those to comply with instructions issued by Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

- 3.7.2. The bidder shall not attach any conditions of his own to the bid. The tender price must be based on the tender documents. **The bidder is not required to present alternative construction options and he shall use without exception the Bills of Quantities as provided, with the amendments as notified in tender notices, if any, for the calculation of his tender price. Any bidder who fails to comply with this clause will be disqualified.**

4. SUBMISSION OF BID

- 4.1.** All documents of the Bid as required shall be typed or written in indelible ink and shall be signed by the Bidder or person duly authorized to sign on behalf of the Bidder.
- 4.2.** In the event of the tender being submitted by a partnership firm or joint venture/consortium, it must be signed by the lead partner holding a valid power-of attorney authorizing him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act,1952.
- 4.3.** Technical Bid-
- 4.3.1.** Attested Copy of the Bidder's valid registration certificate in Kerala PWD, CPWD or other approved agencies.
- 4.3.2.** Duly filled and signed copy of bid submission letter as per item no-1 Part-VII of this bid document
- 4.3.3.** Copies of experience certificates attested by a Gazetted Officer or notarized to prove the similar work experience as per clause 2.4 of section-6 of bid document. Copy of Bank certificate to prove the available credit limit and proof for liquid cash asset to verify the working capital requirement as per clause 2.6 of Part-VI of bid document.
- 4.3.4.** If the bid is being submitted as join venture/consortium/partnership of two or more firms, copy of Memorandum of understanding as per item no-8 of Part-VII of this bid document. In this case a valid power of attorney in the name of lead partner signed by all partners authorizing the lead partner to submit bid, enter into correspondence with the Tender Inviting Authority, file and defend law suits and any other relevant matters shall be submitted.
- 4.3.5.** Duly filled and signed pre-qualification information in the section-VI of this bid document with copies of all testimonials as required in this section.
- 4.3.6.** Any other relevant information with testimonials
- 4.3.7.** The Bidder must attach the scanned copy of the recent income tax return statement filed by the Bidder before the appropriate Income Tax. The Bidder shall produce the necessary income tax documents, if required by the employer for verification.
- 4.3.8.** Price bid
- a) This shall contain only the duly filled BOQ-file in MS-Excel format and shall be submitted in a separate sealed cover.**
- 4.4.** This whole set of certificates and documents shall be submitted to the Tender Inviting Authority's office address (as given in the NIT) by registered post/Speed post of India Post in such a way that it shall be delivered to the office before the deadline of bid submission date. The Tender Inviting Authority reserves the right to reject any bid, for which the above details are not received before the date and time fixed for the opening of technical bid.
- 4.5. Deadline for Submission of the Bids**
- 4.5.1.** The Bidder will not be able to submit his bid after expiry of the date and time of submission of bid.
- 4.6. Modification, Re submission and Withdrawal of Bids**
- 4.6.1.** Re submission or modification of bid by the Bidders for any number of times before the date and time of submission of Bid is allowed. The Bidder can withdraw his/her bid before the date and time of receipt of the bid.

5. BID OPENING AND EVALUATION

5.1. Bid Opening

- 5.1.1. Bids shall be opened on the specified date & time, by the tender inviting authority or his authorized representative in the presence of Bidders or their designated representatives who choose to attend.
- 5.1.2. Opening of bids shall be carried out in the same order as it is occurring in invitation of bids or as in order of receipt of bids. Bidders are not required to be present during the bid opening at the opening location if they so desire.
- 5.1.3. In the event of the specified date of bid opening being declared a holiday for the Employer, the bids will be opened at the same time on the next working day

5.2. Confidentiality

- 5.2.1. Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award has been announced in favour of the successful Bidder.
- 5.2.2. Any effort by a Bidder to influence the Employer during processing of bids, evaluation, bid comparison or award decisions shall be treated as Corrupt & Fraudulent Practices, mentioned under Clause 9 of this ITB and may result in the rejection of the Bidders 'bid.

5.3. Clarification of Bids

- 5.3.1. To assist in the examination, evaluation, and comparison of bids, and qualification of the Bidders; the Tender Inviting Authority may ask the Bidder for required clarification on the information submitted with the bid. The request for clarification and the response shall be in writing or by e-mail, but no change in the price or substance of the Bid shall be sought, offered, or permitted.
- 5.3.2. Subject to clause 5.3.1, no Bidder shall contact the Tender Inviting Authority on any matter relating to the submitted bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Tender Inviting Authority, it shall do so in writing.
 - Examination of Bids, and Determination of Responsiveness During the detailed evaluation of Technical Bid, the Tender Inviting Authority will determine for each Bid
 - a. meets the eligibility criteria as required in the NIT;
 - b. meets the qualification criteria in accordance with the provision of NIT; and
 - c. Is accompanied by the required bid submission fee/ bid security and the required documents and certificates.
- 5.3.3. A substantially responsive bid is one which conforms to all the terms, conditions, and requirements of the bidding documents, without material deviation or reservation. A material deviation or reservation is one
 - a. which affects in any substantial way the scope, quality, or performance of the Works;
 - b. Which limits in any substantial way, inconsistent with the bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or
 - c. Whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids
- 5.3.4. If a Bid is not substantially responsive, it may be rejected by the Tender Inviting Authority, and may not subsequently be made responsive by correction or withdrawal of the nonconforming material deviation or reservation.

- 5.3.5. Non-submission of legible or required documents or evidences may render the bid on-responsive.
- 5.3.6. The Technical evaluation of all the bids shall be carried out as per information furnished by Bidders. The Tender Inviting Authority will evaluate bid and finalize list of responsive Bidders.
- 5.3.7. The Price Bids of the technically responsive and pre-qualified Bidders shall only be opened. At the time of opening of "Price Bid", Bidders, whose Technical Bids were found responsive, can be present, if they desire so.
- 5.3.8. The Tender Inviting Authority shall resort to any negotiation on the Bids submitted by the responsive Bidders. The rates quoted by the Bidders are not final and can be changed during negotiation if the employer desires so.

PART II - GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

- 1.1. Employer means NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES. On whose behalf the Work is taken up for execution. Employer will carry out its functions and obligations through officers who have been delegated powers.
- 1.2. Accepting Authority/Agreement Authority means the officer who has invited and received bids for the Work and has executed agreement for execution on behalf of the Employer.
- 1.3. Engineer means the authorized officer who have been delegated powers by the employer for supervising the work assigned.
- 1.4. Engineer's Representative means Overseer or other subordinate staff posted to assist the Engineer, supervise execution and to maintain documents.
- 1.5. Contract is the agreement between the Agreement Authority and the selected Bidder to execute, complete and maintain the Work.
- 1.6. Contractor means person or persons or firms who have entered into contract for the execution of the work subject to the eligibility conditions of the NIT.
- 1.7. Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provision of the contract.
- 1.8. Contract Data defines the documents and other information which comprise the contract.
- 1.9. Bid or Tender means the Contractor's priced offer to the Employer for the execution and completion of the Work and the remedying of any defects therein in accordance with the provisions of Contract.
- 1.10. Bill of Quantities means the priced and completed Bill of Quantities forming part of the bid.
- 1.11. Specification means the instructions, provisions, conditions and detailed requirements contained in the tender documents which form part of the contract and any modification or addition made or approved by the Accepting Authority.
- 1.12. Drawings means all drawings, calculations and technical information related to the Work provided by the Engineer from time to time to the Contractor under the Contract.
- 1.13. Letter of Acceptance or selection notice means intimation issued by the Accepting Authority as formal acceptance of Bid by the Employer.
- 1.14. Date of commencement means the date of handing over the site to the Contractor.
- 1.15. Time of completion means the period allowed for completing all works related to the Work including carrying out and passing the required quality control tests prescribed.
- 1.16. Date of completion shall be the date of issue of virtual completion certificate. The virtual completion certificate shall be issued by the Engineer- in charge within 15 days of the final measurement and shall specify the work has been completed satisfactorily by the contractor and taken over by the Department. In case of defects liability period the works shall be finally taken over after completion of defects liability period.
- 1.17. Quality control tests means all relevant tests prescribed by the respective code and manual applicable to the Work which are to be made and passed before each part bill is presented for payment.
- 1.18. A Defect is any part of the work not completed in accordance with the contract.
- 1.19. Defects Liability Period is the period named in the Contract Data and calculated from the date of completion.
- 1.20. Plant is any integral part of the works which is to have a mechanical, electrical, electronic or biological function.
- 1.21. Equipment means contractor's machinery and vehicles brought temporarily to site for execution of the Work.
- 1.22. Site means the places provided by the Employer where the Work is to be executed. It may also include any other place or places as forming part of the site, mentioned in the

Contract.

- 1.23. Materials means all supplies, including consumables used by the contractor for incorporation in the works
- 1.24. Works are what the Contract requires the contractor to construct, install and run over to the Employer as defined in Contract Data.
- 1.25. Days are calendar days, month's calendar months.
- 1.26. "Codes" shall mean the following, including the latest amendments, and/or replacements, if any:
 - a. Bureau of Indian Standards/National building code Indian Roads Congress relevant to the works under the Contract and their specifications. If Indian Standards are not available British Standards or AASHTO Standards are to be followed.
 - b. Other Internationally approved Standards and/or rules and regulations touching the subject matter of the Contract.
 - c. Any other laws, rules, regulations and Acts applicable in India with respect to labour, safety, compensation, insurance etc.
- 1.27. Words importing singular only shall also include the plural and vice- versa where the context so requires.
- 1.28. Words importing "Person" shall include firms, companies, corporations, and associations or bodies of individuals, whether incorporated or not.
- 1.29. Terms and expressions, not defined herein, shall have the same meaning as are assigned to them in the Indian Contract Act, and failing that in the General Clauses Act.
- 1.30. "Government Approvals" shall mean all permits, licenses, authorizations, consents, clearances, decrees, waivers, privileges, approvals from and filing with government instrumentalists necessary for the development, construction and operation of the Work.
- 1.31. Measurement Books: The "measurement books" shall be defined as the books with serially numbered and maintained during the currency of the Work to record all measurements qualifying for payment approved by the Engineer. Except for quantities of work paid on level basis, all measurements shall be recorded in the measurement book. For measurements taken on level basis, the levels shall be entered in properly numbered field books.

2. SCOPE, EXTENT, INTENT

- 2.1. Scope: Construction of NS Memorial Institute of Medical Sciences Project including civil, electrical and MEP works, as described in more detail in the accompanying drawings, specifications, schedule and contract documents
- 2.2. Extent: The Contractor shall carry out and complete the Work under the Contract in every respect, and his work shall include the supply of all labour, equipment, materials, plant and machinery, tools, transportation, form work, scaffolding and everything else necessary for the proper execution and completion of the Work in accordance with the Contract Documents and to the satisfaction of the Engineer-in charge. The Contractor shall be fully responsible and liable for everything and all matters in connection with or arising out of or being a result or consequence of his carrying out or omitting to carry out any part of the Work. Where any parts of the Work may be executed by Sub- Contractors, such responsibility and liability of the Contractor shall cover and extend to the work of all such Sub-Contractors.
- 2.3. Intent: The Contract Documents are complementary and what is called for by any one shall be binding as if called for by all. Wherever it is mentioned in the Contract Documents that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost. Materials or work described in words which so applied have a well- known technical or trade meaning shall be held to refer to such recognized standards as are applicable.

3. SITE

- 3.1. Contractor to satisfy himself about site conditions: The Contractor ensures that before submitting bids for the Work the Contractor has visited the Site and satisfied himself about the Site conditions for construction and for logistics and smooth flow of workmen and materials as well as permission from Authorities for this purpose. The Contractor has examined the Site and taken note of character of the soil and of the excavations, the correct dimensions of the Work, and facilities for obtaining any special articles called for in the Contract Documents. The Contractor has also made its own assessment and obtained all information on the Site constraints and on all matters that will affect the execution, continuation and progress, and completion of the Works. Any extra claims or extension of time made in of any misunderstanding, incorrect information on any of these points or on the grounds of insufficient description or information shall not be entertained or allowed at any stage.
- 3.2. Access to site by the contractor: The access to the Site will be shown immediately on award of the Contract to the Contractor and the Site shall be shared with other Contractors and Sub-Contractors as applicable. The Contractor shall upon being given such access commence the Work and diligently proceed with the execution of the Work in accordance with the Contract Documents. Access to the Site by the Contractor shall be merely a license for carrying out the construction of the Work under the Contract, and the Contractor shall not by his being allowed such entry on the Site, acquire any right, lien or interest either in the Work carried out by him under the Contract or anything appurtenant or attached thereto or to any part of the Site, and his claim will only be in the nature of money found due and payable to him in accordance with the certificates issued by the Engineer-in-charge under the provisions contained herein. The Work shall be free from all liens, charges or claims of whatsoever nature from any party other than the Engineer-in charge. The Engineer-in-charge shall have a lien over all work performed by the Contractor, Sub-Contractors and Vendors and also for the materials and equipment brought on Site by them.
- 3.3. The Employer does not undertake to construct or make available any approach road or other means of approach to the proposed work site and the Contractor shall get acquainted with the available means of approaches to the proposed site and quote for the various items. The Employer shall not be liable for any claim raised later on the plea of non-availability or non-access to the site.
- 3.4. The proposed construction site is very actively functioning hospital. The contractor has to ensure protective measures with 3m height MS sheet fabricated metal screen totally around the site
- 3.5. No part of the construction should be visible till 3m height

4. NATURE OF CONTRACT

- 4.1. The Contract shall be an item rate Contract wherein the item rates are for the finished work as per the Contract Documents. The estimated cost is tentative based on the estimated quantities and is liable to change during execution as per the actual quantities executed and approved by the Engineer-in charge. The Contractor understands and agrees that the amount payable is assessed on a re-measurable basis in accordance with the BOQ rates. The Contract Price shall include payment for the supply of all labour (including payment to his Sub-Contractors), equipment, materials, plant and machinery, tools, transportation, formwork, scaffolding, works under this contract and all applicable taxes , duties, octroi, levies, royalties, fees, insurance premiums, contributions towards employees benefits including Employee State Insurance and Provident Funds, arrangement of power and water and all services and activities constituting the Scope of Work defined in the General Conditions of Contract. The

- Contract Price shall also include the Contractor's establishment, infrastructure, overheads & profits, establishing site laboratories, first tier quality control tests, Providing site officer facilities for the Engineer and their staff rectifications including that necessitate during the course of work and all other charges, and shall generally be inclusive of every cost and expense required by the Contract to be borne by the Contractor and necessary for the proper execution and completion of the Work under the Contract, in conformity with the Contract Documents and according to the best engineering and construction practices and to the satisfaction of the Engineer-in-charge. Goods and Service tax, wherever legally applicable, shall be paid by the contractor to the concerned department on demand and it will be reimbursed to him by the Employer on production of receipts/vouchers and after satisfying that it has been actually and genuinely paid by the contractor.
- 4.2. No adjustment of the prices shall be allowed during the period of the contract unless otherwise stated.
- 4.3. The basic price of cement and steel shall be Rs:-470 per bag of cement and Rs: - 75000 per MT of steel. Price fluctuation up to 15% of the basic rate shall be to the contractors' account. In case of variation above 15%, the excess over and above the 15% shall be reimbursed to the contractor. Proper records (Invoice copies) have to be produced to the engineer-in-charge for substantiating any claims on this account. In case of negative variation, the variation beyond 15%, the Contractor will have to reimburse to the client. No other claims for price escalation will be entertained and the rates shall remain firm until completion of the work.

5. NOTICES, FEES, BYELAWS, REGULATIONS etc.

- 5.1. The Contractor shall comply with all applicable laws and Government Acts including the Bye laws or regulations of Central and / or Local Authorities relating to the Work in so far as labour, construction, fabrication and installation activities are concerned, and he shall obtain from the Central and / or Local Authorities all permissions and approvals required for the plying of trucks, construction machinery etc., and also for construction of temporary offices, labour camps, batching plant, base camp, stores and other temporary structures in connection with the Work, and the Contractor shall give all notices and pay all fees and charges that are and that can be demanded by law thereunder. In the Contract Price for the Work, the Contractor shall allow for such compliance and work, and for the giving of all such notices, and shall include the payment of all such fees and charges.

6. LICENSES AND PERMITS

- 6.1. The Contractor shall directly obtain all licenses and permits for the materials under Government control, and those required to be obtained by the Contractor for the execution of the Work. The Contract Price shall include all transportation charges and the other expenses that may be incurred in this connection.

7. CONTRACT DOCUMENT

- 7.1. The following documents shall constitute the Contract documents:
- Articles of Agreement,
 - Notice Inviting Tender
 - Letter of Acceptance of Tender indicating deviations, if any, from the conditions of Contract incorporated in the Tender document issued to the Bidder and/or the Bid submitted by the Bidder,
 - Conditions of Contract, including general terms and conditions, instructions to Bidders, additional terms and conditions, technical terms and conditions, , special conditions, if any etc. forming part of the Agreement,
 - Specifications, where it is part of Tender Documents,

- f. Scope of works/Bills of quantities/schedule of works/quantities and
 - g. Contract Drawings and finalized work program.
- 7.2. After acceptance of Tender the Contractor shall be deemed to have carefully examined all Contract Documents to his satisfaction. If he shall have any doubt as to the meaning of any portion of the Contract Documents, he shall before signing the Contract, set forth the particulars thereof, and submit them to the Agreement Authority in writing in order that such doubt may be removed. The Agreement Authority will provide such clarifications as may be necessary in writing to the Contractor. Any information otherwise obtained from the Employer or the Engineer shall not in any way relieve the Contractor of his responsibility to fulfil his obligations under the Contract.
- 7.3. The Contractor shall enter into a Contract Agreement with the Agreement Authority within 28 (twenty-eight) working days from the date of 'Acceptance of Tender' or within such extended time as may be granted by the Employer. The date of dispatch of Letter of Acceptance by registered post shall be the date of Acceptance of Tender. The performance Guarantee for the proper fulfillment of the Contract shall be furnished by the contractor in the prescribed form within 28 (twenty- eight) days of 'Acceptance of Tender'. The performance Guarantee shall be as per terms prescribed in the clause 7 of "Instructions to Bidders" of this Tender.
- 7.4. The agreement, unless otherwise agreed to, shall be signed within 28 (twenty-eight) working days from the date of Acceptance of Tender, at the office of the Agreement Authority on a date and time to be mutually agreed. The Contractor shall provide required details for signing of the contract like performance guarantee in copies as required, appropriate power of attorney and other requisite materials. In case it is agreed mutually that the contract is to be signed beyond the stipulated time as specified, the bid security submitted with the tender will have to be extended accordingly.
- 7.5. After the signing of the agreement with the Agreement Authority and the Contractor, two certified copies of the agreement are to be made. Original shall be kept with the Agreement authority and the Contractor shall be provided with one certified copy and the other certified copy shall be kept with the Engineer-in Charge. None of these documents shall be used for any purpose other than this Contract and the Contractor shall ensure that all persons employed for this Contract strictly adhere to this.
- 7.6. The laws applicable to this Contract shall be the laws in force in India.

8. ASSIGNMENT AND SUBLETTING OF CONTRACT

- 8.1. The Contractor shall not assign this Contract. The Contractor shall not sub-let the Contract or any part thereof other than for supply of raw materials, for minor works or any special type of works for which makes are identified in the Contract or as approved by the Engineer-in charge. Suppliers of the equipment not identified in the Contract or any change in the identified supplier shall be subject to approval by the Engineer. The experience list of such equipment vendors under consideration by the Contractor for this Contract shall be furnished to the Engineer for approval prior to procurement of all such items/equipment. Such assignment /sub-letting shall not relieve the Contractor from any obligation, duty or responsibility under the Contract. Any assignment as above without prior written approval of Engineer-in charge shall be void.

9. PATENT RIGHTS AND ROYALTIES

- 9.1. Royalties and fees for patent covering materials, articles, apparatus, devices, equipment or processes used in the works shall be deemed to have been included in the Contract Price. The Contractor shall satisfy all demands that may be made at any time for such royalties or fees

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

10. VARIATION OF QUANTITY

- 10.1. The Employer/Engineer-in charge reserves the right to vary the quantities of items or groups of items to be ordered as specified in the Bill of quantities, as may be necessary, during the execution of the Contract. The Contractor is bound to execute such varied quantities of work at his quoted price up to any extent of the agreed quantity or quantities

11. Deductions from contract price

- 11.1. All costs, damages or expenses, which the Employer may have paid, for which under the Contract the Contractor is liable, will be claimed by the Employer. The Engineer-in charge shall deduct the amount, from any moneys due or becoming due by him to the Contractor under the Contract or may be recovered by actions of law or otherwise, if the Contractor fails to satisfy the Employer of such claims.

12. Insurance

- 12.1. The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance covers in two parts, i.e. (a) from the start date to the completion date, and (b) for the Defect Liability period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:
 - a. loss of or damage to the Works, Plants and Materials;
 - b. loss of or damage to Equipment;
 - c. loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract;
 - d. Workman compensation policy to cover personal injury or death.
- 12.2. Policies and Certificates for insurance shall be delivered by the Contractor to the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.
- 12.3. If the Contractor does not provide any of the policies and certificates required, the Engineer-in charge may affect the insurance which the Contractor should have provided and recover any such premiums which the Employer has paid from the payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.
- 12.4. Alterations to the terms of insurance shall not be made without the approval of the Employer.
- 12.5. Both parties shall comply with any conditions of the insurance policies.

- 12.6. **Premium for all insurance policies shall be paid and borne by the Contractor and shall not be reimbursable. The Contractor shall provide to the Engineer-in-Charge all policies of insurance in original. These policies shall be fully executed and shall state that the policies cannot be canceled until completion of the Contract or completion of defects liability period and any extensions thereof. The Contractor shall obtain similar policies from all Sub-Contractors and thereby assume responsibility for any claims or losses to the Employer and Engineer-in-charge resulting from failure of any of the Sub-Contractors to obtain adequate insurance protection in connection with their work and shall indemnify and keep indemnified the Employer and Engineer-in-charge including their employees, officers, servants, agents and any other person moving in the premises, accordingly.**
- 12.7. Unlimited liability: In addition to the liability imposed by law upon the Contractor for injury (including death) to persons or damage to property by reason of the negligence of the Contractor or his agents, which liability is not impaired or otherwise affected hereby, the Contractor hereby assumes liability for and agrees to save the Employer and Engineer-in-Charge including their employees, officers, servants, agents and any other person moving in the premises harmless and indemnifies them from every expense, liability or payment by reason of any injury (including death) to persons or damage to property suffered through any act or omission of the Contractor, his employees, agents, servants, workmen, suppliers or any of his Sub-Contractors, or any person directly or indirectly employed by any of them or from the conditions of the Site or any part of the Site which is in the control of the Contractor or his employees or any of his Sub-Contractors, or any one directly or indirectly employed by either of them or arising in any way from the Work.
- 12.8. All insurance claims, payable by the insurers, shall be paid to the Employer which shall be released to the Contractor in installments as may be certified by the Engineer-in-charge for the purpose of rebuilding or replacement or repair of the works and/or goods destroyed or damaged for which payment was received from the insurers.

13. Liability for accidents and damages

- 13.1. Under the Contract, the Contractor shall be responsible for any loss or damage to the works under this contract until the works are completed and taken over in accordance with the Contract.

14. Time of Completion.

- 14.1. Time: "the essence of the contract": The time allowed for carrying out the Work as entered in the tender shall be strictly observed by the Contractor and shall be deemed to be of the essence of the Contract and shall be reckoned from the date of handing over the site to the Contractor. The Work shall proceed with due diligence until Final Completion. The Contractor shall prepare a Construction Programme with time schedule keeping in view the completion period stipulated for specific portions of the Work and also the overall completion time and submit the same for the approval of the Tendering Authority after the receipt of letter of acceptance or selection notice. The approved work Programme shall be made as part of the contract agreement. The Contractor shall comply with this time schedule. In the event of the Contractor failing to comply with the overall and individual milestones contained in the time schedules, he shall be liable to pay liquidated damages as provided for in this Contract.
- 14.2. Completion Period: The Date of commencement will be the 10th day of site handover or the 10th day after agreement, whichever is earlier. The Milestone dates shall be those specified in the Contract Data or as mutually discussed and agreed. In case the Contractor fails to meet the above stipulated completion period or milestone achievement period, Contractor shall be liable to pay to the Employer, liquidated damages as specified in Clause

- 15 of General Conditions of Contract. In addition to his own work in the overall time period, the Contractor shall provide for the works of other Sub-contractors and Vendors, including those employed directly by the Employer /Engineer-in-Charge.
- 14.3. The contractor has to take over charge of the site by signing the acknowledgement form and commence the work within 10 days from the date of execution of agreement.
 - 14.4. If the site is not taken over by the contractor by signing the acknowledgement form, Engineer will forward the filled-up form by registered/speed post, recording the date of taking over as the tenth day from the date of execution of agreement unless otherwise decided.
 - 14.5. The contractor has to resubmit the acknowledgement form duly signed within three days of receipt and commence the works.
 - 14.6. Unless otherwise decided by the agreement authority, it shall be deemed that the contractor has taken over charge of the site on the tenth day from the date of agreement irrespective of whether he has received the acknowledgement by post or has resubmitted it with his signature. The work will be terminated at his risk and cost if the contractor does not resubmit the acknowledgement form and commence the work as required under 14.3.
 - 14.7. Recovery towards risk and cost will be made from the performance guarantee, if the contractor does not turn up to take charge of the site within the time prescribed under 14.3.
 - 14.8. The works shall be carried out in accordance with the programme submitted by the contractor and agreed to by the Agreement Authority at the time of executing agreement and updated subsequently with the approval of the Agreement Authority.

15. Liquidated Damages (LD)

- 15.1. If the Contractor fails to maintain the required progress in terms of the agreed time and progress chart or to complete the work and clear the site on or before the date of completion of Contract or extended date of completion, he shall without prejudice to any other right or remedy available under the law to the Employer on account of such breach, pay as compensation/ Liquidated damages @ 1 (one) percent of the balance amount of work per week of delay or part thereof. The aggregate of such compensation / compensations shall not exceed 10 (ten) percent of the contract value. This will also apply to items or group of items for which separate period of completion has been specified. The amount of compensation may be adjusted or set off against any sum payable to the contractor under this or any other contract with the Employer.
- 15.2. The Employer, if satisfied, that the work can be completed by the Contractor within a reasonable time after the specified time of completion, may allow further extension of time at its discretion as per clause 19. In the event of extension granted being with Liquidated Damages, the Employer will be entitled without prejudice to any other right or remedy available on that behalf, to recover from the Contractor as agreed damages equivalent to @ 1(one) percent of the contract price per week of delay or part thereof.
- 15.3. If the contractor achieves balance milestones, even though he has failed to achieve initial milestones, and the work has been completed in the specified/original time of completion, the Agreement Authority may release the already levied liquidated damages at his sole discretion.
- 15.4. The Agreement Authority, if not satisfied that the works can be completed by the Contractor and in the event of failure on the part of the Contractor to complete work within further extension of time allowed as aforesaid, shall be entitled, without prejudice to any other right, or remedy available in that behalf, to terminate the contract.
- 15.5. The Agreement Authority, if not satisfied with the progress of the contract and in the event of failure of the Contract or to recoup the delays in the mutually agreed time frame, shall be entitled to terminate the contract.
- 15.6. In the event of such termination of the contract as described in clauses

- 15.7. 15.4 and 15.5 or both, the Employer, shall be entitled to recover Liquidated Damages up to ten percent (10%) of the contract value and forfeit the performance guarantee or Performance Security Deposit made by the Contractor to make good the losses besides getting the work completed by other means at the risk and cost of the Contractor.
- 15.8. The Employer may waive the payment of compensation in the case of contracts where milestones are fixed, depending upon merit of the case, on request received from the Contractor if the entire work is completed within the date as specified in the Contract or as validly extended without stipulating any penalty.
- 15.9. Contractor's default If the Contractor shall neglect to execute the works with the diligence and expedition or shall refuse or neglect to comply with any reasonable orders given to him, in writing by the Engineer in connection with the works or shall contravene the provisions of the Contract, the Agreement Authority may give notice in writing to the Contractor to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days from the date of service thereof, then and in such case the Agreement Authority shall be at liberty to employ other workmen and forthwith execute such part of the works as the Contractor may have neglected to do or if the Agreement Authority shall think fit, it shall be lawful for him, without prejudice to any other right he may have under the Contract, to take the works wholly or in part thereof and in that event the Employer shall have free use of all Contractor's equipment that may have been at the time on the site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same, and the Agreement Authority shall be entitled to retain and apply any balance which may otherwise be due on the Contract by him to the Contractor, or such part thereof as may be necessary, the payment of the cost of executing the said part of the works or of completing the works as the case may be plus a fine of 20 percent of the value of work so carried out. If the cost of completing the works or executing a part thereof as aforesaid plus a fine of 20 percent of the value of work so carried out shall exceed the balance due to the Contractor, the Contractor shall pay such excess. Such payment of excess amount shall be independent of the liquidated damages for delay, which the Contractor shall have to pay if the completion of works is delayed. In addition, such action by the Agreement Authority as aforesaid shall not relieve the Contractor of his liability to pay liquidated damages for delay in completion of works as defined in clause 15. The termination of the Contract under this clause shall not entitle the Contractor to reduce the value of the performance bank guarantee nor the time thereof. The performance guarantee shall be valid for the full value and for the full period of the Contract including Defects Liability Period.
- 15.10. If the Contractor fails to complete the work and the Agreement is canceled, the amount due to him on account of work executed by him, if payable, shall be paid to him only after due recoveries as per the provisions of the Contract and that too after alternative arrangements to complete the work has been made. Any delay in finalization of mutual agreement in regard to any of the Contractor's claim against any act of omission on the part of the Employer or his authorized agents should not result in any work stoppage/further delay on the part of the Contractor.

16.

- 16.1. Extension of time of completion
- a. On happening of any events causing delay as stated hereinafter, the Contractor shall intimate immediately in writing to the Engineer-in-charge: due to any reasons defined as Force Majeure.
 - b. Inclement weather conditions.
 - c. Any other causes which, at the sole discretion of the Employer is beyond the control of the Contractor.

- 16.2. The Contractor may request the Agreement Authority in writing for extension of time within 14(fourteen) days of happening of such event causing delay stating also, if practicable, the period for which extension is desired. The Agreement Authority may, considering the eligibility of the request, give a fair and reasonable extension of time for completion of the work. Such extension shall be communicated to the Contractor in writing by the Agreement Authority through the Engineer- in-charge within one month of the date of receipt of such request. The Contractor shall however use his best efforts to prevent or make good the delay by putting his endeavors constantly as may be reasonably required of him to the satisfaction of the Engineer-in-charge.
- 16.3. When the period fixed for the completion of the Contract is about to expire, the question of extension of the Contract may be considered at the instance of the Contractor or the Employer or the both. The extension will have to be by both party's agreement, expressed or implied.
- 16.4. In case the Contractor does not apply for grant of extension of time within 07 (Seven) days of hindrance occurring in execution of the work and the Employer wants to continue with the work beyond the stipulated date of completion for reason of the work having been hindered, the Engineer-in charge at his sole discretion can grant provisional extension of time even in the absence of application from the Contractor with Approval of employer. Such extension of time granted by the Engineer-in-charge is valid provided the Contractor accepts the same either expressly or implied by his actions before and subsequent to the date of completion. Such extension of time shall be without prejudice to Employer's right to levy compensation under the relevant clause of Contract.
- 16.5. The employer shall levy penalty at the rate of 1% of the contract value of the remaining work per week of delay from the approved execution schedule and upto maximum 10% of contract value.

17. Termination, suspension, cancellation & foreclosure of contract

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

- Contractor informing his decision to do so.
- 17.3. The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they are related to the work terminated and terms satisfactory to the Employer, stop all further sub-Contracting or purchasing activity related to the work terminated, and assist the Employer in maintenance, protection, and disposition of the works acquired under the Contract by the Employer.
- 17.4. The Contract shall stand terminated under the following circumstances unless the Employer is satisfied that the legal representatives of the individual Contractor or of the proprietor of the proprietary concern and in the case of partnership the surviving partners, are capable of carrying out and completing the Contract and the Employer shall in any way not be liable to payment of any compensation to the estate of deceased Contractor and/or to the surviving partners of the Contractor's firm on account of the termination of the Contract.:
- a. If the Contractor being an individual in the case of proprietary concern or in the case of a partnership firm any of its partners is declared insolvent under the provisions of insolvency act for the time being in force, or makes any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors amounting to proceedings for liquidation or composition under any insolvency act.
 - b. In the case of the Contractor being an employer, its affairs are under liquidation either by a resolution passed by the employer or by an order of court, not being a voluntary liquidation proceeding for the purpose of amalgamation or re organization, or a receiver or manager is appointed by the court on the application by the debenture holders of the Employer, if any.
 - c. If the Contractor shall suffer an execution being levied on his/their goods, estates and allow it to be continued for a period of 21(twenty-one) days.
 - d. On the death of the Contractor being a proprietary concern or of any of the partners in the case of a partnership concern and the Agreement Authority is not satisfied that the legal representative of the deceased proprietor or the other surviving partners of the partnership concern are capable of carrying out and completing the Contract. The decision of the Agreement Authority in this respect shall be final and binding which is to be intimated in writing to the legal representative or to the partnership concern.
 - e. If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the partners dies, then unless the Employer is satisfied that the legal representatives of the individual Contractor or of the proprietor of the proprietary concern and in the case of partnership the surviving partners, are capable of carrying out and completing the Contract the Employer shall be entitled to cancel the Contract as to its incomplete part without being in any way liable to payment of any compensation to the estate of deceased Contractor and/or to the surviving partners of the Contractor's firm on account of the cancellation of the Contract. The decision of the Employer that the legal representatives of the deceased Contractor or surviving partners of the Contractor's firm cannot carry out and complete the Contract shall be final and binding on the parties. In the event of such cancellation the Employer shall not hold the estate of the deceased Contractor and/or the surviving partners of the estate of the deceased Contractor and/or the surviving partners of the Contractor's firm liable to damages for not completing the Contract.
- 17.5. On cancellation or on termination of the Contract, the Engineer-in- charge shall have powers
- a. to take possession of the site and any materials, constructional plant, implements, stores, etc. There on.
 - b. to carry out the incomplete work by any means at the risk of the defaulted Contractor
 - c. to determine the amount to be recovered from the Contractor for completing the

- d. To recover the amount determined as above, if any, from any moneys due to the Contractor or any account or under any other Contract and in the event of any shortfall, the Contractor shall be called upon to pay the same on demand. The need for determination of the amount of recovery of any extra cost/expenditure or of any loss/damage suffered by the Employer shall not however arise in the case of termination of the Contract for death/demise of the Contractor as stated in clause.20.4 (d).
- e. The inventory of up to date work and balance stores at site, plant/machineries, equipment's and any other property of contractor utilized for the work shall be taken on charge by the Department after combined survey with the Contractor or his authorized representative. If Contractor or his authorized representative is not appearing for combined survey after one week of giving notice, inventory shall be prepared by the Department in his absence and the Contractor is bound to accept the same.
 - a. During the currency of execution of work, contractor shall not remove his resources without prior permission of Engineer-in charge.
 - b. Additionally, the Employer will reserve the right to debar such defaulting Contractor from participating in future Tenders for a minimum period of one year

Engineer-in-Charge, after giving the contractor 15(fifteen) days' notice in writing, without canceling or terminating the contract, shall be entitled to employ another agency for executing the job or to carry out the work departmentally or contractually through tendering process, either wholly or partly, debiting the contractor with cost involved in engaging another agency or with the cost of labor and the prices of materials, as the case may be. The certificate to be issued by the Engineer-in-Charge for the cost of the work so done shall be final and conclusive and the extra cost, if any, shall be borne by the contractor. However, when this clause is invoked, penalty will not be applicable.

18. SITE FACILITIES FOR WORKERS

- 18.1. The contractor should provide required no.of male and female toilet for workers
- 18.2. The contractor should provide drinking water facility for labours

19. Certificate not to affect right of Employer and liability of contractor

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

Language and measures

- 19.2. All documents pertaining to the Contract including specifications, schedules, notices, correspondence, operating and maintenance instructions, drawings or any other writing shall be written in English language. The metric system of measurement shall be used exclusively in the Contract. Measurements, quantities, prices or rates and amounts shall have two digit precision.

20. Release of information

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

21. Completion of contract

- 21.1. Unless otherwise terminated under the provisions of any other relevant clause, this Contract shall be deemed to have been completed at the expiration of the Defects Liability Period as provided for under the clause 46.

22. Enforcement of terms

- 22.1. The failure of either party to enforce at any time of the provisions of this Contract or any rights in respect thereto or to exercise any option herein provided, shall in no way be construed to be a waiver of such provisions, rights or options or in any way to affect the validity of the Contract. The exercise by either party of any of its rights herein shall not

preclude or prejudice either party from exercising the same or any other right it may have hereunder.

23. Engineer's decision

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

24. Co-operation with other Contractors, Consultants & Engineers

- 24.1. The Contractor shall co-operate with the Employer's other Contractors Consultants and consulting Engineers, if employed in the site, and freely exchange with them such technical information as is necessary for the satisfactory execution of works.

25. Variations or additions

- 25.1. No alterations, amendments, omissions, suspensions or variations of the works (hereinafter referred to as "Variation") under the Contract as detailed in the Contract documents, shall be made by the Contractor except as directed in writing by the Engineer, but the Engineer shall have full power subject to the provision hereinafter contained from time to time during the execution of the Contract, by notice in writing, to instruct the Contractor to make such variation without prejudice to the Contract. The Contractor shall carry out such variation and be bound by the same conditions as far as applicable as though the said variation occurred in the Contract documents. If any suggested variation would, in the opinion of the Contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the Contract, he shall notify the Engineer there of in writing and the Engineer shall decide forthwith, whether or not the same shall be carried out and if the Engineer confirm his instructions, Contractor's obligations and guarantees shall be modified to such an extent as may be mutually agreed. Any agreed difference in cost occasioned by any such variation shall be added to or deducted from the Contract price as the case may be.
- 25.2. In the event of the Engineer requiring any variation, such reasonable and proper notice shall be given to the Contractor to enable him to work his arrangements accordingly, and in cases where goods or materials are already prepared or any design, drawings of pattern made or work done requires to be altered, a reasonable and agreed sum in respect there of shall be paid to the Contractor.
- 25.3. In any case in which the Contractor has received instructions from the Engineer as to the requirement of carrying out the altered or additional substituted work which either then or later on, will in the opinion of the Contractor, involve a claim for additional payments, the Contractor shall immediately and in no case later than ten (10) days, after receipt of the instructions aforesaid and before carrying out the instructions, advise the Engineer to that effect. But the Engineer shall not become liable for the payment of any charges in respect of any such variations, unless the specifications of the same shall be confirmed in writing by the NS Engineer.

- 25.4. In all the above cases, in the event of a disagreement as to the reasonableness of the said sum, the decision of the Engineer shall prevail.
- 25.5. Notwithstanding anything stated above in this clause, the Engineer shall have the full power to instruct the Contractor, in writing, during the execution of the Contract, to vary the quantities of the items or groups of items. The Contractor shall carry out such variations and be bound by the same conditions, as though the said variations occurred in the Contract documents. However, the Contract price shall be adjusted at the rates and the prices provided for the original quantities in the Contract.

26. Replacement of defective parts and materials

- 26.1. If during the progress of the works the Engineer shall decide and inform in writing to the Contractor, that any part of work or materials used therein is unsound or imperfect or has furnished any work is inferior than the quality specified, the Contractor on receiving details of such defects or deficiencies shall at his own expense within seven (7) days of his receiving the notice, or otherwise, within such time as may be reasonably necessary for making it good, proceed to alter, re-construct or remove such work and furnish fresh materials up to the standards of the specifications.
- 26.2. In case the Contractor fails to do so, the Engineer may on giving the Contractor seven (7) days' notice in writing of his intentions to do so, proceed to remove the portion of the works or materials so complained of and, at the cost of the Contractor, perform all such work or furnish all such equipment provided that nothing in this clause shall be deemed to deprive the Employer of or affect any rights under the Contract which the Employer may otherwise have in respect of such defects and deficiencies.

27. Limitations of liabilities

- 27.1. The final payment by the Employer in pursuance of the Contract shall mean the release of the Contractor from all his liabilities under the Contract. Such final payment shall be made only at the end of the defects liability period as detailed in clause 46 and till such time as the Contractual liabilities and responsibilities of the Contractor, shall prevail. All other payments made under the Contract shall be treated as on account payments.

28. Payments

- 28.1. The payment to the Contractor for the performance of the works under the Contract will be made by the Employer as per the guidelines and conditions specified herein. All payment made during the Contract shall be on account payments only. The final payment will be made on completion of all the works and on fulfillment by the Contractor of all his liabilities under this contract and also after issue of Completion Certificate by the Agreement Authority.
- 28.2. All payments under the Contract shall be in Indian Rupees only.
- 28.3. All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.
- 28.4. Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the employer to take action

- under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.
- 28.5. The bill has to be prepared by the contractor.
- 28.6. **The Contractor will be required to produce income-tax and GST clearance certificates before the final payment and release of Performance Security Deposits.**

29. Method of measurement and Bill Preparation:

- 29.1. All Works shall be measured for making payments to the Contractor. To evaluate Work under this Contract and instructed as per work order/change orders issued by the Engineer-in-Charge, the standard method of measurement in accordance with the Standards laid down by CPWD Specifications Vol-I and II or Bureau of Indian Standards (IS: 1200) shall be followed. However, if definite methods of measurements are stipulated in the Schedule of Rates or Specifications, then the same shall supersede BIS methods and shall be followed. In the event of any dispute with regard to the method of measurement of any work, the decision of the Engineer-in-Charge shall be final and binding and no extra claims shall be entertained or allowed at any stage in this regard.
- 29.2. The bills shall be prepared by the contractor and will be verified and certified by the NS Engineer/Project consultant. Bills shall be prepared when the completed works are worth more than 1 crore.

30. Covering up:

- 30.1. The Contractor shall give at least 24 hours clear notice in writing to the Engineer-in-Charge before covering up any of the Work in foundations or any other such areas in order that inspection of the Work may be carried out for maintaining proper quality control. In the event of the Contractor failing to provide such notice he shall, at his own expense, uncover such Work as required to allow the inspection to be taken and thereafter shall reinstate the Work to the satisfaction of the Engineer-in-Charge. Each stage of all hidden works shall be approved by the Engineer-in charge before executing the next stage.

31. Rectification of improper work noticed:

- 31.1. If it shall appear to the Engineer-in-Charge during the progress of the Work that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of any inferior description or that any materials or articles provided by the Contractor for the execution of the Work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the Contract, the Contractor shall, on demand in writing from the Engineer-in-Charge specifying the work, materials or articles complained of, notwithstanding that the same may have been passed and certified, forthwith rectify or remove and reconstruct the work so specified in whole, or in part as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost and in the event of his failing to do so within a period so specified by the Engineer-in-Charge in his demand aforesaid, the Engineer-in-Charge may rectify or remove and re execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor, and deduct the expenses from the Performance Security Deposit any sums that may be due at any time thereafter to the Contractor or from his performance guarantee.

32. Rates for the extra, additional, altered or substituted items

- 32.1. Employer reserves the right to alter the Scope of Work (See Clause 10 and 30) and consequently the Contract Price shall be suitably adjusted for such changes by applying the

- approved rates. All change orders shall be issued by the Engineer-in-Charge with approval and the onus shall be on the Contractor to obtain such prior written consent of the Employer.
- 32.2. There shall be an order in writing to execute the extra item of work duly signed by the Agreement Authority before its commencement.
- 32.3. If the contractor finds, after examining the specifications and plans that extras are involved, he should give notice to the Engineer-in charge to this effect and shall proceed with the execution of the extra item only after receiving instructions in writing from Engineer-in charge and Agreement Authority.
- 32.4. Extra items may be classified as new, additional, substituted or altered items, depending, on their relation or otherwise to the original item or items of work.
- 32.5. The rates for extra items shall be worked out as below
- a. In the case of extra items whether additional, altered or substituted, for which similar items exists in the contract, the rates shall be derived from the original item by appropriate adjustment of cost of affected components. The percentage excess or deduction of the contract rate of the original item with reference to the employer estimated rate shall be applied in deriving the rates for such items. The Engineer's interpretation as to what is a similar class of work shall be final and binding on the Contractor.
 - b. In the case of extra items whether additional, altered or substituted and for which similar items do not exist in the contract and rates exists in the prevailing market rate, shall be taken.
 - c. In the case of extra items whether additional, altered or substituted, for which the rates cannot be derived from similar items in the contract, and only partly from the departmental schedule of rates the rates for such part or parts of items which are not covered in the schedule of rates shall be determined by the Engineer-in charge on the basis of the prevailing market rates giving due consideration to the analysis of the rate furnished by the contractor with supporting documents, including contractor's profit, overheads and other allowed charges if any. This shall be added on to the departmental rate (including contractor's profit, overheads and other allowed charges if any) current at the time of ordering or executing the extra item, whichever is earlier for the other part the item for which rates can be derived from the schedule of rates.
 - d. In the case of extra item whether altered or substituted, for with the rates cannot be derived either from- similar item of work in the contract or from the departmental schedule of rates, the contractor shall within 14 days of the receipt of the order to carry out the said extra item of work communicate to the Engineer-in charge the rate which he proposes to claim for the item, supported by analysis of the rate claimed and the department shall within one month thereafter determine the rate on the basis of the market rate giving consideration to the rate claimed by the contractor, after applying the tender deduction except on cost of departmental material

33. Price Adjustment

No price adjustment will be allowed however the Price of cement and steel will be adjusted as follows.

- 33.1. The basic price of cement and steel shall be Rs:-470 per bag of cement and Rs: - 75000 per MT of steel. Price fluctuation up to 15% of the basic rate shall be to the contractors' account. In case of variation above 15%, the excess over and above the 15% shall be reimbursed to the contractor. Proper records (Invoice copies) have to be produced to the engineer-in-charge for substantiating any claims on this account. In case of negative variation, the variation beyond 15% will have to reimburse to the client. No other claims for price escalation will be entertained and the rates shall remain firm until completion of the work.

34. Deductions for uncorrected work:

- 34.1. If the Engineer-in-Charge deems it inexpedient to get corrected or rectified any work of the Contractor which is defective or damaged or of substandard quality or is generally not in accordance with the Contract Documents, then an equitable and appropriate deduction shall be made thereof from the Contract Price, and the Engineer-in-Charge's decision in this respect shall be final and binding on the Contractor.
- 34.2. Furthermore if, by reason of any accident, or failure, or other event occurring to, in or in connection with the Work, or any part thereof, either during the execution of the Work or during the Defects Liability Period, any remedial or other work or repair shall, in the opinion of the Engineer-in-Charge, be urgently necessary for the safety of the Work, or any part thereof, and the Contractor is unable or unwilling to immediately and at once do such work or repair, the Engineer-in-Charge may employ and pay other persons or agencies to carry out such work or repair as the Engineer-in-Charge may consider necessary. If the work or repair so done by other persons or agencies is work which, in the opinion of the Engineer-in-Charge, the Contractor was liable to do at his own expense under the Contract, then all expenses incurred by the Employer / Engineer-in-Charge in connection with such work or repair shall be recovered from the Contractor and shall be deducted by the Employer / Engineer-in-Charge from any money that may be payable or that may become payable to the Contractor or from the Contractor's performance guarantee.
- 34.3. The defective or uncorrected work of the Contractor at any stage (during or after completion of work) may adversely affect or damage the work of other Vendors. Contractor shall at his own cost immediately rectify, correct or replace both his defective work as well as the work of the other Vendors so damaged, within the time period stipulated by the Engineer-in-Charge, so as not to effect the progress and quality of other Vendor's work. In case the Contractor fails to do the necessary corrections to the satisfaction of Engineer – in –Charge or delays the correction work, then the Engineer-in-Charge shall be at liberty to get the correction work done and if the correction work is not possible, then any extra work necessary to cover the defect or damage, done through same / any other Vendor at Contractor's cost.
- 34.4. Actual costs including any incidentals thereof incurred by the Engineer- in-Charge on such corrections / extra works shall be recovered from the payments or any amounts due to the Contractor.

35. Virtual completion of works:

- 35.1. The Contractor shall complete the Works by the intended date of completion. In case Extension of Time has been granted, the extended date of completion shall be considered. The Works shall be considered as Virtually Complete only upon satisfactory correction of all defects notified by the Engineer, and only after the Work has been completed in every respect in conformity with the Contract Documents and after all the systems and services have been tested and commissioned, and after the Site has been cleared and the Work cleaned in accordance with Clause 78 and when the Agreement Authority on a report by the Engineer-in-Charge have certified in writing that the Work is Virtually Complete. The virtual completion certificate shall be issued by the Engineer-in-charge within 15 days of final measurement. The Defects Liability Period shall commence from the date of Virtual Completion in the virtual completion certificate issued by the Agreement Authority.
- 35.2. Should, before Virtual Completion, the Employer / Engineer-in- Charge decide to occupy any portion of the Work or use any part of any equipment, the same shall not constitute an acceptance of any part of the Work or of any equipment, unless so stated in writing by the Engineer-in-Charge.
- 35.3. Prior to the issue of the Virtual Completion Certificate, the Contractor shall submit and hand-over to the Engineer-in-Charge the keys to all locks, all operation and maintenance manuals

- for systems and services, material reconciliation statements, warranties, as built drawings, any spares called for in the Contract, and everything else necessary for the proper use and maintenance of the Work complete with all systems and services.
- 35.4. It is clarified that all materials whether Employer supplied or not shall be procured by the contractor at his own cost for carrying out correction work. No charges shall be paid on this account.

36. Programme chart /milestones:

- 36.1. The Contractor should strictly adhere to the agreed milestones, if any for the work. If the milestones are not achieved by the Contractor, the Contractor shall pay the Employer liquidated damages as per clause 15 of GCC. However, release of interim Liquidated Damages can be considered in case the very next Milestone is achieved on time. Extension of time for any milestone if allowed has to be obtained in writing from the Agreement Authority well in advance of completion dates.

37. Penalty / fine for non-compliance of safety codes & labour laws:

- 37.1. If the Engineer-in-Charge notifies the Contractor of non-compliance with safety codes as in Clause no. 68 and 69 and the labour laws etc. Contractor shall immediately if so directed or in any event not more than 10(ten) hours after receipt of such notice, make all reasonable effort to correct such non-compliance and to ensure that there is no re occurrence of such on-compliance.
- 37.2. If the Contractor fails to do so, the Engineer-in-Charge shall levy a fine of Rs.500 (Rupees five hundred only) per head per day of the total number of labourers employed on that particular day at site for not complying with safety codes & labour laws etc.

38. Guarantees:

- 38.1. The Contractor understands and agrees that the Engineer-in-Charge is expressly relying and will continue to rely on the skill and judgment of the Contractor in executing the Work and remedying any defects in the Work. The Contract represents and warrants that:-
- a) The Contractor shall perform the Work in a timely manner, in strict accordance with the Contract Documents, and consistent with generally accepted professional, construction and construction-supervision practices and standards provided by an experienced and competent professional contractor and construction supervisor rendered under the same or similar circumstances.
 - b) The Contractor is and will be responsible to the Engineer-in-Charge for the acts and omissions of his Sub-Contractors and their respective employees, agents and invitees and all the persons performing any of the Work on behalf of the Contractor.
 - c) Besides the guarantees required and specified elsewhere in the Contract Documents, the Contractor shall in general guarantee all work executed by the Contractor and his Sub-Contractors for Defects Liability Period from the date of issue of the Virtual Completion Certificate. Those parts of the Work or equipment or installations, for which extended guarantee periods are stipulated elsewhere in the Contract Documents, shall be guaranteed for such periods that are so stipulated. The duration of the Defects Liability Period, unless specified otherwise, shall be the extent of length of such guarantee periods.
- 38.2. The Contractor represents, warrants and guarantees to Engineer, inter alias that:
- a) The execution of the Work shall be approved and capable of use, operation, performance and maintenance for accomplishing the purpose for which it has been built and acquired.
 - b) The Work shall comply with the Specifications, Drawings, and other Contract Documents

- and that quality standards as per the PWD Quality Control Manual shall be maintained.
- c) The Work shall, for Defect Liability Period from the date of issue of the Virtual Completion Certificate, be free from all defects and the Work shall be of structural soundness, durability, ease of maintenance, weather tightness etc.
 - d) The materials, workmanship, fabrication and construction shall be of the specified and agreed quality and all materials shall be new.
 - e) The Work performed for the Engineer-in-Charge shall be free from all liens, charges, and claims of whatsoever nature from any party other than the Engineer-in-Charge.
- 38.3. Where, during such guarantee periods as mentioned above, any material or equipment or workmanship or generally any item of work fails to comply or perform in conformity with the requirements stipulated in the Contract Documents or in accordance with the criteria and provisions of the guarantee, the Contractor shall be responsible for and shall bear and pay all costs and expenses for replacing and/or rectifying and making good such materials, equipment, workmanship, and items of work and, in addition, the Contractor shall be also responsible for and shall bear and pay all costs and expenses in connection with any damages and/or losses suffered as a consequence of such failure.
- 38.4. All guarantees required under the Contract shall be in the format approved by the Engineer-in-Charge and submitted to the Engineer-in-Charge by the Contractor when requesting certification of the final bill.

39. Defects liability:

- 39.1. The Defect Liability Period shall be as mentioned in the Contract Data.
- 39.2. Maintenance by contractor during defects liability period: All defective items of work and defects noticed and brought to the attention of the Contractor by the Engineer in writing during the Defects Liability Period shall be promptly and expeditiously attended to and replaced and/or rectified and made good by the Contractor at his own cost, to the complete satisfaction of the Engineer-in-Charge.
- 39.3. Replacement and/or rectification and making good by contractors of all defective materials, equipment and/or workmanship during defects liability period: The Contractor shall replace and/or rectify and make good, at his own cost, and to the satisfaction of the Engineer-in-Charge, all defective items of work and defects arising, in the opinion of the Engineer-in-Charge, from materials, equipment, and/or workmanship not performing or being in accordance with the Drawings or Specifications or the instructions of the Engineer-in-Charge or other Contract Documents or the best engineering and construction practices, and which may appear or come to notice within Defects Liability Period after Virtual Completion of the Work. Any item, material or matter repaired or replaced shall receive a new Defects Liability Period of like duration beginning upon the date the repaired or replaced item, material or matter is returned for use to the Engineer-in-Charge, provided that the aggregate guarantee period shall not exceed 24 months. The Contractor shall be also liable for all costs associated with damages and/or losses which are a consequence of such defective items of work and defects, and such costs shall be recouped by Engineer-in-Charge/Agreement Authority from the Contractor and shall be recovered from the Performance Security Deposit held and/or from the Contractor's final bill (if the final bill has not been certified and paid for at the time), or the same would otherwise be recovered from the Contractor. Should the Performance Security Deposit held (and the amount in respect of the final bill if it has not been certified and paid for at the time) be insufficient to meet such costs, damages, losses and expenses, as determined by the Engineer-in-Charge, then the Contractor shall be legally bound to pay the balance amount due under the claim to the Engineer-in-Charge within one month of receiving notification to that effect from the Engineer-in-Charge. In the event of failure on the part of the Contractor to pay the balance amount due within one month as stated above,

the Engineer-in-Charge shall be entitled to invoke the performance bond and the Contractor shall raise no objection in this regard. In respect of those parts of the Work for which longer guarantee periods are stipulated elsewhere in the Contract Documents, the Defects Liability Period for such parts of the Works shall be until the end of the respective guarantee period that is stipulated for each such part. No payment shall be made to the contractor on this account.

- 39.4. All the material whether Employer supplied or not shall be supplied by the Contractor at his own cost for undertaking an correction/rectification/replacement of defective/damaged or uncorrected works

40. Final completion of the work:

- 40.1. The Work shall be considered as finally complete at the end of the Defects Liability Period subject to the Contractor having replaced and/or rectified and made good all the defective items of work and defects and hand over the Work in accordance with clause above, to the satisfaction of the Engineer-in-Charge, and provided that the Contractor has performed all his obligations and fulfilled all his liabilities under the Contract, and when the Agreement Authority has certified in writing that the Works are finally complete. Such Final Completion in respect of those parts of the Work, for which extended guarantee periods are stipulated elsewhere in the Contract Documents, shall be achieved at the end of such stipulated guarantee periods.

41. Taking over of the works

- 41.1. The Contractor shall be responsible to maintain all his works till completion of the Defects Liability Period and to handover the work to the Assistant Engineer. In this regards the works would be jointly inspected by a team comprising of representatives of Contractor and the Engineer-in- Charge, for noting any discrepancy, defect, shortcomings. Within the time period specified by the Engineer-in-Charge the Contractor shall rectify, correct or replace the defective works so noted during the joint inspection, at his own cost to the satisfaction of the Engineer-in-Charge. On acceptance of the Contractor's work, the contractor shall prepare the inventory of his works, and hand over the Work & the inventory to the Engineer.
- 41.2. During carrying out the rectification, correction or replacement Works as mentioned above the Contractor shall take all necessary precautions to safeguard the existing finishing and works of other Vendors against any damage. In case the works of other Vendors are damaged by the Contractor while undertaking the rectification / replacement work, the Contractor shall rectify / replace the works so damaged at his own cost to the satisfaction of the Engineer-in-Charge.
- 41.3. On failure of the contractor to rectify, correct or replace the defective works or on undue delay on part of the contractor for the same, the Engineer-in-Charge shall be at liberty to undertake the correction works by itself or through any Vendor at the Contractor's cost. All such costs including any incidentals thereof incurred by the Engineer-in-Charge shall be recovered from the Contractor's payments or from any amounts due to the Contractor.
- 41.4. Subject to clause 42 of this section, upon the issue of virtual completion certificate, the Engineer may take over the completed work for intended use. Such taking over of the works prior to completion of the Defects Liability Period by the Engineer shall not discharge the contractor of his responsibilities for the balance Defects Liability Period and the Defects Liability Period shall remain in force till completion of Defects Liability Period.
- 41.5. On removal of all the defects and handing over to the Employer upon successful completion of the Defects Liability Period by the Contractor, the Engineer-in-Charge shall issue the Final Completion Certificate to the contractor and the Defects Liability Period shall deemed to be complete.
- 41.6. Produce fire NOC certificate ,pollution control certificate electrical inspection

A class certificate 45 days before the handing over of the site

42. Governing law:

42.1. The governing Law of the Contract shall be Indian law.

43. Standards of conduct:

43.1. The Contractor, in performing its obligations under this Contract, shall establish and maintain appropriate business standards, procedures and control, including those necessary to avoid any real or apparent impropriety or adverse impact on the interests of the Employer/ Engineer-in-Charge. The Employer / Engineer-in-Charge will in no event reimburse the Contractor for any costs incurred for purposes inconsistent with such policies.

43.2. Salient Features of Some Major Labour Laws (Applicable to the establishments engaged in construction work)

- a) Workmen Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:
 - i. Pension or family pension on retirement or death, as the case may be.
 - ii. Deposit linked insurance on the death in harness of the worker.
 - iii. Payment of P.F. accumulation on retirement/death etc.
- d) Maternity Benefit Act 1951: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- e) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Employer by Law. The Contractor is required to take license from the designated Officer. The Act is applicable to the establishments of the Contractor for the Employer if they employ 20 or more contract labour. Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Bridges, and Runways etc. are scheduled employments.
- f) Payment of Wages Act 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- g) Equal Remuneration Act 1979: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- h) Payment of Bonus: Minimum bonus shall be paid as per the State Government rules prevailing during the time of work.
- i) Industrial Disputes Act 1947: The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- j) Industrial Employment (Standing Orders) Act 1946: It is applicable to all establishments

employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

- k) Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- l) Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry. Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more interstate migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home up to the establishment and bucket.
- m) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 1% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First- Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
- n) Factories Act 1948: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

44. Grounds for withholding payments:

- 44.1. The Engineer-in-Charge may withhold the whole or part of any compensation due to the Contractor to the extent necessary to protect the Employer from any loss on account of any breach of Contractor's obligations under the Contract. When the cause for withholding is rectified, such amounts then due and owing shall be paid or credited to the Contractor.

CONTRACTOR'S SITE ORGANIZATION AND RESOURCES

45. Contractor's representative and supervisory staff

- 45.1. The Contractor shall at his cost provide and ensure continued effective supervision of the Work with the help of the Contractor's Representative, assisted by a team of qualified, experienced and competent engineers, supervisors and adequate staff, to the satisfaction of the Engineer-in-Charge for the entire duration of the Work. The Contractor shall submit his proposed site organization chart for the approval of the Engineer-in-Charge. The Contractor's Representative shall be on the Site at all times as the Work and the Work progresses and shall be responsible for carrying out the Work to the true meaning of the Drawings, Specifications,

Conditions of Contract, Schedule of Rates, the other Contract Documents, and instructions and directions of the Field Engineers. The instructions and directions given in writing to the Contractor's Representative or to any of his assistants at the Site by the Engineer-in-Charge shall be deemed to have been given to the Contractor officially. Attention is called to the importance of the Contractor requesting written instruction from the Engineer-in-Charge before undertaking any Work where the Engineer-in-Charge's and/or Employer's direction or instructions are required. Any such Work done in advance of such instructions will be liable to be removed at the Contractor's expense and will not be paid for unless specifically approved in writing by the Engineer-in-Charge, as the case may be. All key staff employed at the Site by the Contractor shall be considered essential to the performance of the Work and the Work Co-ordination Services, and all key staff shall be subject to the approval of the Engineer-in-Charge. However, such approval shall not relieve the Contractor of any of his Contractual obligations. The Engineer-in-Charge shall, however, have the authority to order the removal from Site of any undesirable personnel. If key staff becomes unavailable for assignment to the Work or the Work Coordination Services for reasons beyond the Contractor's control, the Contractor shall immediately notify the Engineer-in-Charge to evaluate the impact on the Work. Prior to substitution or addition of any key staff, the Contractor shall obtain the Engineer-in-Charge's written consent as to the acceptability of replacements or additions to such personnel. The Contractor shall at all times be fully responsible for the acts, omissions, defaults and neglect of all of his representatives, agents, servants, workmen and suppliers and those of his Sub-Contractors.

46. Man-power and plant and machinery

46.1. The Contractor shall at his own cost provide and install all equipment, materials, plant/machines. Provision of Passenger Lift, Batching Plant, Concrete Pumps, Cranes, and Material Hoists each of adequate capacity, will be required in case of bulk concreting and fast construction. Other equipment like concrete mixers (weigh batchers in case of design mixes), ladders, and scaffolding etc., necessary for the execution of the Work in conformity with the Contract Documents and to the satisfaction of the Engineer-in-Charge will also be provided by the contractor at his own cost in adequate quantity. All machines, tools, trucks, form work material, man-power and everything else necessary for the proper and satisfactory execution and completion of the Work in accordance with the Contract Documents shall be provided by the Contractor at his own cost. The pre-qualification approval of the list of equipment however shall not relieve the Contractor of any of his responsibilities, obligations and liabilities under the Contract. The Contractor shall augment his manpower, plant and machinery without extra cost to the Engineer-in-Charge whenever required or so directed by the Engineer-in-Charge in order to conform to the approved construction programme for the achievement of milestones and Virtual Completion. The batching plant, Concrete batch mix plant shall be computerized (Microprocessor based) with printing facility so as to keep the printed output for each batch of concrete mix and for each component (stone aggregates, sand, cement, fly ash, water. Contractor has to submit mix Design for concrete before commencement of work for approval of Engineer. Plasticize & any other concrete admixture) for each batch of design mix concrete for record purpose. The plants shall also be equipped with antipollution device and mechanisms.

47. Contractor store, site offices and other facilities

47.1. It is agreed that Contractor has inspected the site and has made his own assessment towards the availability of space at site for his stores, yards, offices, placement of batching plant, steel & shuttering yards, cranes, material hoists and other facilities. A mutually determined area within the constraints of the Site will be allowed to the Contractor free of cost for the purpose

of storing his tools, plant, materials, Site office, cement go down, canteen, plant & machinery etc. In case contractor is not able to accommodate his facilities within the site, or in the opinion of the Engineer- in-Charge contractor's facilities are to be removed or relocated in the interest of the progress of work (contractors and / or any other agencies / vendors) the contractor shall make his own arrangements elsewhere outside the site at his own cost for the same. Water tank for the purpose of construction, Site offices, required no .of male and female toilets, every day drinking water facility, workshops and storage sheds etc. shall be built by the Contractor at the Contractor's cost. Water tank/s constructed for the purpose of construction should be of such dimensions as to provide storage for at least two days consumption. Site offices shall be of such dimensions to accommodate the Contractor's own office. A separate facility shall be provided and maintained for Engineers& removed after construction period. The Contractor shall remove all the temporary construction constructed by him at the Site for the purpose of completing the Work after the Work is completed. Costs of all such facilities including construction & removal shall be borne by the Contractor. Construction of labour hutments will not be allowed inside the Site. The Contractor shall at his own cost make all arrangements for space, lodging, transportation etc. for the labours.

48. Security

- 48.1. The Contractor shall at his cost provide at all times adequate number of watchmen to guard the Site, materials and equipment, to the satisfaction of the Engineer-in-Charge. The Contractor shall at all times be fully responsible for the security of all materials and equipment on the Site, whether owned by the Employer, owned by the Contractor or those of any Sub-Contractor. Employer / Engineer shall not be responsible for any loss due to theft, fire, accident or any other reasons, whatsoever.
- 48.2. Scaffolding, staging, guard rails, barricades: The Contractor shall at his cost provide steel scaffolding, staging, guard rails, barricades and safety barriers around all excavations, openings and at all edges, temporary stairs and other temporary measures required during construction. The supports for the scaffolding, staging guard rails, barricades and safety barriers and temporary stairs shall be strong, adequate for the particular situations, tied together with horizontal pieces and braced properly. The temporary access to the various parts of the building under construction shall be rigid and strong enough to avoid any chance of mishaps. The entire scaffolding arrangement together with the staging, guard rails, barricades and safety barriers, and temporary stairs shall be to the approval of the Engineer-in- Charge which approval however shall not relieve the Contractor of any of his responsibilities, obligations and liabilities for safety and for timely completion of the Work. The use of wooden scaffolding on the Site is strictly forbidden.

49. Temporary Roads:

- 49.1. The Contractor shall at his cost construct and maintain temporary roads/access ways to suit Site requirements at locations mutually agreed with the Engineer-in-Charge. Such roads/access ways will also be used by other Contractors/vendors/ Officials working at the Site.

50. Safety Equipment & Personnel:

- 50.1. The Contractor shall provide sufficient helmets, safety boots/shoes, nets and protective clothing for use by the Work management team, his own staff, staff of its subcontractors and Engineer, Engineer's Representative. The Contractor shall make available at all times when work is being undertaken, a vehicle suitable for the emergency evacuation of personnel from the site to a hospital staffed and equipped to receive injured personnel.

51. Temporary Lighting:

- 51.1. The Contractor shall make his own arrangement in respect of the provision of adequate lighting at all places where adequate visibility is not there or at night works and also provide general lighting of site as a whole in a proper safe and satisfactory manner.

52. Protection of Environment:

- 52.1. The Contractor understands that the Site is free from pollutants at the time of access to the Site and commencement of the Work. The Contractor shall comply with all applicable environmental laws and regulations and shall ensure that the Site is and remains free from pollutants at the end of the Work. The Contractor shall ensure inter-alia, that neither the soil nor the ground water is polluted or contaminated by fuels or lubricants emitted by machinery operated on the Site or by other dangerous or poisonous substances which are or are deemed to be hazardous to the environment. Notwithstanding the above, the Contractor shall comply with all the directions and decisions of the Engineer-in-Charge in this regard.

53. First Aid Facilities:

- 53.1. The Contractor shall provide adequate first aid facilities at site.

54. Labour regulations:

- 54.1. The Contractor shall be wholly and solely responsible for full compliance with the provisions under all labour laws and /or regulations such as Payment of Wages Act 1948, Employees Liability Act 1938, Workmen's Compensation Act-1923, Employees State Insurance Act-1948, Employees Provident Fund Act-1952, Industrial Disputes Act- 1947, the Maternity Benefit Act-1961, the Contract Labour (Regulation and Abolition) Act-1970 and the Factories Act-1948 or any modifications thereof or any other law relating there to and rules there under introduced from time to time. The Contractor shall assume liability and shall indemnify the Employer and Engineer-in- Charge from every expense, liability or payment by reason of the application of any labour law, act, rules or regulations existing or to be introduced at a future date during the term of the Contract. Insurance cover towards the above shall be effected by the Contractor as called for in Clause 12. In general, in respect of all labour directly or indirectly employed in the Work for the performance of Contractor's part of the Contract, the Contractor shall comply with all the rules framed by the Government authorities concerned from time to time for protection of the health and welfare of the workers. The Contractor shall at his own cost obtain a valid licence for himself and the Employer under the Contract Labour (R & A) Act 1970 and the Contract labour (Regulation and Abolition) Central Rules 1971 and under any other applicable rules before the commencement of the Work and continue to have a valid license until the completion of the Work.
- 54.2. Payment of wages: 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 relevant Central / Local Labour Regulations or as per the provisions of the Contract Labor (Regulation and Abolition) Act 1970 and the Contract Labour Regulation and Abolition of Central Rules 1971, wherever applicable. He shall also abide by the minimum wages and other regulations applicable to the labour engaged in the Work, as laid down by the concerned Central / local authorities (State, District or other local Authorities). In case the contractor fails to pay fare wages as required by the authorities then the Employer/ Engineer-in- Charge shall be entitled to do so and receives such amounts including associated cost incurred by them in doing so from the contractor.
- 54.3. Model Rules: The Contractor shall at his own expense comply with or cause to be complied with, Model Rules for labour welfare framed by Government or other local bodies from time to time for the protection of health and for making sanitary arrangements, Malaria control, etc. for workers employed directly or indirectly on the Work and in the workers hutment area.

- In case the Contractor fails to make arrangements as aforesaid, the Employer shall be entitled to do so and recover the cost thereof from the Contractor.
- 54.4. Safety Codes: In respect of all labour, directly or indirectly employed on the Work for the performance and execution of the Contractor's Work under the Contract, the Contractor shall at his own expense arrange for all the safety provisions as listed in
- (i) Safety codes of Central Public Works Department and Bureau of Indian Standards,
 - (ii) The Electricity Act,
 - (iii) The Mines Act, and Regulations,
 - (iv) Regulations of employment & conditions of service Act 1996, Rules and Orders made there under and such other acts as applicable. Precautions as stated in the safety clauses are of minimum necessity and shall not preclude the Contractor taking additional safety precautions as may be warranted for the particular type of work or situations. Also mere observance of these precautions shall not absolve the Contractor of his liability in case of loss or damage to property or injury to any person including but not limited to the Contractor's labour, the Employer's Consultants, Employer's Representatives and Engineer-in-Charge's representatives or any member of the public or resulting in the death of any of these. Protective gear such as safety helmets, boots, belts, gloves, spectacles, nets, fire extinguishers etc. shall be provided by the Contractor at his own cost to all his manpower at the Site. The Contractor shall impose such requirements on all Sub-Contractors and Vendors also. It shall be the responsibility of the Contractor to ensure that such protective gear is worn at all times by all personnel working at the Site during the term of the Work. The Employer, Engineer, and Engineer's Representative shall each have the right to stop any person not wearing such protective gear from working on the Site.
- 54.5. In case the Contractor fails to make arrangements and provide necessary facilities as aforesaid, the Engineer-in-Charge shall be entitled (but not obliged) to do so and recover the costs thereof from the Contractor. The decision of the Engineer-in-Charge in this regard shall be final and binding on the Contractor.

55. Safety/Site Conditions:

- 55.1. The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and ensure that the methods of carrying out the Work and the Work by the Contractor including his workmen, employees, Sub-Contractors and Vendors meet all the necessary safety standards and requirements. In order to fulfil this obligation the Contractor shall appoint a permanent, full time and suitably qualified safety officer for the Site, who shall be responsible for incorporation, implementation and enforcement of all safety measures and requirements for maintaining safe working conditions, safety of manpower and equipment, general safety and security of Site as per the various safety codes and stipulations mentioned in contract documents. The Contractor shall provide Id-Cards (Identity Cards) to each of his worker with designated number & colour only of the card as directed by the Engineer-in-Charge.
- 55.2. The Contractor has full responsibility for maintaining the Site in good and clean condition and removing all trash and debris on a daily basis to the satisfaction of the Engineer. The Contractor is responsible for providing adequate sanitary facilities and maintaining them in a clean and healthy condition. If any hazardous or obnoxious materials (as defined by Indian law) are specified for use or are being used by Sub-Contractors or Vendors, the Contractor shall take necessary clearances from concerned departments and keep record of such material and forthwith give written notice to the Engineer-in-Charge and shall ensure that the Sub-Contractors and Vendors, as applicable, use, store and dispose of such hazardous or obnoxious materials strictly in accordance with all applicable laws.
- 55.3. Additional Safety Regulations: The Contractor shall continuously maintain adequate

protection for the Work against fire and other hazards and shall protect the Employers /Engineer-in-Charges property from damage or loss during the performance of this Contract. The Contractor also shall adequately protect property adjacent to the Work. The Contractor shall take all necessary precautions for the safety of its employees, Subcontractors and the Vendors performing the Work and later phases of the Work and shall comply with all applicable safety laws and regulations to prevent accidents or injury to persons on, about, or adjacent to the Site. The Contractor shall be responsible for coordinating a safe working programme with the Field Engineer. Such a programme shall include, and the Contractor shall be responsible for maintaining, the following safe working conditions and practices:

- a) All combustible material, food matter, garbage, scrap, and other debris generated during the performance of the Work shall be collected and removed from the Site on daily basis. Arrangements for scrap disposal should be discussed with Field Engineers.
- b) An adequate number and type of fire extinguishers and sand buckets shall be provided at the Site for fire control and shall be kept/maintained in satisfactory and effective working condition, at all times.
- c) The Contractor and its employees, labourers and subcontractors shall strictly obey all "No Smoking" restrictions.
- d) The Contractor shall not operate or use or manipulate utilities already established at the Site without the Engineer- in-Charge's prior written approval.

55.4. Safety with regard to site and housekeeping: - The contractor shall depute a dedicated team of adequate number of workers under the responsibility of the Safety In charge for carrying out the safety and housekeeping work at site on daily basis. Following shall be ensured by the Contractor and his safety & housekeeping team:

- a) The use of intoxicants or unlawful drugs at the Site, in any degree, shall be strictly prohibited. The Contractor shall rigorously enforce this regulation.
- b) When overhead work is in progress in or around an occupied area, signs to denote such work prominently displaying "Overhead Work" shall be used and a barricade shall protect the area. Safety nets and appropriate catchments provisions shall be provided at suitable levels so as not to allow any material to fall on the ground.
- c) Dusty work, such as concrete breaking or demolition, in or near occupied areas, shall proceed only after wetting down the area and taking steps necessary to prevent dust from penetrating occupied areas and creating nuisance.
- d) Care shall be taken not to block any door, passageway, and safety exit, firefighting equipment, or safety equipment with materials or equipment.
- e) Materials must be piled, stacked, or stored in a neat and orderly manner. All stacking in the site, whether inside or outside a building, shall be parallel to or at right angles to the building line or fence. The stacking of materials shall be organized on daily basis.
- f) When noisy operations of a prolonged nature are necessary in or near an occupied area, arrangements must be made with the Engineer-in-Charge for scheduling to minimize any nuisance in the occupied area.
- g) All critical and dangerous locations / areas at site shall be marked with caution signs, indications and directions in the form of well-designed and uniform signage, the design of signage shall be approved by the Engineer-in- Charge.

55.5. The contractor should provide required number of male and female clean toilets along with every day drinking water facility for the labour

56. Child Labour:

56.1. The Contractor shall not employ any labour less than 18(eighteen) years of age on the job. If

female labour is engaged, the Contractor shall make necessary provisions at his own expense for safeguarding and care of their children and keeping them clear of the Site. No children shall be permitted at the Site.

57. Contribution towards workers/employee benefits, fondest

- 57.1. The Contractor shall include in the Contract Price all expenses necessary to meet his obligations for making contributions toward employee benefits funds (Such as provident fund, Employees State Insurance benefits, ESI, old age pension and/or any other benefits/compensation legally payable) in compliance with all the statutory regulations and requirements. All records in this connection shall be properly maintained by the Contractor and produced for scrutiny by the concerned authorities and the Engineer-in-Charge and the Employer whenever called for.
- 57.2. Labor welfare fund has to be paid by the client based on the prevailing laws

58. Setting out and site surveys

- 58.1. The Contractor shall establish, maintain and assume responsibility for all bench marks and grid lines, and all other levels, lines, dimensions and grades that are necessary for the execution of the Work, in conformity with the Contract Documents. The Contractor shall establish his relation to the permanent benchmarks and boundary lines established at the Site. The Contractor shall verify and co-relate all the survey data available at the Site before commencing the Work and shall immediately report in writing any errors or inconsistencies to the Field Engineer. Commencement of Work by the Contractor shall be regarded as his acceptance of the correctness of all survey and setting out data available at the Site and no claims shall be entertained or allowed in respect of any errors or discrepancies found at a later date. If at any time error in this regard appears during his progress of the Work, the Contractor shall at his own expense rectify such error to the satisfaction of the Engineer-in-charge. The approval by the Engineer-in- Charge of the setting out by the Contractor shall not relieve the Contractor from any of his responsibilities, obligations, and liabilities under the Contract.
- 58.2. The Contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignment for all levels and dimensions and for the correctness of every part of the Work, and he shall rectify effectively any errors or imperfections therein. All such rectifications shall be carried out by the Contractor at his own cost and to the instructions and satisfaction of the Engineer-in-Charge
- 58.3. The Contractor shall employ qualified surveyors to carry out all the surveys and setting out works.

59. Drawings, specifications, interpretations etc.

- 59.1. The drawings included/available with the tender are to be used for general guidance only. These drawings are broadly indicative of the work to be carried out. These drawings are not the "Construction Drawings" and details indicated there in are for guidance only and are liable to be modified by the Engineer-in-Charge during course of actual construction. No claim whatsoever shall be admissible on account of changes that may be introduced later by the Engineer-in-Charge.
- 59.2. In general, the Drawings shall indicate the dimensions, positions and type of construction, the Specifications shall stipulate the quality and the methods and performance criteria, and the Schedule of Rates shall indicate the rates for each item of work for evaluating change orders. However, the above Contract Documents being complementary, what is called for by any one shall be binding as if called for by all. Wherever there is a discrepancy between drawings and specifications, the drawings shall be followed. In interpreting the specifications,

the following order of decreasing importance shall be followed:

- i. Bill of Quantities
- ii. Technical Specifications
- iii. Drawing
- iv. CPWD/MoRTH/IRC Specifications.
- v. Indian Standard Specification of BIS

- 59.3. Matters not contained in the specifications and in case of any ambiguities in written specifications of the contract, the works shall be executed as per relevant Bureau of Indian Standards codes and Central Public Works Department specifications MoRTH specifications and IRC specifications in the above order of preference. If such codes have not been framed, the decision of the Engineer-in-charge shall be final. Any work indicated on the Drawings and not mentioned in the Specifications or vice versa, shall be deemed as though fully set forth in each. Work not specifically detailed, called for, marked or specified shall be the same as similar parts that are detailed, marked or specified. From time to time during the progress of the Work, the Contractor will be issued with revisions of Drawings and written instructions by the Engineer-in- Charge in connection with and necessary for the proper execution and completion of the Work. All such revisions of Drawings and written instructions shall be part of the Contract Documents and the Contractor shall be bound to carry out the work that is shown and detailed on all such Drawings and shall be bound to follow and comply with all such instructions.
- 59.4. It shall be the responsibility of the Contractor to ascertain and ensure that all the Work is carried out in accordance with the latest revisions of the Drawings issued to him. Should the Contractor fail to do this, all the rectifications and remedial work that may be required to conform to the latest revisions of the Drawings shall be at the Contractor's expense.
- 59.5. Wherever it is mentioned in the Conditions of Contract, Specifications, and other Contract Documents that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost, unless otherwise provided in the Documents.
- 59.6. No deviations shall be made by the Contractor, in the execution of the Work from the Drawings, Specifications, and other Contract Documents. Only the Engineer-in-Charge/Project consultant shall issue interpretations and clarifications.
- 59.7. The Contractor shall immediately in writing bring any errors or inconsistencies in the Drawings and Specifications to the attention of the Field Engineer for interpretation or correction before proceeding with the affected portion of the Work, and no claims or losses alleged to have been caused by such discrepancies shall be entertained or allowed at any stage. Local conditions, which may affect the Work, shall likewise be brought to the Field Engineer's attention at once. If at any time it is discovered that work, which has been done or is being done is not in accordance with the approved Drawings and Specifications, the Contractor shall correct the work immediately. Correction of such work shall be at the expense of the Contractor and shall not form a basis for any claims for payment or extension of time. The Contractor shall carry out all the rectification work only after obtaining approval for the same from the Engineer-in-Charge.
- 59.8. No scaling of any Drawing shall be done to obtain the dimensions. Figured dimensions on the Drawings shall be used for carrying out the Work. Drawings with large-scale details shall take precedence over small scale Drawings. Where any Drawings and details have not been provided but are necessary for the execution of the Work, it shall be the responsibility of the Contractor to seek these drawings and details in writing from the Engineer- in-Charge at least four weeks prior to the latest date by which the Contractor needs these drawings and details to suit the programmed execution of the Work. No extension of time shall be allowed for any

- delays caused due to the Contractor's failure to seek such details.
- 59.9. Drawings, Schedule of Rates, Specifications, and other Contract Documents, and all copies thereof furnished by the Engineer-in-Charge shall become the Employer's property. They shall not be used on any other work and shall be returned to the Employer at his request or at the completion of the Contract.
- 59.10. Shop drawing has to be prepared by corresponding MEP contractor as per corresponding site condition and execution approval obtained from NS Engineer or consultant
- 59.11. Before preparing the shop drawing approval of the product and material obtained from NS Engineer or consultant

60. Overtime work

- 60.1. If it is necessary for the Contractor or any Sub-Contractor to work on other than working days or outside the normal working hours in order to keep up to the time schedule and meet the Construction Programme, the Contractor shall obtain the prior approval of the Engineer-in-Charge in writing, which approval shall not be unreasonably withheld. The additional cost of wages and any other costs incurred as a result of overtime or any shift work (except supervision expenses incurred by the Employer) shall be borne by the Contractor.

61. Contractor Supplied material

- a) All the materials including reinforcement steel, cement, aggregate etc. shall be procured by the contractor. Quoted rate to include labour, basic cost of material, cost of accessories, taxes, payment to suppliers, transportation, handling, storage, safety, wastage, accounting and reconciliation and to provide and any other documents/formalities for purchase of materials, cost of electricity, water, and other taxes payable and Contractor's overheads and profits etc.
- b) The materials shall be fully accounted for by the Contractor as required hereinafter. In accounting for the materials with allowances to cover all wastages and losses that may have been incurred in the process of handling, storing, cutting, fabrication, fixing and installing. The contractor shall submit statement of account and reconciliation of material lying in Contractor's stores along with each Running Account Bill and consolidated statement of reconciliation along with Final Bill.
- c) The Contractor shall, at all times when requested, satisfy the Engineer-in-Charge by the production of records or books or submissions of returns that the materials are being used for the purpose for which they are procured and the Contractor shall at all times keep the records updated to enable the Engineer-in-Charge to apply such checks as he may desire to impose. The Contractor shall, at all times, permit the Engineer-in-Charge to inspect his warehouse. The Contractor shall not, without prior written permission of the Engineer-in-Charge, utilize or dispose of the materials for any purpose other than intended in the Contract.

62. Materials and workmanship:

- a) The Contractor shall be responsible for the establishment of a full and comprehensive quality control system for the Work. The system shall include, but not be limited to, the means of controlling the testing and receipt of materials, the inspection of the work, the filing and ordering of drawings and correspondence and the duties and responsibilities of staff members.
- b) All materials and equipment to be incorporated in the Work shall be new unless there is specific provision in the contract for reusing old good quality material. The materials, equipment, and workmanship shall be of the best quality of the specified type, in conformity with Contract Documents and the best engineering and construction practices,

and to the complete satisfaction of the Engineer-in-Charge. This requirement shall be strictly enforced at all times and stages of the Work and no request for change whatsoever shall be entertained on the grounds of anything to the contrary being the prevailing practice. The Contractor shall immediately remove from the Work any materials, equipment and/or workmanship which, in the opinion of the Engineer-in-Charge, are defective or unsuitable or not in conformity with the Contract Documents and best engineering and construction practices, and the Contractor shall replace such rejected materials, equipment and/or workmanship with proper, specified, required and approved materials, equipment and/or workmanship, all at his own cost within a period of seven (7) days from the date of issuance of such notice.

- c) The Contractor shall, whenever required to do so by the Engineer-in-Charge, immediately submit satisfactory evidence and necessary test results as to the kind and quality of the materials and equipment.

63. Special makes or brands:

- a) Where special makes or brands are called for, they are mentioned as a standard. Others of equivalent quality may be used provided that Engineer-in-Charge considers the substituted materials as being equivalent to the brand specified, and prior approval for the use of such substituted materials is obtained in writing from the Engineer-in-Charge.
- b) Unless substitutions are approved by the Engineer-in-Charge in writing in advance, no deviations from the Specifications and other Contract Documents shall be permitted, the Contractor shall indicate and submit written evidence of those materials or equipment called for in the Specifications and other Contract Documents that are not obtainable for incorporation in the Work within the time limit of the Contract. Failure to indicate this in writing will be deemed sufficient cause for denial of any request for an extension of time and /or additional cost because of such circumstances.
- c) Alternative equivalent brands if suggested by the Contractor during construction may be considered if approved brand is not available in market, provided the suggested brand fully meets the requirements and is acceptable to the Engineer-in-Charge.

64. Certificates:

The Contractor shall furnish, at his own cost, test certificates, calibration certificates for the various materials and equipment as called for by the Engineer-in-Charge. Such test certificates should be for the particular consignment/lot/piece as decided by the Engineer-in-Charge. The details in respect of the test and calibration certificates shall be as decided by the Engineer-in-Charge for the relevant items.

65. Construction programme.

- 65.1. The contractor should furnish an overall construction programme for the approval of the Engineer-in charge before the start of the works. The construction programme shall clearly show all the sequential activities of work required to be carried out from the commencement of the Work up to the Virtual Completion.
- 65.2. The construction programme shall be based on the mutually agreed milestones.
- 65.3. Every month, or sooner if required by the Engineer-in-Charge, the approved programme charts shall be reviewed in relation to the actual progress of the Work, and shall be updated as necessary. If at any time it appears to the Engineer-in-Charge that the actual progress of the Work does not conform to the approved programme, the Contractor shall produce, at its expense and without reimbursement therefore, a revised programme showing the modifications to the approved programme and the additional input of resources by the Contractor necessary to ensure completion of the Work within the time stipulated for

completion.

- 65.4. The submission to and approval by the Engineer-in-Charge of such programmes or the furnishing of such particulars shall not relieve the Contractor of any of his responsibilities, obligations and liabilities under the Contract.

66. Protection works.

- 66.1. The Contractor shall take full responsibility for the proper care and protection of the Work from commencement of work until completion and handing over of the Work to the Assistant Engineer at no additional cost. The Contractor shall protect and preserve the Work in every way from any damage, fire or accident, including by providing temporary roofs, boxing or other construction as required by the Engineer-in-Charge. This protection shall be provided for all property on the Site as well as adjacent to the Site. The Contractor shall adequately protect, to the satisfaction of the Engineer-in-Charge, all the items of finishing work to prevent any chipping, cracking, breaking of edges or any damage of any kind whatsoever and to prevent such work from getting marked or stained or dirty. Should the Contractor fail to protect the Work or any part thereof and should any damage be caused to the same, the Contractor shall be responsible for all replacement and rectification, as directed by the Engineer-in-Charge, and all costs and expenses in connection with such replacement and rectification shall be to the account of the Contractor and shall be borne by him.
- 66.2. The Contractor shall in connection with the Work provide and maintain at his own cost all lights, security guards, fencing and anything else necessary for the protection of the Work and for the safety of the public and everyone associated with the Work, all to the approval and satisfaction of the Engineer-in-Charge.
- 66.3. All operations necessary for the execution of the Work shall be carried out so as not to interfere with the convenience of the public, or with the traffic, or the access to, use and occupation of public or private roads and footpaths or of properties whether in the possession of the Employer or of any other person. The Contractor shall save harmless and indemnify the Employer & Engineer-in-Charge in respect of all claims, proceedings, damages, costs, charges, and expenses whatsoever arising out of or in relation to any such matters.

67. Cleaning of works and clearing offsite:

- 67.1. The Contractor shall maintain the Site, adjoining areas within 20 meters all around site and all Work thereon in neat, clean and tidy- conditions at all times. The Contractor shall remove all rubbish and debris from the Site and adjoining areas on daily basis and as directed by the Field Engineer. Suitable steel skips shall be provided at strategic locations around the Site to receive waste and packaging materials.
- 67.2. Just prior to the Virtual Completion of the Work, or whenever so directed by the Engineer-in-Charge, the Contractor shall carry out all the work necessary to ensure that the Site & 20 meter area all around site is clear and the Work are clean in every respect, the surplus materials, debris, sheds and all other temporary structures are removed from the Site, all plant and machinery of the Contractor are removed from site, the areas under floors are cleared of rubbish, the gutters and drains are cleared, the doors and sashes are eased, the locks and fastenings are oiled, all electrical, plumbing and other services are tested and commissioned, the keys are clearly labeled and handed to the Engineer, so that at the time of Virtual Completion the whole Site and the Work are left fit for immediate occupation and use, to the approval and satisfaction of the Engineer-in-Charge and the Employer.
- 67.3. The proposed construction site is very actively functioning hospital. The contractor has to ensure protective measures with 3m height MS sheet fabricated metal screen totally around the site
- 67.4. Above 3m a horizontal stable net may be tied and fixed well to prevent falling

68. Settlement of disputes

- 68.1. Arbitration shall not be a means of settlement of any dispute or claim out of this contract. All disputes and differences arising out of the contract may be resolved through discussions between the Employer and the Contractor within the purview of the contract agreement. If such discussions are not fruitful, the disputes shall be settled through arbitration as per the Arbitration and conciliation Act 1992.

69. Retention amount

- 69.1 An amount equivalent to 10% of the gross RA bill amount shall be retained as security in the form of retention money from each RA bill aggregating to a total of 50 lakhs.

Part III : SPECIAL CONDITIONS OF CONTRACT

1. General

- 1.1. The Special Conditions of Contract are an extension of and are to be read in conjunction with the General Conditions of Contract. Should there be any contradictory requirements in the two, the requirement as per the Special Conditions of Contract shall prevail.

2. Reference drawings

- 2.1. The Contractor shall maintain on site one set of all Drawings issued to him for reference.

3. Completion drawings (As Built) & Measurement books

- 3.1. On completion of the Work, the Contractor shall submit three (3) complete sets of drawings and marked up prints of "AS BUILT" drawings verified and approved by the Engineer-in-Charge. These drawings shall include and show all the changes / deviations made from the working drawings during the course of construction and also the other details as called for by the Engineer-in-Charge. During the execution of the Works a set of drawings prepared initially shall be retained in the Contractors Site Offices for the exclusive purpose of recording changes made to the Work as the construction proceeds. The drawings shall be prepared on computer through CAD Software and provided to the Engineer-in- Charge as hard and soft copy.
- 3.2. Along with the completion drawings the Contractor shall also prepare and submit to the Engineer-in-Charge, a complete set of all final measurement of works in the form of bound measurement books and a soft copy of the same. Measurement Books shall incorporate the standard measurements of the items as per the completion / as built drawings in modules finalized in consultation with the Engineer-in- Charge.

4. Testing of installations:

- 4.1. All water retaining structures and the basement shall be tested as specified for the waterproof qualities, in the presence of the Engineer-in- Charge or his authorized representative. The Contractor shall also perform all such tests as may be necessary and required by the Engineer-in-Charge to ensure quality of the executed works. The Contractor shall provide all labour, equipment, and materials etc., required for the performance of the tests.

5. Quality assurance and Quality Control

- 5.1. The Contractor shall establish an effective quality control system at the Site and implement the same through an independent team consisting of qualified and experienced Engineers and technical personnel to enforce quality control on all items of the Work at all stages. Generally the following are to be noted regarding the quality control of the works in this contract.
- 5.2. Quality control of various items in this Work shall be governed by the provisions of standard quality control procedure as per relevant codes of practice. Contractor has to submit a quality control plan for the whole work for approval before commencement of the work. The Contractor is to mobilize technical personnel who are well versed with quality control tests and other guidelines stipulated in the QC manual plan.
- 5.3. The selected Bidder shall establish site laboratories with required facilities.

- 5.4. Being the agency entrusted with execution of the Contract, the primary responsibility for ensuring quality of each item of work in this Contract is vested with the Contractor. Engineer-in charge or his Representatives shall issue guidelines as and when required for ensuring Quality Control, which the Contractor has to follow.
- 5.5. The Engineer and his Representatives shall have the right to direct Contractor to remove materials supplied which do not conform to standards specified. 5.6. Third party tests, if approved by the Engineer-in charge shall be arranged by the Contractor in an approved laboratory as directed by the Engineer-in-charge. It is desirable that the test shall be done in the presence of the representatives of the Engineer-in charge and the Contractor to eliminate any further disputes. The expenses shall be met by the Contractor. The result obtained in the test shall be final and binding on both the Contractor and the Employer.
- 5.7. Wherever specified, the contractor shall also obtain manufacture's test certificate from the manufacturer/dealer and submit the same before executing the items listed in such certificates. Contractor shall be responsible for the genuineness of the Manufacturer's Test Certificate obtained and submitted by him. Contractor shall record a statement in the Manufacturer's Certificate that *"This Certificate for supply of (Name of material with item no in BOQ) has been obtained by me from.....(Name and address of Manufacturer/Dealer) on..... (Date of receipt of certificate) for the actual materials supplied at site* "The rate quoted by the Bidder shall include all expenses for carrying out the first tier quality control tests. Expenses for third party tests as detailed in clause 7.4 of the introduction to QC Manual, if required, shall also be borne by the Contractor.

6. Drilling, cutting etc.

- 6.1. All cutting and drilling of walls or other elements of the building or structure for the proper entry/installation of inserts, boxes, equipment, etc. shall be carried out using electrically operated tools only. Manual drilling, cutting, chiselling, etc. shall be permitted with the written approval of Agreement authority. No structural member shall be cut or chased without the written permission of the Engineer-in-Charge. Cutting and drilling of structural members shall be carried out using vibration free diamond wire sawing and diamond drilling only with prior permission from the Engineer-in- Charge. The costs for procurement and using such equipment are deemed to be included in the Contract and no extra costs will be paid.

7. Approval by statutory bodies:

- 7.1. The Employer will handle commencement Certificate, No Objection Certificate and Occupation Certificate if applicable under this Contract. The contractor shall be responsible for providing required notices to authorities and to obtain and retain with him at his own cost all other approvals from the statutory bodies pertaining to works under this tender and temporary structures to be constructed at site or equipment to be erected, labour, Employee Insurance, Provident Funds, Tax Departments. Etc. and any other approval required to facilitate performance of Contractor's work under the Contract till completion. Refusal by statutory authorities to issue any certificate or any other approvals due to the Contractor's failure to observe the relevant rules and regulations in connection of the construction in accordance with the sanctioned plans and/or specifications shall render the Contractor liable for damages and in addition, render him liable to obtain such certificates at his cost.

8. Name board and publicity

The Contractor shall display at site a name board showing the details of works, built up area, name of Client, Architect, Consultant / PMC, as directed by the Architect / Consultant / PMC

9. Water and Electricity

- 9.1. Contractor shall make his own arrangement for electricity and water for construction purposes. The water used for construction purpose shall be potable and tested once in every 6 (six) months. The source of water shall be approved by the Engineer-in-charge.
- 9.2. The contractor shall arrange the water good for construction and personal use at his own cost and shall be responsible for all further connections, pumps, pipes, storage facilities and all other things necessary to distribute and use services from this distribution point.
- 9.3. The electricity required for Construction Work shall be arranged by the Contractor from the authorities and/ or generators provided at the site at his own cost. Contractor shall be responsible for all distribution points as may be required for the Work. The Contractor shall also make arrangement for alternative standby services at his own cost in the form of additional Generators of adequate capacity (day and night) so that there is no delay in progress of Work as per construction schedule submitted by him and approved by the Engineer-in-Charge. Contractor shall ensure adequate capacity of generators to support such load sharing with other vendors.
- 9.4. All statutory Fees, & miscellaneous expenses and costs for electric power and Water connection for construction purposes shall be borne by the Contractor.

10. Price Adjustment this is same as Cl.33 of GCC (can be deleted)

No other price adjustment for other materials and other compounds shall be allowed.

- 10.1. The basic price of cement and steel shall be Rs:-470 per bag of cement and Rs: - 75000 per MT of steel. Price fluctuation up to 15% of the basic rate shall be to the contractors' account. In case of variation above 15%, the excess over and above the 15% shall be reimbursed to the contractor. Proper records (Invoice copies) have to be produced to the engineer-in-charge for sub standing any claims on this account. In case of negative variation, the variation beyond 10% will have to reimburse to the client. No other claims for price escalation will be entertained and the rates shall remain firm until completion of the work.

11. Sub-Contracting

- 11.1. No subcontracting shall be done without prior written approval of Agreement Authority. Maximum value of works to be sub-contracted is limited to 25% of Contract value except MEP woks. The value of a sub- contract and Provisional Sums items as and when awarded, should be intimated by the Contractor to the Engineer-in charge and it should also be certified that the cumulative value of the sub-contracts awarded so far is within the aforesaid limit of 25%. A copy of the contract between the Contractor and Sub-Contractor shall be given to the Engineer within 15 days of signing and in any case 7 days before the Sub Contractor starts the Work and thereafter the Contractor shall not carry any modification without the consent in writing of the Engineer. The terms and conditions of sub-contracts and the payments that have to be made to the sub- contractors shall be the sole responsibility of the Contractor. Payments to be made to such sub- contractors will be deemed to have been included in the Contract price. However, for major sub-contracts (each costing over Rs 50 lakhs), it will be obligatory on the part of the Contractor to obtain consent of the Engineer. The Engineer will give his consent after assessing and satisfying himself of the capability, experience and equipment resources of the sub-contractor. In case the Employer intends to withhold his consent, he should inform the Contractor within 15 days to enable him to make alternative arrangements to fulfil his programme.
- 11.2. The Contractor shall provide sufficient superintendence, whether on the site or elsewhere, to ensure that the work to be carried out by a sub- contractor complies with the requirements of the Contract.

- 11.3. The proposed sub-contract terms and conditions shall impose on the sub-contractor such terms of the Contract as are applicable and appropriate to the part of the Works to be sub-contracted, to enable the Contractor to comply with his obligations under the Contract.
- 11.4. Notwithstanding any consent to sub-contract given by the Engineer, if in his opinion it is considered necessary, the Engineer-in-charge shall have full authority to order the removal of any sub-contractor from the Site or off-Site place of manufacture or storage.

12. Specialized Works to be carried out by licensed persons/firms:

- 12.1. For MEP work or HVAC OR FIRE work, the quality and competency of the above specialized work contractor has to be proved 30 days before the commencement of work with proper document and testimonial

13. Contractor's temporary works design

- 13.1. The Contractor shall, prior to commencing the construction of any temporary Works like earth protection works for deep excavations, temporary platforms /form works for heavy concreting etc., submit a certificate to the Engineer signed by him certifying that the temporary Works have been properly and safely designed and checked to carry the intended load without failure and that the Contractor has checked the effect of the Temporary Works on the Permanent Works and has found this to be satisfactory. The Employer and the Engineer shall not be responsible for any failure of such temporary structures and the Contractor is bound to take care of all expenses related to such failures, its rectification and subsequent remedial measures if any at no extra cost.

14. Contractors Technical Personnel at site

- 14.1. The contractor shall employ Technical personnel in addition to other supporting staff as detailed below for tenure of the contract for works supervision depending upon the cost of work.
- a) For works, Estimated cost from Rs.500 lakhs to Rs.10 Crores Project Manager- 1no. (Civil Engineering Graduate with minimum 5 years experience)
 - ii. Site Engineer - 2 nos (1 no for supervision and 1 no for Quality Control) - (Civil Engineering graduate with minimum 2 years experience)
 - iii. Supervisor - 2 nos (Civil Engineering Diploma holder with minimum 1 year experience)
 - iv. Supervisor (Mechanical) (if required) - 1 no (Mechanical Engineering Diploma holder with minimum 1 year experience)

15. Contractors Equipment at site

- 15.1. The contractor shall own/hire/deploy the required tools and plants as specified in the Contract data for the satisfactory execution of the work

16. Advance Payments

- 16.1. Mobilization Advance
- i. This clause shall be applicable only when so provided in 'Contract Data'.
 - ii. Mobilization advance, shall be 10% of the Contract price for civil works and shall be in two or more installments. The first instalment of such advance shall be released by the Engineer-in-charge to the contractor on a request made by the contractor to the Engineer-in-Charge in this behalf on signing of the agreement. The second and subsequent installments shall be released by the Engineer-in-Charge only after the contractor furnishes a proof of the satisfactory utilization of the earlier instalment to the entire satisfaction of the Engineer-in-Charge and on successful completion of site mobilization including concrete batching plant,

concrete pump, tower crane, shuttering and staging materials, site office, site laboratory, survey equipment etc to the entire satisfaction of the Engineer in charge..

- iii. Before any instalment of advance is released, the contractor shall execute an unconditional Bank Guarantee from a Nationalized or Scheduled Bank for the amount equal to the amount of advance and valid for the contract period. This Bank Guarantee shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery.

16.2. Mobilization advance shall be deducted from the forthcoming immediate interim payments onward at pro rata at 10% from each bills. The entire advance shall be recovered when 85% of contract price is reached.

16.3. Secured Advance for non-perishable materials (Applicable only for MEP Works)

- a) The contractor, on signing an indenture in the form to be specified by the Engineer in- Charge, shall be entitled to be paid during the progress of the execution of the work up to 60% of the assessed value of any materials which are in the opinion of the Engineer-in- Charge non-perishable, non- fragile and non- combustible and are in accordance with the contract conditions and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered/deducted from the next payment made under any of the clause or clauses of this contract.
- b) Secured advance, if paid, shall be recovered from each succeeding interim payment to the extent materials have been incorporated into the Works.
- c) Contractor have to submit a procurement plan for the above material for approval of the engineer prior to placing supply of orders.
- d) Warranty for Equipment such as DG set, Chiller etc., shall be procured by the contractor and warranty shall be made in favour of the client.

PART IV : TECHNICAL SPECIFICATION

A. TECHNICAL SPECIFICATIONS FOR RCC PILE FOUNDATIONS

A. Unless otherwise stated, the quantity of the materials and specifications for the work shall conform to the latest I.S. specifications. If both these specifications are not applicable to any items, it shall be decided by the Architect/ Engineer in-charge, with the concurrence of the EMPLOYER as per the general Engineering practice, whose decision shall be final and binding on the contractor

1. The scope of work is for providing and Testing of Rotary drilling Bored Cast-in-situ RCC pile foundation/DMC Pile.
2. The piles will have to be founded on hard rock as per the design. Minimum anchorage in hard rock should not be less than 300mm or as per the design of structural engineer.
3. Removal of obstruction if any, met with during pile driving or boring shall also be done by the contractor. No extra payment will be made for this work.
4. The pile shall be bored, cast-in-situ.
5. Boring of pile shall be permitted in a group pile after 24 hours from the time of casting of last pile.
6. The execution of pile foundation shall conform to IS 2911 (Part 1/Section 2)1985 with latest amendments and southern railway specification of works. All the Piles shall be of the same type and shall be built to carry the heaviest load.
7. Vertical load testing of piles shall be carried out as per procedure laid down in IS Code of practice for design and construction of pile foundation.
8. The test shall be considered satisfactory if the safe load from the vertical load test with settlement not exceeding 12mm works out to be not less than one and half times safe bearing capacity of the pile.
9. If the pile or the pile group doesn't satisfy the above condition for accepting the same as satisfactory, the corrective measures shall be carried out as directed by the engineer in charge. The additional expenditure incurred by contractor for such corrective measures shall be borne by the contractor himself.
10. The base line for the building will be given by the EMPLOYER and further lining out work will be carried out jointly. Each pile point will be approved by the EMPLOYER / CONSULTANT prior to commencement of boring and also prior to commencement of concreting so that there will not be any question of piles going out of centre.
11. Normal tolerance for out of centre and out of plumpness as specified in I.S. Code of practice shall be allowed for.
12. The rates should include for boring through hard strata, boulders, masonry, old foundations etc. and in case the same are met with no additional payment will be made.
13. All reinforcement as per finally approved designs and drawings and as actually placed in the piles/ concreting works including reinforcement, projecting in cap, laps, pins, chairs, hooks etc. be measured and paid.

14. The quantities indicated in the enclosed schedule are tentative and all work as per finally approved designs and drawings and as actually carried out at site shall be measured and paid.
15. Utmost care should be taken not to cause any damages to the foundations as well as superstructure of the adjoining structures.

16. Removal of Rigs

The contractor should retain at least ONE RIG with accessories at site till the Centre line of all piles are checked and verified by the CONSULTANT.

B. METHOD OF CONSTRUCTION OF BORED CAST INSITU PILE WITH THE USE OF BENTONITE SLURRY-(FOR DIRECT MUD CIRCULATION METHOD)

1. Initial boring of about 1.5/2.0 meters is to be done using the bailer. Temporary guide casing is then lowered in the bore hole. The diameter of cutting tool/chisel will be 7 cms. to 8 cms. less than the outside diameter of casting / guide pipe. The working ground level should be minimum 1.5 meters above water table / high tide level.
2. The centre line of guide casing should be checked with respect to the reference points before continuing further boring.
3. The bore hole is then filled with bentonite slurry fed from bentonite installation. The specifications for bentonite and bentonite slurry are as under.
4. Use of drilling mud (Bentonite) in stabilizing the sides of the bore holes is permitted wherever necessary. The contractor cannot claim any extra cost on account of the use of Bentonite for piling.
5. All bored materials and surplus used bentonite slurry will have to be carted away to any area arranged by the contractor at his own risk and cost.
 - a. Bentonite powder used in the process should be tested for its liquid limit, and liquid limit should be more than 300%. Sand content in bentonite slurry should not be more than 7%. The purpose of limiting the sand content has no major technical importance. It is mainly to control and reduce the wear and tear on the pumping equipment.
 - b. Bentonite solutions should be made by mixing it with fresh water using pump for circulation. The density of the solution should be 1.05 to 1.10 depending on the site condition and the viscosity tested by marsh cone should be approximately 35 second.
6. Bentonite slurry is pumped by high pressure reciprocating pumps/ verticals pumps into the bore hole through the cutting tool and the same is allowed to overflow the bore. The material which comes out along with bentonite slurry is passed through channels and is collected in sediment tanks where sediments settle and bentonite can be reused. If necessary, the bentonite may be passed through decanter to remove sand particles before it is reused.
7. After the founding strata are reached the bore hole is flushed by bentonite slurry with direct mud circulation chisel till the residue from the bore holes are flushed out completely. The pumping for the flushing is done by use of mud circulation pump. During flushing the chisel is kept resting on the founding strata to remove all the loose sediments which might have accumulated on the founding strata. The direct mud circulation chisel and connecting rods are removed from the bore hole thereafter.

8. Reinforcement bars may be tack welded to rings to provide more rigidity to the cage. Roller cover blocks may be provided to the cage to approximately 2 meters intervals and suitably staggered.
9. Reinforcement cage in suitable lengths is then lowered.
10. Before concreting, the bore is once again flushed by bentonite slurry through tremie to ensure that the bottom is cleaned after placing the reinforcement.

C. METHOD OF CONCRETING OF PILES CONSTRUCTED WITH THE USE OF BENTONITE SLURRY.

The method of concreting adopted is with the use of tremie as indicated below

- 1) The concreting is to be done by tremie, the tremie diameter being minimum 200mm.
- 2) The concrete mix should have a slump of about 150 to 180 mm and maximum aggregate size should not exceed 20/25 mm.
- 3) The concreting of piles will be carried out with the design of the structural consultant as per the mix design cement content with minimum cement content of 400 kg/m³. The details of which is mentioned elsewhere.
- 4) When the bore has reached its final depth, it shall be free from any foreign matter before the placing of reinforcement and concrete filling for the pile is started. The reinforcement for the pile shall be carefully placed in position and concreting then started.
- 5) Before pouring the concrete through tremie, the bottom of the concreting funnel should be closed with a steel plate. After the funnel is filled with concrete the plate is removed and concrete is discharged. Thereafter, concreting is done in a continuous manner up to the required level. It should always be ensured that the bottom of the tremie pipe is minimum 2 meters within concrete to avoid mixing of the fresh concrete with bentonite slurry. Concreting is to be filled approximately 600 to 900 mm above the cut of level, so that good concrete will be available at the cut of level. In case the cut off level of the pipe is the same as the top of guide casing, then the concrete should be allowed to overflow till good concrete is visible.
- 6) The quantity of concrete required for the depth of the particular pile shall be calculated on the spot and checked with the actual quantity of used.
- 7) The concrete will be machine mixed.
- 8) The Concrete is to be placed in the pile only by tremie method ensuring that tip of the tremie is at least 500mm below the top of concrete at any time.
- 9) After concreting up to the required level is done, the guide casing is withdrawn.

B. TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

1. GENERAL

- 1.1. The specifications and mode of measurements for Building works shall be in accordance with Central Public Works Department (CPWD) Specifications 2009 Volumes I and II and Kerala PWD Manual and that for Road and Bridge works shall be in accordance with MoRTH/IRC specifications with up to date correction slips unless otherwise specified in the nomenclature of individual item or in the individual item specification in the Bill of Quantities.

The entire work shall be carried out as per the above specifications in force with up to date correction slips issued up to the date of opening of tender.

- 1.2. The work shall be executed as per latest relevant standards/codes published by B.I.S. (formerly ISI) inclusive of all amendments issued thereto or revision thereof, if any, up to the date of opening of tenders.
- 1.3. In case of B.I.S. (formerly I.S.I) codes/specifications are not available, the
- 1.4. The work shall be carried out in accordance decision of the Engineer based on standards prescribed by ASTM, BS, DIN, AASHTO and similar organizations or acceptable sound engineering practice and local usage shall be final and binding on the contractor. However, in the event of any discrepancy in the description of any item as given in the bill of quantities or specifications appended with the tender and the specifications relating to the relevant item as per specifications mentioned above, or in drawings the former shall prevail. with the design and drawings furnished by the Employer. The drawings shall have to be properly co-related before executing the work. In case of any discrepancy noticed between the drawings, final decision, in writing of the Engineer shall be obtained by the contractor. For items, where so required, shall be clarified before starting the particular items of work for prior approval of the Engineer and nothing extra shall be payable on this account.
- 1.5. Only articles classified as "Premium/First Quality" by the manufacturers shall be used unless otherwise specified. First tier Quality Control tests for all materials and work shall be done as per the procedure and frequency detailed by society through the architects. Proper proof of procurement of materials from authentic manufacturers shall be provided by the contractor to the satisfaction of Engineer. Manufacturer's test certificate shall also be produced by Contractor as required in the relevant provisions by society through the architects. The contractor shall carryout Mix Design for all RCC works done by the labs approved by the Government.
- 1.6. In respect of the work of other-agencies deployed in the same site through a separate contract by the Employer for doing work like electrification, air-conditioning, external services, other building work, horticulture work, etc. and any other agencies simultaneously executing other works, the contractor shall afford necessary coordination and facilities for the same. The contractor shall leave such necessary holes, openings, etc. for laying / burying in the work pipes, cables, conduits, clamps, boxes and hooks for fan clamps, etc. as may be required for the electric, sanitary air-conditioning, firefighting, PA system, telephone system, C.C.T.V. system, etc. and nothing extra over the agreement rates shall be paid for the same.
- 1.7. Unless otherwise specified in the bill of quantities, the rates for all items of work shall be considered as inclusive of pumping out or bailing out water if required for which no extra payment will be made. This will include water encountered from any source such as rains, floods, or due to any other cause whatsoever.
- 1.8. Any cement slurry added over base surface (or) for continuation of concreting for bond is added its cost is deemed to have in built in the item unless otherwise/explicitly stated and nothing extra shall be payable or extra cement considered with consumption on this account.
- 1.9. The rate for all items in which the use of cement is involved is inclusive of charges for curing.

- 1.10. The contractor shall clear the site thoroughly of all scaffolding materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer before the work is considered as complete.
- 1.11. Rates for plastering work, if any (excluding washed grit finish on external wall surfaces) shall include for making grooves, bands, chicken wire mesh over joints etc. wherever required and nothing extra shall be paid for the same.
- 1.12. The rates quoted for all brick/concrete work shall be deemed to include making openings and making good these with the same specifications as shown in drawings and/or as directed. No extra payment shall be made to the contractor on this account.
- 1.13. Rates for all concrete/plaster work shall include for making drip course moulding, grooves etc. wherever required and no extra shall be paid for the same.
- 1.14. Rates for flooring work shall include for laying the flooring in strips/as per sample or as shown in drawings wherever required and nothing extra shall be paid for the same.
- 1.15. The drawing(s) attached with the tender documents are for the purpose of tender only, giving the tenderer a general idea of the nature and the extent of works to be executed. The rates quoted by the tenderer shall be deemed to be for the execution of works taking into account the "Design Aspect" of the items and in accordance with the "Construction Drawings" to be supplied to the Contractor during execution of the works.
- 1.16. The quoted rate shall be for finished items and shall be complete in all respects including the cost of all materials, labour, tools & plants, machinery etc., all taxes, duties, levies, octroi, royalty charges, statutory levies etc. applicable from time to time and any other item required but not mentioned here involved in the operations described above. The Employer shall not be supplying any material, labour, plant etc. unless explicitly mentioned so.
- 1.17. There could be some restrictions on the working hours, movement of vehicles for transportation of materials and location of labour camp. The contractor shall be bound to follow all such restrictions and adjust the programme for execution of work accordingly.
- 1.18. The contractor shall also ensure that all work sites within the site are properly cordoned off by means of barricades and screens up to a height of 3.0 m above ground level at his own cost. The contractor shall use pre-coated GI sheets which are in good condition mounted on steel props.
- 1.19. Stacking of materials and excavated earth including its disposal shall be done as per the directions of the Engineer-in-Charge. Double handling of materials or excavated earth if required shall have to be done by the contractor at his own cost.
- 1.20. The Contractor will have to take prior approval of the Engineer-in charge for the Make of materials before procurement of the same. It may also be noted that if any of the makes does not comply with Standards, it will not be allowed for use. No claim what so ever shall be entertained on this account.
- 1.21. The contractor shall clear the site of all rubbish, remove all grass and low vegetation and remove all bush wood, trees, stumps of trees, and other vegetation only after consultation with the Field Engineer as to which bushes and trees shall be saved.

- 1.22. The contractor shall carry out the survey of the site and shall establish sufficient number of grids and level marks to the satisfaction of the Engineer-in-charge, who shall decide on the basis of this information, the general levels of the construction works.
- 1.23. Prior to commencement of construction, the contractor shall in consultation with the Engineer-in-charge, establish several site datum bench-marks, their number depending on the extent of the site. The bench-marks shall be sited and constructed so as to be undisturbed throughout the period of construction.
- 1.24. The Engineer-in charge might have got the soil investigation done and if so, copy of the report will be handed over to the contractor for their scrutiny upon specific request by the Contractor. The Contractor shall however inspect the site and study the findings from the trial pits or bores in order to assess the problems involved in and methods to be adopted for excavation and earthwork. The contractor shall ascertain for himself all information concerning the sub-soil conditions, ground water table levels and intensity of rainfall, flooding of the site and all data concerning excavation and earthwork. The Employer shall not be responsible for any later claims of the contractor for any extra work required to be done on account of this and shall not pay any extra amount in this regard.
- 1.25. The Contractor shall set out the works using Total Station and during the progress of the building shall amend at his own cost any errors arising from inaccurate setting out. During the execution of the work contractor must cross check his work with the drawings. The contractor shall be responsible for all the errors in this connection and shall have to rectify all defects and/or errors at his own cost, failing which the Engineer- in charge serves the right to get the same rectified at the risk and cost of the contractor.
- 1.26. Cleaning up and handing over: - Upon completion of the work all the areas should be cleaned. All floors, doors, windows, surface, etc. shall be cleaned down in a manner which will render the work acceptable to the Engineer-in-charge. All rubbish due to any reason, shall be removed daily from the site and an area of up to ten metres on the outer boundaries of the premises will be cleaned by the contractor as a part of the contract. Upon completion of the Work, the contractor shall hand over to the Assistant Engineer the following:
- a. Written guarantee and certificates
 - b. Maintenance manuals, if any, and
 - c. Keys.
- 1.27. Tests: - All materials and methods of tests shall conform to the latest rules, regulation and specifications as per provisions laid out in the relevant IS codes. The Engineer-in charge will have the option to have any of the materials tested and if the test results show that the materials do not conform to the specifications, such materials shall be rejected.
- 1.28. Samples: - The contractor shall submit to the Engineer-in charge samples of all materials for approval and no work shall commence before such samples are duly approved. Samples of materials for concrete works, masonry units, building insulation, finished hardware, door and windows, flooring materials etc. and every other work requiring samples as detailed in the PWD Quality Control Manual or as required by the Engineer-in charge shall be supplied

to them and these samples will be retained as standards of materials and workmanship. The cost of procuring the samples shall be borne by the contractor. Throughout this specification, types of material may be specified by manufacturer's name in order to establish standard of quality, price and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the Bidder may assume the price of 'approved equivalent' except that the burden is upon the contractor to prove such equality, in writing.

1.29. The rates tendered by a Bidder for the work shall include the cost of:

- a. All labour and supervision thereof, all materials, tools, implements and plant of every description, ladders, cordage tackle, etc. as well as the provision of safe and substantial scaffolding required for the proper execution of the work in conformity with the various items of work;
 - b. Supplying the requisite agency with necessary equipment to set out the work as well as to afford facilities for such examination of the work as the Society through Architectural may at any time consider desirable, as also to count, weigh and assist in the measurement or check measurement of the work or materials;
 - c. Providing and maintaining all temporary fences, shelters, lights, watchmen and danger signals and such other precautions as are necessary for the protection of the work or materials, as well as to protect the public and those connected with the work from accidents at the site of, or on account of the work;
 - d. All sheds, mortar mills and mixing platform of every kind required for the proper execution of the work according to the specifications;
 - e. All fees and royalties of materials and
 - f. Finally clearing away of all rubbish, surplus materials, plant etc. on completion of the work and dressing and levelling off and restoring the site to a tidy condition, prior to handing over the work to the Engineer in charge and also its maintenance until so taken over.
- 1.30. In the case of supplies of materials such as rubble, broken stones, gravel, sand etc. which may have to be measured prior to being used on the work, the Bidder must always stack or arrange them neatly on level ground or on ground cleared and levelled by him for the purpose in such manner as may be ordered by the Engineer so that they may be easily susceptible for inspection and measurement, the cost of such clearing, levelling and stacking or arranging being included in the rates for work. Each stack must be straight and of uniform section throughout and of the dimensions specified by the Field Engineer. Materials not stacked or arranged in accordance with instructions issued will not be measured and paid for.

1.31. The Bidder should state whether he has all the plant necessary for execution of the work. If the opinion of the Engineer-in charge, Bidder's own plant is neither sufficient nor suitable for the proper execution of the work, the department may supply other available plant and recover hire charges for the same. The decision of the Engineer-in charge in the matter shall be final and binding on the Contractor.

1.32. Unless otherwise specifically provide for in the Contract, the Contractor shall at his own cost

keep all portions of the work free from water whether due to springs, or inclement weather and neat and sanitary condition and shall also see that drainage and sewage are prevented from entering the site of work or accumulating therein.

- 1.33. The Bidder shall be responsible for the proper use and bear the cost of protection of materials made over to him by the Department for use on the work and bear any loss from deterioration of from faulty workmanship or any other cause. The cost of materials thus allowed to deteriorate amounting as it does to and excess issue over sanctioned quantities, will be recovered at rates 20 percent over the actual cost. The orders of the Engineer-in charge in the matter shall be final binding on the Contractor.
- 1.34. The Contractor shall be responsible to see that the level or the other pegs, profiles, bench, marks masonry pillars or other marks set up by the Department for guidance in the execution of the work are not disturbed, removed or destroyed. If the same is disturbed, it will be replaced by the Engineer at the cost of the Contractor.
- 1.35. Any materials brought to the site of work, or any work done by the Contractor but rejected by the Engineer-in-charge as being not up to the specifications shall in the case of materials supplied be then and there removed from or broken up at the site of work, and in the case of work done, the dismantled or rectified at the expense of the Contractor, as may be ordered by the Engineer-in-charge.
- 1.36. In all cases whether so specified in the contract or not, the work shall be executed in strict accordance with the Contractor's accepted bid and these specifications and with such further drawings and specifications and orders as may from time to time be issued by the Engineer-in charge.

ADDITIONAL SPECIFICATIONS

1. All the measurements shall be as per the latest edition of B.I.S.
2. The Technical specifications, code of practice etc. shall be referred in accordance with Specifications and work shall be executed accordingly for all works.
3. Items which are not covered under Specification shall be carried out as per relevant IS Specifications or as per manufacturer's specifications or as directed by the Engineer-in-charge.
4. The detailed specifications for electrical works shall be in accordance with General Specifications for Electrical Works Part I (Internal) 2013.

Civil Works

1. Cement (OPC) - ACC, Ultratech, Coromandel, RAMCO, Dalmia, Malabar Cements
2. White cement- Birla, JK White, Vembanad
3. Brick/Block Work - Autoclaved Aerated Concrete block, Concrete block
4. Chemical Admixtures- CeraChem, Sika, FOSROC, Choksey Chemicals
5. Reinforcement steel - SAIL, TATA (TISCON), Vyshak, Jindal and JSW Steel Ltd
6. Structural Steel -SAIL, TATA (TISCON), RINL, Jindal

7. MS pipe, Tubes, Bar, Flats, Angle, Tee Sections- SAIL, TATA (TISCON),Jindal
8. Waterproofing compound - Asian paints HDPE ,Fosroc, CeraChem, Sika, PidiliteCICO, Impermo, Acco proof
- 9.Pre-laminated particle board - Novapan/Merino/GreenLam/Kitlam, Ecoboard Associated/ Century
10. Gypsum Board- SaintGobain, Lafarge, Boral Board, Armstrong
11. Door Hardware -Dorma, Kich, Classic, Haffle, Ozone, Geze ,Godrej ,Hettich
12. Hydraulic door closers/floor springs- Godrej, Hardwyn, Dorma, Everest, Ozone
13. Locks/Latches- Dorset, Godrej, Harrison, plaza, Yale
14. Glass -Saint Gobain, Asahi, Pilkington, Glaverbel, Modi Guard
15. Vitrified Tiles- Johnson, Kajaria, NITCO, RAK
16. Glazed Ceramic tiles- Johnson, Kajaria NITCO, RAK
17. Floor Springs - Dorma ,Ingersoland , GEZE
18. Interlocking Concrete Blocks Ultra, Shree, Hindustan Tiles, Vyara Tiles Pvt. Ltd.,Nitco
- 19.Paint/primer/oil- bound distemper, Acrylic paint Asian Paints, ICI Dulux, Nerolac, Berger, Jotun
20. Water proof cement paint -Snowcem India Ltd, Asian Paints, Berger,
21. Synthetic enamel paint- Berger, Nerolac, Asian, ICI
22. Cement based on Gypsum plastering/wall putty- JK wall putty, Birla wall case, Saint Gobain,Asian Paints, Altek. (Inside plastering)
23. Mirror Glass -Modi Guard, Saint Gobain, Asahi, Atul 23 Aluminium Sections Hindalco / Jindal /Bhoruka / Indal 24 Vitreous Commodes / wash basin Hindware, Roca, Parryware, Kohler, Cera
24. Hand Rails Stainless Steel - IONA Steels/equivalent
25. Thermal Insulation - Saint Gobain SA, BASF SE, Sika AG /equivalent

ADDITIONAL TECHNICAL SPECIFICATIONS

DOORS

- Supplying and fixing SINGLE DOORS with cheruteak wood of size 100 x 75 mm for the outer frame and shutter frames 100 x 30 mm, 150 x 30 mm centre rail and 25 mm thick plank for panels and finishing neatly as per design, 3 nos 100 mm stainless steel hinges, screws, 1 no mortise lock, copper 2 nos aluminium towerbolts, 150 mm long steel screws, door stopper, rubber bush, door closers, architrave of size 75 x 20 mm, etc. including all cost and labour charges.
- Supplying fully finished Pre Hung door: - Both side HP Laminate color (client's choice) Plain Vertical Flush door - Single leaf- with matching PVC Wrapped WPC Jamb with front side Architrave other side Tackers. Door of 35mm thick with 4 side edges painted / Lock Hole Boring (Using mortise lock) / Hinge Rebate Cutting / Extruded Sauer land core filling from Germany. Jamb width 100 mm. (TOILET)

TOUGHENED GLASS DOOR

- Automatic sliding door operator supply of automatic door operator of DORM or

approved equivalent make Manufacturer as per approved drawing. Compliant with European standards and produced according to the guidelines for power-operated doors BGR 232, the UVV and the VDE regulations. TÜV design tested, tested according to the low voltage guidelines, fulfills DIN 18650 standards. The track profile should be separate from the main profile for enabling reduction in vibration insulation. Operator length = 4150 mm, clear passage opening = 2000 mm, clear passage height = 2500 mm, includes microprocessor controlled drive unit, with self-learning mechanism, program selector with knob, motion detector (eagle 6 radars, 02 no's), mechanical components, toothed belt, cover profile, floor guide for frame less glass (02 no's), glass clamping rail (02 no's), safety device-light barrier (01 pair). Body finish: standard silver anodized operator profile, electro mechanical lock with 12 mm plain toughened frame less glass for complete elevation - 2 moving panels. UPS of 750 VA shall be provided by others, which will give power backup of 20 min. Only & if the duration of power cut to the operator is more than 30 min., then separate arrangement needs to be done for the same as automatic operator requires uninterrupted stabilized power supply. The above work complete in all respect as per approved drawings and to the satisfaction of engineer in- charge / architect consultant.

- Providing fixed glass partition and manual glass doors with S/S patch fitting: frame less partitions with 10 / 12 mm clear toughened glass with DORMA or approved equivalent make Manufacturer (PT standard). Patch fittings such as PT-24-top pivot, PT-20-top patch, PT-10-bottom patch, US 10 corner lock with EPC, lock keeper plate, PT-40 top patch with over panel, PT-90 central connector, PT-91 corner connector, PT-92 side connector, 'H' pull handle TGDH-H-450 (450 mm x 25 mm) and floor spring DORMA or equivalent BTS75V conforming to DIN EN1154 with adjustable spring strength EN(1-4). The above work complete in all respect as per approved drawings and to the satisfaction of engineer-in charge/ architect consultant.

FIRE STAIR METAL DOOR

Providing and fixing, Design, Supply and install TATA fire rated doors or approved equivalent make Manufacturer as per approved drawing. Leaves Constructed from .0012m thick skin pass galvanized iron sheet or thick skin pass galvanized iron sheet. Frames Constructed from .0016m thick skin pass galvanized iron sheet or .0012m thick skin pass galvanized iron sheet formed to single or double rebate profile of size. Vision glass in .005m thick clear/wired glass circular or rectangular in size 0.2 x 0.3m. The door frames and door shutters are primed with Zinc- Phosphate Stoving Primer and finished with Polyurethane Aliphatic grade or epoxy paint as required. Hinges material stainless steel ball bearing butt hinges. Mortise sash lock with lever handles, mortise dead bolt, mortise latch, panic devices etc. Can be provided as required.

HAND RAILS

Providing and fixing, Design, Supply and install customized Handrail as per drawing and detail using- IONA or approved equivalent make Manufacturer. Face fixed Balustrade system made

out of Stainless steel 304 grade - Satin Finish. Vertical post shall be SS Plate of size 80x12 mm flat balustrade (IM062S). 5+ 0.78+ 5mm sentry laminated glass, height will be 1.2mtr from FFL. Single Post fixed on RCC at maximum C/C of 1500mm and the rail pipe at top shall be 50mm Dia x 2.5 mm thick and the rail pipe fusion bonded with vertical plate with Spigot plate and connecting plate to the shape to hold the top rail at the Junctions of Post and Rail, by using necessary fixtures for fixing the balustrade, top rail height should be 1050mm from FFL .including cutting the section to the required length line, welding, grinding, etc. as per specifications, drawing and directions of engineer in charge at all heights.

FIRE STAIR

Providing and fixing for fire stair, 50.8mm dia top rail and 20mm dia verticals, vertical distance centre to centre 10cmm. Height should be 120cm from FFL. Using 304 grade. Including cutting the section to the required length line, welding, grinding, etc., as per specifications, drawing and directions of engineer in charge at all heights.

ALUMINIUM WINDOWS

Manufacturing and Supplying High quality Powder coated Aluminium 27mm Algeria series profile 2-Track 2-Shutter Sliding Window & ventilators Outer frame 82mm x 41mm, Shutter 60mm x 30mm, Clip 23mm x 18mm, interlock 50mm x 30mm, Stainless Steel noiseless High Load Bearing capacity Rollers, Crescent/Touch Lock, All Hardware Fittings have 5 Year Replacement Guarantee, 5mm clear glass (Saint Gobain/Equivalent), EPDM Gasket & well finished with other accessories including window grill Supplying and fixing Aluminium Powder coated windows profile 2-Track 2-Shutter Sliding Window Outer frame 55 mm x 40 mm, Shutter 66 mm x 37 mm, Clip 23 mm x 22 mm, inter lock 38 mm x 32 mm, Stainless Steel noiseless High Load Bearing capacity Rollers, Crescent /Touch Lock, All Hardware Fittings, 5mm clear glass Aluminium powder coated windows Manufacturing and Supplying High quality Powder coated Aluminium 27 mm Algeria series profile 2-Track 2-Shutter Sliding Window with Fixed Outer frame 82mm x 41mm, Shutter 60mm x 30mm, Clip 23mm x 18mm, interLock 50mm x 30m, Stainless Steel noiseless High Load Bearing capacity Rollers, Crescent/Touch Lock, All Hardware Fittings have 5 Year Replacement Guarantee, 5mm clear glass (Modi/ Saint Gobain /Equivalent), EPDM Gasket & well finished with other accessories

C. TECHNICAL SPECIFICATION FOR MEP WORKS

A. HVAC

Scope of Work

The scope comprises of 'supply, installation, testing and commissioning' of DX type system conforming to these specifications and in accordance with the requirements of approved shop drawings and schedule of quantities.

Design Parameters

Indoor Design Conditions

DB	: 24.0 ± 0.5 ° C
RH	: 55-60 %

List of codes & standards

- IS : 659-1964 (Reaffirmed 1991) Air Conditioning (Safety Code)
- IS : 660-1963 (Reaffirmed 1991) Mechanical Refrigeration (Safety Code) ▪ IS : 732 Code of practice for electrical wiring
- ANSI/AHRI Standard 575- Method of Measuring Sound Within an Equipment Space ▪ BS : EN:779 Filters
- ASHRAE Handbook 2013
- ASHRAE Standard 90.1 2013 Energy Standard for Buildings Except Low-rise Residential Building ▪ ASHRAE Technical Committee 8.7 Variable Refrigerant Flow
- ASHRAE Safety Standard 15, Standard 34
- ASHRAE Standard 62.1, 2013 Ventilation for Acceptable Indoor Air Quality
- ISO 16484-5 :2014 Building Automation and Control System
- ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes

1) DIRECT EXPANSION SYSTEM

This section deals with supply, installation, testing, commissioning of indoor-Outdoor units confirming to general specification and suitable for the duty selected. The type, capacity and size of indoor units shall be as specified in detailed technical specification and bill of quantities

All the indoor units should have same decorative panel size regardless of their difference

in capacity for uniform aesthetic view.

- **Hi-wall Split Units (Wall mounted)**

Unit shall have electronic expansion control valve which quickly controls refrigerant flow rate in respond to load variations of the room. The fan shall be of the dual suction multi blade type statically and dynamically balanced to ensure low noise and vibration free operation. Unit shall be 220/240V, 50/60Hz, Single phase comprises of copper evaporator coils, filters, set temperature display screen. Outdoor unit shall be comprised of inverter driven scroll compressor, condenser coil, low noise condenser fan, fan guard, motor protection, supporting stands, vibration isolators etc. Unit shall be supplied with cordless remote controller with LED/LCD display information, Refrigerant shall be R410 A or R32, COP of the unit shall be > 3.5 and emblazon of the unit shall be as per architect's/client's advice

Electrical

The electrical work shall be carried out as per IE rules. The electrical contractor shall provide incoming cable with earthing for each indoor or outdoor unit as per the OEM standards. The further distribution of control cabling and earthing of GI shall be carried out by the AC contractor.

- **Four-way Cassette Units (Ceiling Suspended)**

Unit shall have electronic expansion control valve which quickly controls refrigerant flow rate in respond to load variations of the room. The fan shall be of the dual suction multi blade type statically and dynamically balanced to ensure low noise and vibration free operation and with thermal fuse/equivalent for motor protection in case of overheating. The cooling coil shall be made out of seamless copper tubes and have continuous aluminum fins. The housing of the unit shall be powder coated galvanized steel. The body shall be light in weight and shall be able to suspend in four corners. The unit shall have external attractive panel for supply and return air. Unit shall have single, double or four-way, supply air grille (actuator operated), which can be set to desirable direction via remote, on sides and return air grille on the center. Each unit shall be provided with a high lift drain pump (min 750 mm vertical lift), wireless temperature and fan speed control remote with LCD display and provision for fresh air duct connection. Unit shall be equipped with thermal & acoustic insulation so that the noise level at the highest operating level shall not exceed 45 dB (A) at a downward vertical distance of 1.5 m from the grille of the unit. All the units shall be supplied along with suitable supports.

- **Control and Interlocking**

The complete system shall have Microprocessor Controls with 'Auto Check Function' to indicate errors and malfunctioning in piping and cablings. Microprocessor should control speed or switching or by pass of compressors, condensers, fans, and liquid management. It

shall function along with the system for proper oil return and stable and safe operation of system.

Micro Processor shall have preset memory, which shall not be erased on power failure. Units should have automatic restart in case of mains failures. 'Precision Temperature Control' should be mandatory with electronic expansion valves adjusting to load fluctuation and operating load fluctuation to maintain $\pm 0.5^{\circ}$ C of set point with PID control algorithm. Individual controllers with wired or wireless remote for operation, status etc. shall be used. All units should have Self - Diagnostic Function to pre-warn of failure or problems with function codes.

▪ **Room Thermostat**

Thermostats shall be compatible in design and appearance and shall be of modern, compact design with option of key locking type conversant concealed temperature set point adjustment. No room thermostat shall operate on Voltage in excess 24 Volt unless specifically noted otherwise. Thermostat shall have on/off switch, multi speed fan switch and LED's.

▪ **Freeze Protection Thermostat**

Sensing element shall be fixed to the front of the coil or wrapped around the pipe to guard against freezing at any point. If the capillary is damaged the thermostat shall cut- out to the safety side.

Electrical

The electrical work shall be carried out as per IE rules. The electrical contractor shall provide incoming cable with earthing for each indoor or outdoor unit as per the OEM standards. The further distribution of control cabling and earthing of GI shall be carried out by the AC contractor.

Inspection & Testing

All materials, equipment and the completed installation will be inspected by project engineer. Equipment, materials or work rejected because of defects or non-conformance with drawings and specifications shall be replaced or corrected without any additional cost as directed by engineer.

- All units must be tested in the presence of manufacturer's representative and his/her approval.
- Provide materials and equipment required to perform the tests. Defects found shall be corrected at no additional cost.

Submittals

Product Data: Submit manufacturer's technical data for air distribution equipment, including capacity ratings, fan performance curves with operating point clearly indicated, Finishes of materials, dimensions, weights, furnished accessories, and installation and instructions.

Shop Drawings: Submit manufacturer's assembly type shop drawings indicating dimensions, required clearances, installation details and field connection details

Wiring Diagrams: Submit the manufacturer's electrical requirements for power supply wiring to the units.

Operation and Maintenance Data: Submit manufacturer's operation and maintenance manual.

Spare Parts List: Submit the manufacturer's spare parts list for equipment for a period of 5 years for the engineer's review and approval

Freight, Handling & Storage

Freight, handling and storage of materials shall be in accordance with manufacturer's recommendations regarding the same.

Deliver materials to the site in manufacturer's original factory wrappings and containers, clearly labelled for identification of manufacturer, brand name and contents. Store materials off ground in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Follow manufacturer's instructions regarding freight, handling and storage of materials.

Warranty

All equipment and materials shall be provided of standard products of renowned manufacturers who have vast experience of manufacturing and installing control equipment specified in this section. The system shall be installed by skilled personnel, regularly employed by the controls manufacturer with full responsibility for proper operation of the controls including debugging and proper calibration of each component in the entire system. Supplier shall have in-place support facility within 30 km of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment. Submit a written guarantee signed by manufacturer, contractor, and installer agreeing to replace partitions which fail in material or workmanship within a period of 1 year from the date of handing over.

Quality Assurance

- Motors and electrical accessories shall comply with the applicable Indian Standards.
- Electrical components and installation shall comply with National Electrical Code.
- Test, adjust and balance air conditioning systems during designed weather conditions

Training

Field training shall be given to client's operation/maintenance personnel on the troubleshooting procedures and testing, adjusting, and balancing procedures. Review with owner's personnel, the information contained in the operation and maintenance manual.

2) PIPING

i. Refrigerant Piping

Copper tubes of approved brand shall be used for refrigerant piping. Hard pipes must be used above OEM specified dia. All pipes shall be insulated with minimum 13 or 19mm thick insulation as per OEM standards for the entire length; and flexible braided pipe (for external runs of pipe). Insulation shall be nitrile rubber covered with glass-cloth having density of 200GSM. All exposed piping insulation shall be with UV.

Protection/UV Coating with glass cloth fabric. Pipes should be installed in an accessible position wherever possible. Exposed to sun & visible piping shall be covered by braided PVC

pipes/sleeves for mechanical protection and aesthetics.

Necessary filters, driers, gauges, sight glass, safety cut-outs, etc. shall be provided in each refrigerant circuit as per the manufacturer's standards. Number of joints shall be kept to a minimum, and all joints must be located in the accessible runs of the pipes. Continuous, joint-less pipes must be used for all concealed/buried/inaccessible piping. Adequate extra length of pipes shall be left during piping work to avoid unnecessary joints during installation of indoor & outdoor units.

Provide high-density insulated pipe supports supplied by the insulation manufacturer, at each pipe support and clamp to prevent insulation compression, thermal bridging and condensation. Alternatively provide PVC pipe sleeves over the normal insulation at all support cable ties & clamps to prevent insulation compression.

All joints in copper piping shall be sweat joints using low temperature brazing and / or silver solder. Before joining any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while constructing the joints. Subsequently, it shall be thoroughly blown out using carbon dioxide / nitrogen.

Horizontal suction line shall be pitched towards suction of the compressor for proper oil return. The refrigerant line sizing should be designed to achieve minimum pressure drop and avoid oil return problem.

After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at a pressure of 20 kg per sq.cm (high side) and 10 kg/cm² (low side). Pressure shall be maintained in the system for a minimum of 24 hours. The system shall then be evacuated to a minimum vacuum. Vacuum shall be checked with a vacuum gauge.

Pipes or ducts entering into the building through external wall cutouts should slope away from the building cutout, to stop rain water entering the building along through any gap between duct/pipe and the closed cutouts

Pipe and duct ends shall be kept closed at all times before and during installation to prevent ingress of moisture, dust and construction debris.

All pipe supports shall be strong enough to withstand bending stresses in the pipes and shall be spaced not more than 1800mm apart.

Each support shall be isolated from the supported pipe or fitting by anti-vibration springs or durable, non-deteriorating liner of rubber or neoprene.

Wherever pipes are laid in two layers, an additional strip/support to be provided between the two layers so the pipes do not rest on each other.

All copper pipes except 6mm diameter shall be insulated with minimum 19mm thick Nitrile Rubber insulation for the entire length. Pipes up to and including 6mm shall be insulated with 13mm thick Nitrile Rubber insulation

PVC sleeves or high-density insulation sleeves to be provided wherever pipes pass through the cut-outs in walls or wooden partitions to avoid compression of insulation.

Avoid installing pipes directly above the A/C machines.

All exposed insulation on terrace or in open shafts should be protected with UV paint / UV coating & glass cloth having density of 200GSM and finally covered with removable GI sheet cover for mechanical protection. UV protection must be applied immediately after installation of insulation to prevent damage from sun-light.

ii. Condensate Drain Piping

The drain piping shall be made out of rigid PVC (10 KG/SQ.CM) pipes of sizes as specified

in Schedule of Quantities. The piping shall be supported by clamping on MS angle 25mm x 3mm running continuously below the pipe. Some places it required to make slot in floor/wall for laying drain pipes. The piping shall be insulated with 9 mm thick closed cell nitrile rubber sleeves. U trap shall be provided in the drain connection of each indoor unit. All MS pipes support/clamps shall be painted with red oxide primer followed by two coats of synthetic enamel finish paint

Where refrigerant & drain pipes and electric conduits are buried in the wall/floor, the trenching should be sufficiently deep so that plaster cover of minimum 25 mm is available after insulated pipes/conduits. Buried/encased pipes must be suitably insulated as specified to prevent sweating on the surface of wall.

Drain pipe connection from each A/C unit should be connected with the drain header from top of the header to prevent back-flow from header to individual tapping. Each section of drain piping, including Header and individual connections should have adequate slope, minimum 1:100.

Drain outlet must have U-trap before terminating to NT/GT. End point of Drain pipe is to be temporarily closed with end cap during installation.

3) MODE OF MEASUREMENT

Mode of measurement shall be as follows,

Piping

- Piping with insulation shall be measured in running length (meters) for each size of pipe.
- The length of piping including accessories and fittings shall be measured along the center line of piping.
- No separate measurement of flanges, bends, elbows, reducer, expanders, tees, cross pipe supports, hangers, anchors, sockets for thermometer, pressure gauge, etc. shall be made. All such fittings / accessories shall be treated as normal piping.
- All accessories and finishes connected with insulation work shall be deemed to form part of insulation, and no separate measurement shall be made for such items.

Electrical

The electrical works shall be measured, as prescribed in the specification of work, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the contract. Wherever not specifically mentioned in the contract, the mode of measurement as prescribed in the relevant IS codes shall be applicable and binding to the contract. Only the latest editions of all the codes of practices including all latest official amendments and revisions shall be applicable.

4) GENERAL ITEMS INCLUDED IN THE WORK

The items described below are included in the scope of work of the contractor, without any extra cost. Owner/Client will not reimburse any amount, fee, payments, penalties etc. in connection with the same to contractor.

Pedestals/Foundations

Installation of all equipment including construction of machinery foundations, positioning of foundation bolts, grouting, etc. The contractor has to furnish detailed specifications of foundations and drawings and the same has to be got approved before proceeding for foundation erection work. Foundation shall be of RCC 1:1 1/2:3 grade (Unless otherwise

specified)

Approvals

To obtain necessary statutory approvals from all govt. local bodies, agencies, etc., if required. The fee and incidental charges for the same shall be borne by the contractor. No such payments will be reimbursed by owner/client.

Painting

All exposed metal work furnished under these specifications, except as otherwise specified shall be painted after installation. Painting shall be with 2 or more coats of Synthetic enamel of approved brand over a coat of zinc chromate yellow primer (Unless otherwise specified).

Material Safety

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipment against damage from any cause whatsoever. The watch & ward of the stores, equipment & materials shall be the responsibility of the contractor till the completion, commissioning & handing over to owner/client.

Personnel Training

System operation and troubleshoot training to be given to owner's personnel with supporting manuals.

Civil Works

Openings of walls, slabs, trenches, etc. and making those good thereof to original finish to the satisfaction of owner/client.

Consumables and Hardware

Providing all consumables and hardware such as welding electrodes, sealing compounds, bolts, nuts, washers, gasket material, cement, bricks, graded stone, etc.

Adequate Manpower

Supply of skilled and semi-skilled manpower, experienced supervisory and technical staff and competent management for execution of work.

Ladders and Scaffolding

Providing required, ladders, temporary supports, temporary protection, scaffolding and similar items

Miscellaneous

Contractor may visit the site before submission of the quotations. He must go through all the drawings and documents and fully acquaint himself with various conditions. No claim at a later date on account of lack knowledge of the site and working conditions will be entertained. The contractor shall take away the balance of any materials left at the site after commissioning of the system. The cost, if already paid, for such items shall be deducted from the subsequent running bills. Owner shall not be liable to pay for any of the incidental charges connected with the above.

The contract agreement shall be executed on a non-judicial stamp paper of value not less than Rs.100/-, and the cost of the stamp paper shall be borne by the contractor.

All materials, tools and tackles, equipment, labor skilled and semi-skilled including their housing, sanitation, procurement of water, food stuff, medical aid etc. are to be arranged by the contractor. Cost of Transportation of labor and materials shall be borne by the contractor.

The contractor shall be responsible for any damage resulting from his negligence or ignorance to existing facilities / installations and will restore, replace or repair any such damages at his cost to the complete satisfaction of owner/client.

The tenderer has to select the equipment meeting the general/ technical specifications mentioned in the tender.

The drawings enclosed are for reference only. The tenderer has to check the exact requirement suitable to the site conditions and get it approved by the consultant.

The contractor shall furnish set of operating instructions securely framed and shall also supply one set of tools free of cost required for routine and special maintenance work. Catalogue /brochure/ technical information with drawings of all equipment/machinery /item shall also be enclosed along with the tender.

PREAMBLE TO SCHEDULE OF QUANTITIES

All items of work under this Contract shall be executed strictly to fulfil the requirements laid down under “Basis of Design” in the specifications. Type of equipment, material specification, methods of installation and testing and type of control shall be in accordance with the specifications, approved shop drawings and the relevant Indian Standards, however capacity of each component and their quantities shall be such as to fulfil the above mentioned requirement.

The unit rate for all equipment or materials shall include cost in INDIAN RUPEES (INR) for equipment and materials including all taxes and duties and also including forwarding, freight, insurance and transport into Contractor’s store at site, storage, installation, testing, balancing, commissioning and other works required.

The rate for each item of work included in the Bill of Quantities shall, unless expressly stated otherwise, include cost of:

- All materials, fixing materials, accessories, appliances tools, plants, equipment, transport, labour and incidentals required in preparation for and in the full and entire execution, testing, balancing, commissioning and completion of work called for in the item and as per Specifications and Drawings.
- Wastage on materials and labour.
- Loading, transporting, unloading, handling/double handling, hoisting to all levels, setting, fitting and fixing in position, protecting, disposal of debris and all other labour necessary in and for the full and entire execution and for the job in accordance with the contract documents, good practice and recognized principles.
- Liabilities, obligations and risks arising out of Conditions of Contract.
- All requirements of Specifications, whether such requirements are mentioned in the item or not. The Specifications and Drawings where available, are to be read as complimentary to and part of the Bill of Quantities and any work called for in one shall be taken as required for all.

In the event of conflict between Bill of Quantities and other documents including the Specifications, the most stringent shall apply. The interpretation of the Architect / Consultant / Project Manager shall be final and binding.

The Contractor shall procure and bring Materials/Equipment to the site only on the basis of drawings approved for construction and shop drawings and not on the basis of Bill of Quantities which are approximate only. This also applies to the Contractor’s requisition for Owner supplied materials.

The contractor shall include for making all the opening in slabs, beams, walls etc. as required for his work. However, the contractor can coordinate with civil work to provide necessary sleeves.

All openings shall be closed using water proofing compound or as specified by Project Manager.

The work shall be carried out in conformity with the AC drawings and within the requirements of architectural, plumbing, electrical, Fire fighting, structural and other specialized services drawings.

The contractor shall co-operate with all trades and agencies working on the site. He shall make provision for hangers, sleeves, structural openings and other requirements well in advance to prevent hold up of progress of the construction schedule. All supports to the civil structure shall be provided with anchor fasteners.

On award of the work, contractor shall submit a schedule of construction in the form of a PERT chart or BAR chart for approval of the Project Manager.

On award of the work the contractor shall be issued two (2) sets of consultant's drawings. The drawings shall be the basis of contractor's shop drawings.

Shop drawings are detailed working drawings coordinated with other trading work, which incorporate the contractor's details for execution of the work and incorporate equipment manufacturer's details and dimensions to ensure that the same can be installed in the space provided.

All shop drawings should detail equipment data, pipe routing and levels, showing location of other services at crossings etc., and must be fully coordinated with other services, before execution of the works.

All shop drawings will be made on AutoCAD and colour prints have to be produced for site work. All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar / concrete / water proofing of appropriate mix and strength as directed by the Project Manager. Contractor shall provide holes, sleeves, recesses in the concrete and masonry work as the work proceeds.

The contractor shall, from time to time, clear away all debris and excess materials accumulated at the site failing which the same shall be done by Project Manager at contractor's risk and cost and cost of clean-up shall be deducted from the contractors prorated bill.

After the fixtures, equipment and appliances have been installed and commissioned; contractor shall clean up the same and removes all plaster, paints, stains, stickers and other foreign matter or discoloration leaving the same in a ready to use condition.

On completion of all works, contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done by the Project Manager at the Contractor's risk and cost. Cost of the clean-up shall be deducted from the contractor's bills on pro-rata basis in proportion to his contract value.

B. ELECTRICAL

The Electrification of this project has to be done with best workmanship and quality in addition to safety and reliability. All equipment, Switchboards, Cables, Cable trays, Cable racks, Supports, Wiring, conduits etc., should be installed as per CEA regulations, IER, IEC, IS & requirements of other applicable statutory authorities.

Matters not covered by the specifications given in the contract, as a whole shall be covered by the relevant Indian Standard Codes. If such codes on a particular subject have not been framed, the decision of the Employer / Consultant shall be final. No deviations from relevant standards shall be entertained.

LIST OF STANDARDS AND REGULATIONS

The following specifications will apply under all circumstances to the equipment to be supplied and installed against this contracts and it is to be ensured that the Contractor shall obtain for himself at his own expense and on his own responsibility all the information which may be necessary for the purpose of submitting the tender and for entering into a contract keeping in view the specifications of installation and inspection of site etc.

IS/IEC CODE	DESCRIPTION
IS 3842 P1-P12:67	Application guide for electrical relays for ac systems part 1-12
IS 8478:77	Application guide for on load tap changers.
IS 10561:83	Application guide for power transformer
IS 4146:83	Application guide for voltage transformer
IS 13235:91	Calculation of the effects of short-circuit current
IS/IEC 60898 1:2	Circuit breakers for over current protection for household and similar installation (AC operation)
IS 13234:92	Guide for short circuit calculation in 3 phase AC system
IS 8061:76	Code of practice for design installation and maintenance of service lines up to and including 650V.
IS 3043:87	Code of practice for earthing
IS 732:89	Code of practice for electrical wiring installation
IS 4347:67	Code of practice for hospital lighting
IS 900:92	Code of practice for installation and maintenance of induction motors
IS 4591:68	Code of practice for installation and maintenance of escalators

IS 10118 P 1-4: 82	Code of practice for selection, installation and maintenance of switch gears. Part 1-4. General, selection, installation, maintenance
IS 1255:83	Code of practice for installation and maintenance of power cables up to and including 33 kV rating
IS 1866:83	Code of practice for supervision and maintenance of mineral insulating oil in equipment
IS10028 P1- 3: 85,81	Code of practice for selection installation maintenance of transformers part 1-3 selection; installation; maintenance;
IS/IEC 60529 :1	Degree of protection of enclosures
IS/IEC 62305:15	Code of practice for the protection for buildings and allied structures against lightning
IS 6262:71	Methods of test for power factor and dielectric constant of electrical insulating liquids
IS1248-P1-9:93,83,84	Direct acting indicating analog electrical measuring instruments.
IS 6103:71	Methods of test for specific resistance of electrical insulating liquids
IS 2993:75	Motor capacitors
IS 9283:79	Motors for submersible pump sets.
IS 8468:77	On load tap changers
IS 12065:87	Permissible limits of noise level for rotating electrical machine
IS 2026 P1:P4 77,81	Power transformer Part 1-4 General; temperature rise; insulation level and dielectric test; terminal marking; tapings and connectors
IS 694:90	PVC insulated cables for working voltages up to and including 1100V
IS 694:90	PVC insulated cables for working voltages up to and including 1100V

IS 3961-P1-P5	Recommended current ratings for cables. Part 1 paper insulated lead sheathed cables/Part 5 PVC insulated light duty cables
IS 12640:88	Residual current operated circuit breaker
IS7098P1-P2:88,85	XLPE insulated PVC sheathed cables Part-1 For working voltage up to 1100V/ Part 2 For working voltage from 3.3 kV up to and including 33kV
IS13573 P1:3/IEC 605802	Cable accessories for power cables for working voltages from 1.1kV to 33kV
IS 8923:78	Warning symbols for dangerous voltage
IS 11171:85	Dry type transformers
IS 1180:14	Oil type transformers
IS 8686:77	Static protective relays
IEC 61439,(IS 8623 P1-P3:93)	Specification for L.V switchgear and control gear assemblies including DB Part 1-3
IS 16227 P1:5	Low voltage switch gear and control gear-AC circuit breakers
IS 15652 06	Insulating floor mats for electrical purposes
IS 1646:97	Fire safety of buildings-Electrical installations
IS 12083:86	Electrical relays

I. LOW VOLTAGE SWITCHGEAR & PANEL BOARD

1.0 Scope

This Specification covers the design, material selection, constructional features, manufacture, inspection and testing at the manufacturer's works, packing, transportation, delivery, installation, testing and commissioning:

1.1 The Switch gear Bus Bar, Construction and Breaker Details for switchboards as Follows

1.1.1	Switch gear and Bus Rating	
1.1.1.1	Switch gear Designation	:Refer SLD
1.1.1.2	Rated voltage, phases & frequency	:433V, 3 PH, 4 Wire, 50 Hz
1.1.1.3	System neutral earthing	:Effectively earthed Effectively earthed
1.1.1.4	Maximum system voltage	:433V + 10%
1.1.1.5	One minute power frequency	
	a) Power circuits	:2500V
	b) Control circuits	:1500V
	c) Aux. Circuits connected to CTs & PTs	:2000V
1.1.1.6	Reference ambient temperature	:40oC
1.1.1.7	Maximum temperature of bus bars, droppers and contacts at continuous current rating under site reference ambient temperature	:90oC
1.1.1.8	Thickness of sheet steel Cold Rolled Hot Rolled	:Frame, 2.0 Doors 1.6/2.0 covers 1.6/2.0 :Frame, 2.5 Doors 2.0 covers 2.0
1.1.1.8	Degree of protection as per IS: 13947 (PART 1)	:IP-42 for INDOOR and IP 65 for OUTDOOR
1.1.1.9	Bus bar material	:Al - grade 19501
1.1.1.10	<i>Clearances in air of live parts</i> <i>Phase to phase</i> <i>Phase to earth</i>	:25.0mm :19.0mm
1.1.1.11	<i>Painting</i>	:Light Grey shade RAL 7035 of IS: 5
1.1.2	Breakers	

1.1.2.1	Circuit breaker type	:ACB / MCCB / MCB (As per enclosed 433V Single Line Diagram)
1.1.2.2	Voltage frequency & no. of phases	:433V, 50 Hz, 3 Ph
1.1.2.3	Rated operating duty	:O-3 min - CO - 3 Min - CO
1.1.2.4	Rated breaking capacity a). KA (rms) at 433V, 0.25 P.F.	:Refer SLD
1.1.2.5	Short circuit withstand current for 1 sec. Duration	:Refer SLD
1.1.2.6	Type of operating mechanism	:Motor wound spring charged
1.1.2.7	Shunt trip required	: Yes
1.1.2.8	Protection required	
	1.1.2.8.1 Relays/series releases	:Relays
	1.1.2.8.2 Under voltage release required	:No
1.1.2.9	Minimum no. of additional auxiliary contacts (for purchaser's use)	:6 NO + 6 NC
1.1.2.10	Control voltage	
	1.1.2.10.1 For spring charging motor	:240V AC
	1.1.2.10.2 For closing/tripping	:30V DC
1.1.2.11	Emergency manual operation required in addition to electrical operating devices a) For spring charging & closing b) For tripping	: Yes :Yes

2.0 Applicable Standards

Standards mentioned below are only guidelines. The equipments and works shall be carried out as per the latest standards

1.	Switch gear General Requirements	IS 4237	IEC 947
2.	AC Circuit Breakers	IS 13118	IEC 56
3.	Factory built assemblies of switch gear and control gear for voltages up to and including 1000V AC and 1200V DC	IS 8623	IEC 61439
4.	Air break switches	IS 13947(Part 3)	IEC 947-3
5.	Miniature circuit breakers	IS 8828	IEC 898
6.	HRC cartridge fuses	IS 9224	IEC-269
7.	D Type fuses	IS 8187	
8.	Contactors	IS 13947(Part 4)	IEC 947
9.	Starters	IS 13947(Part 4)	IEC 947
10.	Control switches / push buttons	IS 6875	
11.	Current transformers	IS 2705	IEC 44-1
12.	Voltage transformers	IS 3156	IEC 186

13.	Relays	IS 3231	IEC 255
14.	Indicating instruments	IS 1248	IEC 51
15.	Arrangement for bus bars main connections and accessories	IS 11353 / IS 5578	
16.	AC electricity meters	IS 722	
17.	Degree of protection	IS 13947(Part 1)	IEC947-1
18.	Code of practice for installation and maintenance of switch gear	IS 10118 -	
19.	Code of practice for phosphating iron and steel	IS 6005	
20.	Wrought aluminium & aluminium alloys for electrical purposes	IS 5082	IEC 114
21.	Control transformer for switch gear and control gear for voltage not exceeding 1000V AC	IS 12021	IEC947

3.0. PANEL BOARDS/SWITCH GEARS

1.0 General

Panels shall be of sheet steel enclosed cubicle pattern, free standing floor mounting, totally enclosed, and module type, compartmentalized multitier formation design. The enclosure shall be fabricated out of cold - rolled sheet steel having a minimum thickness of 1.6mm. Hinged type doors with suitable interlocks and panel keys shall be provided for feeder compartments, cable alley and bus bar chamber. The panel should be vermin, dust and damp proof, the degree protection being not less than IP 42 as per of IS 2147. All metal parts should be chemically treated with seven tank process, powder coated with standard thickness and superior finish. The constructional details and general arrangement drawings of the panels and DB's shall be furnished by the contractor and get approved by the Consultant before fabrication.

Easily recognizable names shall be assigned to each of the switchboards and clearly visible painted nameplates shall be fixed on all switchboards.

Proper identification should be provided for all circuits and feeders. Engraved labels shall be provided for all feeders and incomer with cable size details of the feeders and incomer.

The maximum operating height of the switches should not be more than 1825mm and minimum 350mm.

All doors shall be provided with square type rubber gaskets to prevent entry of dust, water, insects, vermin etc.

The bus bar shall be of Copper/Aluminium suitable for 4-wire 433 volts 50Hz system and shall have adequate continuous and short circuit rating as per standards.

The bus bar insulators shall be FRP/DMC/EPOXY molded.

All the bus bars shall be provided with heat shrinkable PVC sleeves and suitably colour coded.

Switch fuses of 100A and above rating shall be inter-connected to the bus bars by aluminium/copper strips and below 100A rating by insulated rigid copper conductors of suitable sizes.

Crimping type cable lugs shall be used for all internal wiring and cable termination.

All potential circuits for indicating lamps, voltmeters etc., shall be protected by HRC fuse, mounted at an accessible position and the wiring should be with 1.1kV grade PVC insulated flexible copper conductors.

The panel shall be provided with a horizontal copper earth bus running throughout the length of the panel board at top/bottom and terminals for earthing should be provided at both ends. The panel shall be rigidly installed on the floor using necessary angles and channels. Removable type gland plate shall be provided for glanding the cables at bottom or top as the case may be.

1.1 Design and Performance Requirement

All the 433V AC, devices/equipment like bus support insulators, circuit breakers, relays, CTs, PTs, etc., mounted inside the switch gear shall be suitable for continuous operation and satisfactory performance under the following supply conditions:

- | | |
|---|-------|
| i) Variation in supply voltage : | + 10% |
| ii) Variation in supply frequency : | + 5% |
| iii) Combined voltage and frequency Variation : | 10% |

1.2 Constructional Features

Switch gear enclosure shall be:

- Metal enclosed, indoor, floor mounted modular type
- Made up of the requisite vertical sections
- Dust and vermin proof construction with degree of protection not less than IP42.

- Easily extendable on both sides by the addition of vertical sections after removing the end covers
- Provided with a metal sill frame made of structural steel channel section properly drilled for mounting the Switch gear along with necessary mounting hardware. Hardware shall be zinc plated and passivated
- Provided with cable entry facilities at top/bottom as per layout requirement with 3mm thick removable gland plates on breaker panels and 2 mm thick removable gland plates on other panels with necessary cable glands. For 1- core cables, these plates shall be non-magnetic
- Of uniform height of not more than 2450mm
- Provided with gaskets all round the perimeter of adjacent panels, panel and base frame, removable covers and doors
- Provided with bus bars running at the top or bottom, as required, all along the length of the switch gear in a separate sheet steel enclosure.

1.3 433V Switchgear

1.3.1 Main and Auxiliary Buses

i) Main Buses & Taps

The busbars shall be made of copper/aluminium alloy of E99 grade. All bus bars, bus taps shall be insulated with heat shrinkable PVC to provide a permanent high dielectric non-ageing and non-tracking protection; impervious to water, tropical conditions and fungi.

The insulation shall be non-inflammable and self-extinguishing and in fast colours to indicate phases. The joints shall be insulated in such a way as to provide for accessibility of contact bolts for maintenance. Joints shall be covered with removable moulded shrouds made out of fibreglass-reinforced polyester.

ii) Auxiliary Buses

Auxiliary buses for control power supply and space heater power supply buses shall be insulated, and adequately sized to suit requirements. The material for control supply buses shall be electrolytic copper and for space heater power supply shall be same as that for power buses.

1.4 Circuit Breakers

1.4.1 Circuit breakers shall be -

1.4.2 Of the Air-Break drawout type, mounted along with its operating mechanism on a wheeled carriage moving on guides, designed to align correctly and allow easy movements.

1.4.3 Of the shunt trip type.

1.4.4 Provided with an operating mechanism

1.4.5 Provided with mechanically operated targets to show 'open', 'closed', 'service' and 'test' positions of the circuit breaker.

1.4.6 Provided with mechanically operated, red 'trip' push button, shrouded to prevent accidental operation.

1.4.7 Provided with locking facilities in the 'service', 'test', and 'isolated', positions. In test position the breaker will be tested without energising the power circuits. The breaker shall remain fully housed inside the compartment in the test position.

1.4.8 Provided with 6 NO and 6 NC potential free auxiliary contacts, rated 6A at 240V AC and 1A inductive breaking at 220V AC.

1.4.9 Provided with 'red', 'green' and 'amber' indicating lamps to indicate 'closed' 'open' and 'auto-trip' conditions of the circuit breaker when breaker operation is controlled by a control switch.

1.4.10 All indicating lamps shall be clustered LED type, with in-built short circuit, surge protections etc.

1.4.11 Adequate number of contacts shall be provided to have remote annunciation of the breaker feeders:

- i) Breaker 'ON'
- ii) Breaker 'OFF'
- iii) Breaker 'TRIP'
- iv) Breaker 'Service'
- v) Breaker 'Test'

Circuit breaker rating shall be selected to suit the site conditions mentioned in this document.

1.5 Operating Mechanism

Circuit breakers shall be provided with power operated mechanism of the motor wound spring charging stored energy type with provision for emergency manual charging facility

1.5.1 Closing of circuit breaker shall automatically initiate recharging of springs and the motor shall be automatically decoupled when the emergency manual-charging handle is coupled

1.5.2 The mechanism shall make one complete closing operation once the switch is operated, even though the control switch is released before the closing operation is complete, provided that there is no counter trips impulse

1.5.3 An electrical anti-pumping relay shall be provided in addition to mechanical anti-pumping feature.

1.6 Circuit breakers shall be provided with all necessary interlocks including the following interlocks:

1.6.1 It shall not be possible to plug-in a closed circuit breaker, or to drawout a circuit breaker in the closed position.

1.6.2 It shall not be possible to operate a circuit breaker unless it is in the fully plugged-in, test, or fully isolated position.

1.6.3 Interlocking arrangement shall be such that, the incomer breaker is to be tripped in case of tripping of upstream breaker (Transformer Primary side).

1.7 Closing and trip coil shall operate satisfactorily under the following conditions of supply voltage variation:

1.7.1 Closing coils - 85% to 110% of rated voltage.

1.7.2 Trip coils - 70% to 110% of rated voltage.

4.0 MCCBs

- a. MCCBs in AC circuits shall be of TP/TPN/FP construction arranged for simultaneous manual closing and opening. Operating mechanism shall be quick-make, quick-break and trip-free type. The ON, OFF and TRIP positions of the MCCB shall be clearly indicated and visible to the operator. Operating handle for operating MCCBs from door of board shall be provided.
- b. The instantaneous short circuit release shall be so chosen by the CONTRACTOR as to operate at a current in excess of the peak motor inrush current and a range of settings shall be provided for the ENGINEER'S selection.
- c. MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.
- d. Minimum no. of additional auxiliary contacts (for purchaser's use) shall be provided.
- e. MCCBs shall incorporate time delay devices to ensure that it will tolerate harmless transient overload unless this is well in excess of 25% of its rated value for a sustained period.
- f. All MCCBs shall be with rotary operating handles, necessary spreader links, shrouding etc.
- g. 400A and above should be with electronic trip unit.

5.0 Contactors

- a. Motor starter contactor shall be of the electromagnetic type rated for uninterrupted duty as defined in applicable standards.

- b. Main contacts of motor-starter contactors shall be of silver plated copper.
- c. Contactors shall be of the double break, non-gravity type.

6.0 Direct-on-Line Starters/Star Delta Starters

Starters shall be suitable for Class AC 3 utilisation category as specified in applicable standards.

7.0 Thermal Overload Relay

Starters shall be complete with a three element, positive acting, ambient temperature compensated, time lagged thermal overload relay with adjustable settings. The setting range shall be properly selected in accordance with the rating of the motor.

8.0 Switch and Contactor Ratings

Switch and contactor ratings for various motor starter modules shall be selected based on the motor rating during the detailed engineering. Bidder shall select appropriate ratings for HRC fuses and ranges for thermal overload relays and indicate the same in the bid.

9.0 Switchgear Auxiliaries

- a. Adequately rated single phase, two winding, dry type transformers shall be included for providing supply to the switch gear control and alarm circuits, space heaters provided in the switch gear.
- b. All inter panel wiring required shall be included in the scope.

10.0 Instrument Transformers

Instrument transformer as called for in the SLD shall be provided for all switchgear /Panels.

10.1 Current Transformers

Current transformers shall be of dry type with short time current rating equal to that of the associated switchgear for 1.0 sec. for breaker feeders. For feeders with fuse, CTs shall have withstood capacity equal to the through current of associated fuse.

10.2 Voltage Transformers

Voltage transformers shall be of dry type and shall have continuous over voltage factor of 1.2 and short time over voltage factor of 1.5 for 30 seconds for effectively earthed system.

11.0 Instruments & Relays

11.1 Indicating instruments

11.1.1 All electrical indicating instruments will be 96 mm square, with 240-degree scale (Taut band type). They shall be suitable for semi-flush with only flanges projecting on vertical panels.

11.1.2 Instruments shall have accuracy class of 1.0 or better. The design of the scales shall be such that it can read to a resolution corresponding to 50% of the accuracy class index. KWH meter mentioned in the SLDs shall have pulse output to be integrated with the BAS system and an accuracy class of 0.5

11.2 Protective relays

11.2.1 Protective relays shall conform to standard requirements. Type of relays either static or electro-mechanical which meet the various performance requirements are considered acceptable.

11.2.2 All static relays shall be adequately protected against external voltage surges

and noise signals. In addition to this, all the input circuit of static relays will include their own auxiliary current and voltage transformers with screened windings. Where auxiliary interposing transformers are not feasible in the input circuit, relays would have special surge suppression circuits to suppress external noise and surges.

11.2.3 Output elements of all static relays shall consist of electro-mechanical relays only.

11.2.4 Relays shall have at least the following electrically independent output contacts for the following purposes:

11.2.4.1 Tripping circuit

11.2.4.2 Remote / local annunciation

If the main relay does not have sufficient number of output contacts inherently, these shall be multiplied using auxiliary relays. These auxiliary relays shall be used for annunciation, indication, etc. only. For tripping, only the contact of main relay shall be used directly

12.0 Wiring and Accessories

12.1 Cubicles shall be completely wired up to equipment/ terminal block. Inter panel and inter-cubicle looping of control and cubicle space heating supplies to be carried out by CONTRACTOR. Wiring to be carried out with 650V grade single core PVC insulated stranded copper conductor of following sizes:

a) All circuits except CT circuit : 1.5 sq.mm.

b) CT circuit : 2.5 sq.mm.

12.2 Longitudinal troughs extending throughout the full length of the panels to be provided for interpanel wiring, AC-DC supplies, PT circuits, annunciator circuits, etc. Ferrules for wire termination to be provided. Wire connected to trip circuit will have red coloured ferrule.

13.0 Terminal Blocks

- a. Terminals blocks for CT and PT secondary leads shall be provided with test links and isolating facilities.
- b. All spare contacts and terminals of the panel mounted equipment and devices shall be wired to terminal blocks. At least 10% spare terminals shall be provided
- c. Terminal blocks to be suitable for connecting the following conductors of the PURCHASER's cables on each side:
 - (a) All circuits except CT circuit Minimum of two 1.5 mm² copper
 - (b) CT Circuits Minimum of four 2.5mm² copper

II) WIRING FOR LIGHT, FAN AND POWER

All materials supplied shall have ISI marks and if ISI marks are not available, they shall be of approved make and quality approved by the Consultants. The enclosures for switches, sockets, regulators, outlets etc., shall be of recessed /surface mounted type as required. The enclosure shall be made of corrosion resistant sheet-steel. Best quality switches, plugs, mounting plates, metal boxes etc., as specified in the schedule alone shall be permitted to be used.

Single core stranded copper conductor, PVC insulated, FRLS 1100V grade, shall be used for wiring.

Wiring shall be done as per following:-

Circuit wiring	: 2.5 Sq. mm
Light/Fan/6A plug points	: 1.5 Sq. mm
6/16 Amps, 230 V Plug points	: 2.5 Sq. mm
20 Amps 230V/440V plug points	: 4.0 Sq. mm

Flexible cord for connecting
Light/Fan etc.

: 1.5 Sq. mm

Red, Blue and Yellow wires shall be used for the phases, black for the neutral and green for covered earthing conductor and Control wiring if any use grey colour.

The number of wires in conduits shall not exceed those permitted by the relevant BIS code of practice.

Separate circuit should be provided for all power socket outlets of 20 Amps or higher.

The total load on any distribution board shall be, as far as possible equally distributed over the three phases.

Only ISI marked rigid MS or PVC conduit and accessories shall be used for wiring.

Only three point ceiling roses shall be used. One run of 2.5/4.0 Sq.mm PVC insulated copper wire as earth continuity conductor along with the circuit wiring inside the conduit and 1.5 Sq.mm PVC insulated copper as earth continuity conductor along with the point wiring shall be installed in the system. All non-current carrying metal parts of the wiring and fixtures shall be earthed using this wire.

Circuit wiring shall include wiring from distribution board up to the control board.

Point wiring shall include wiring from the control board up to all the outlets in the point.

Wiring shall be carried out by the looping back system. All connections shall be done only inside the inspection boxes, junction boxes or enclosures at an accessible position.

No running joints shall be made in the wiring. Control switches shall be connected in the phase conductors only and shall be ON when knob is down. Switches shall be of modular type and fixed in 16 SWG thick MS boxes with cover plates as specified.

Chipping of walls, concrete, drilling holes and other minor civil works and rectification shall be included.

All Telephone wiring shall be provided with ferrule identification to terminals. Wiring shall conform to IS 732:89

III) Testing

The following tests shall be carried out on all types of wiring on completion of the work and before energizing the installation.

- ❖ Insulation resistance test.
- ❖ Electrical Continuity test.
- ❖ Earth Continuity test.
- ❖ Earth electrode resistance test
- ❖ Switch polarity.

(a) Insulation resistance test:

The insulation resistance shall be measured by using 500V megger between the following points.

Phase and neutral conductor with all fuses in position and all switches in closed condition and main switch in OFF position with lamps and other devices removed.

Between earth and whole system of conductors with all fuses in place, all switches closed and all lamps in position.

Between Neutral and earth with all lamps removed.

The insulation resistance in mega ohm as obtained by each of the above tests shall not be less than 50 divided by the number of points on the circuit. Where a whole installation is being tested, a lower value than that given by the above formula is acceptable subject to a minimum of one mega ohm.

(b) Electrical continuity test:

Earth and every circuit shall be tested for electrical continuity by using a multi meter.

(c) Earth Continuity test:

The earth continuity conductor including metal conduit shall be tested for electrical

continuity and the resistance of the same along with the earthing lead measured from the connection with the earth electrode to any point in the earth continuity conductor in the complete installation shall not exceed the value specified as per IS.(d) Earth electrode resistance test:

The earth electrode resistance shall be tested as specified as per standard

(e) Switch polarity test:

Test shall be made to verify that all switches in every circuit had been fitted in the same conductor throughout and such conductor shall be marked for connection to the phase conductor

IV). CONDUITS:

All the conduits used shall have ISI mark. Wherever wires/cables are taken through masonry works, road crossing etc. they shall be protected by running them through PVC conduit pipes. After installation, the walls, flooring etc. shall be restored to the original condition by proper plastering. The size of the conduit shall be selected based on the overall diameter of the Cables/ Wires/ Earthing conductors and after leaving a free area of 40% of the overall diameter of the conduit.

The total number of conduits crossing a particular point in the roof shall be limited so that the strength of the roofing concrete and the structure is maintained.

Outlets

(i) The switch box shall be made of either rigid PVC molding, or corrosion resistant sheet steel on all sides except at the front. The regulator boxes shall however be made only of corrosion resistant sheet steel.

(ii) PVC boxes shall comply with the requirements laid down in IS 14772 : 2000. These boxes shall be free from burrs, fins and internal roughness. The thickness of the walls and base of PVC boxes shall not be less than 2 mm. The clear depth of PVC boxes shall not be less than 60 mm.

V) .CABLE LAYING AND TERMINATION

All cables shall conform to IS 7098/ IS 1554 (part 1) 1976 as amended up to date. For medium and low voltage power cabling heavy duty PVC/XLPE insulated and sheathed wire armoured and PVC covered power cables of 1.1kV grade with aluminium conductors as specified only shall be used. For control cabling 1.1kV grade flexible copper cables shall be used.

The civil contractor shall construct Trenches/Ducts coming inside the building, generator room etc. and providing cover plate/slab for trenches. All other minor civil works like filling sand, laying concrete tiles and bricks, chipping of walls/concrete, drilling holes etc., shall be carried out by the contractor at his cost.

Suitably designed MS cable trays, racks and supports etc., shall be used as required for installing the cables.

During construction, the contractor may embed in the walls and slabs the required anchoring plates to which the fabricated steel can be welded or bolted later.

The fabricated steel shall be painted with two coats of metal primer and two coats of enamel paint before they are installed.

Cables buried under roads shall be protected by enclosing them in GI pipes or PVC pipes embedded in concrete. Minimum bending radius shall not be less than 15 times overall diameter of the pipes.

The minimum depth to the top of surface, of buried 11kV cable shall be 1000mm and LT cable 750mm from ground level. When cables are to be laid in ground excavations shall be cut to the lines and levels, widths and depths so that the cable is laid at the minimum depth specified. The trench should be vertical and as straight as possible, but where bends are unavoidable the trench should allow the cable to be installed at not less than its minimum-bending radius.

Where cables are laid close to other services it should have a minimum clearance of 500mm from other services such as Telephone, Water and Sewer lines.

When HV or LV cables are laid in ground these should be bedded. The thickness of sand bed should be 75mm. The cable should be further covered with sand of minimum thickness of 150mm. It should then be covered with 310 x 230 x 45mm thick concrete cable tiles laid to fully cover the cable in a continuous line. Warning tapes shall be laid in the trenches of 11kV cable 40cm below the final level of the ground.

All cable ends shall be suitably sealed to prevent the ingress of moisture during the works. Insulation readings of the cables should be checked with the appropriate megger before making terminations and also after making terminations. Insulation values of the various cables shall be furnished to the Consultant.

All cable joints shall be made in suitable, approved cable joint boxes, jointing of cables in the joint boxes and the filling in of manufacturer's instructions and in an approved manner. All straight T-joints shall be done in epoxy mould boxes with epoxy resin.

Cables of different working voltages shall be effectively segregated. Cast iron cable route markers shall be provided for cables laid underground wherever necessary

11KV Power Cables

11 kV Unearthed grade, single / multicore, stranded aluminium conductor, armoured unarmoured, XLPE insulated with PVC inner sheath and overall PVC sheathed. The system is non-effectively earthed. These cables shall conform to IS-7098-Part-I (1988)/IEC-502 (1983) in all respects. The cable shall be provided with both conductor and insulation screening with semi-conducting compound. For multi core cables, fillers used to fill in the space between the phases shall be non-hygroscopic, chemically inert and non-putrescent. The cables shall conform to IS 7098 Part - II (1985)/ IEC 502 (1983) in all other respects. Cables laid outside the building, either buried or in trench shall be of armoured type.

415V Power Cables

The cables shall be 1100V grade, single / multi core, stranded aluminium conductor, unarmoured, XLPE insulated, with PVC inner sheath and outer sheath of PVC. The cables for emergency services shall be with FRLS properties. The cables shall conform to IS 1554 - Part - I (1988). For multi core cables, fillers used to fill in the space between the phases shall be non-hygroscopic, chemically inert and non-putrescent.

Cables shall be clamped on to trays/supports by using metallic clamps. Use of non-metallic items such as cable ties is not permitted.

VI) DISTRIBUTION BOARDS

All distribution boards shall be marked "LIGHTING" or "POWER" as the case may be and also marked with the voltage and number of phases of the supply. Each DB shall be provided with a drawing giving details of each circuit with its controls, the current rating of the circuit, the rating of the MCBs and all the important details shall be given in the circuit diagram. All emergency DBs should have the label "EMERGENCY, AC/DC, TPN/SPN" (As the case may be) painted on it or marked neatly in large letters. Serial numbers if any allotted to each DB in the drawings shall be painted on it in red colour for Emergency DBs and in white colour for other DBs. The board shall be installed in a clean, dry and well-ventilated area. The access to the board and the area in front of the board shall always remain free without any blockage or hindrance.

Distribution boards shall be of totally enclosed dead front safety type and with dust and vermin proof construction. The enclosure shall be made of the sheet steel corresponding to the size. The sheet steel shall be treated with a rigorous rust inhibition process before fabrication. The distribution boards shall comprise of miniature circuit breaker, Earth leakage Circuit Breaker as incoming and required number of miniature circuit breakers as outgoing. The mains and outgoing shall have rating as specified on the drawings and schedule. The cabinet shall be spray enameled to required colour shade finish. The interior surface shall be finished to a off-white shade. The interior components shall be mounted on a separate sheet steel which is mounted on locked on to the studs provided inside the cabinet. The cabinet shall be equipped with a 14 G inside hinged front door having a spring latch and a vault lock or over flanged door.

Cabinets shall have detachable suitable size top and bottom, cable/conduit entry boxes with gland plates made out of 14 gauge. The hinged type door shall be with compressed rubber gasket lining and for over flanged type door the same gasket shall be provided inside the box.

The MCB DB shall be installed with the bottom side of the DB at a minimum height of 1500mm from the finished floor level. The MCB DB shall be installed recessed on the wall. The incoming cable shall be concealed and laid in a smooth curve. **DB concealing works including chipping of brick wall and plastering works shall be included.**

a. Bus Bars:

Suitable size bus bars made of high conductivity copper and mounted on non-hygroscopic insulating supports shall be provided. Neutral and earth bus bar shall be with taped holes and brass screws spring washers, etc., complete.

For UPS distribution boards separate bus bars shall be provided for system neutral and body earthing.

b. Circuit Breakers:

Miniature circuit breakers shall be of approved design and make. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front face of all the breakers shall be flush with each other. The incoming MCBs shall be provided with insulator shoes.

c. Safety and Interlocks:

All the live parts are properly shrouded such that accidental contact with live parts are totally avoided. Distribution boards interior assembly shall be dead front with the front cover removed. Incoming MCB terminal shall be shrouded with insulating shoes. Suitable insulating barrier made of arc resistant material shall be provided for phase separation. Ends of the bus structures shall also be shrouded.

d. Terminals:

Distribution boards shall be provided with a terminal block of adequate size to receive mains and outgoing circuits. The location of the terminal block shall be so located that, crowding of wires in the proximity of live parts is avoided.

e. Directory:

Distribution boards shall be provided with a directory indicating the areas of loads served by each circuit breaker, the rating of breakers, size of conductors, etc.. The directory shall be mounted on metal holder with a clear plastic sheet on inside surface of the front door. The Din Plate with a clear perspex sheet shall be provided on the front door for over flanged door type DBs.

VII). CABLE TRAY

General

Cable Tray and Cable Ladder systems are intended for the support and accommodation of cables and possibly other Electrical equipment in Electrical/Instrumentation/Communication systems.

Design and Fabrication of Cable Trays

The cable trays / ladders shall be fabricated according to the design specified by IEC 61537 and should be tested for Safe Working Load (SWL). The relevant details of SWL and the load chart with respect to SWL, supporting distance and the deflection should be according to the following chart.

Safe Working Load (SWL) with a span length up to 3 meters

Description	Side Height (in mm)	Width (in mm)	Span length (in meters)		
			1.5 m	2 2.5m m	3m
Permitted Load (in kg/meter)					
Perforated Cable Tray	50/60	100	90	40	-
	50/60	150 - 300	100	40	-
	50/60	400 -600	135	60	-

Fabrication of Tray / Ladder and accessories at site and welding is not permitted. In unavoidable circumstances, if any cut or holes are made in the trays/accessories, zinc spray need to be applied over the surface. The metal edge has to be protected by edge protection sleeves to avoid cable damage. Edge of the supports has to be protected with plastic END caps. Screwed connections and internal fixing Devices should not create any damage to the cable when correctly fixed. Sudden or jerky motions shall not be used to tighten reusable screw connections.

Cables shall run in cable tray/ mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures using mounting accessories

Cable Tray

The cable tray and all accessories shall be fabricated from sheet steel and has to be hot dip galvanized against corrosion confirming to ISO 1461-1999 for installations in both indoor and outdoor applications & should have a Base Perforation Class B according to IEC 61537. The cable trays shall be supplied in standard lengths of 3000mm and the width of the tray shall be as follows.

Width: 50, 100, 150, 200, 300, 400, 500 & 600 mm.

All the cable tray accessories like Bend's, TEES's, Cross over's etc. should be designed in accordance with IEC 61537 and shall be factory fabricated. The accessories shall be from the same material as of the tray and modular type, it should be connected with the trays by using fasteners. Typical details of trays, fittings and accessories.etc are shown in the enclosed drawings.

For Cable trays designed, tested and confirming to IEC 61537, thickness of cable tray should be according to the manufacturer's catalogue. . In any case locally fabricated and non-tested trays are used; thickness should be 2 mm up to span length of 1.5 meter, 2.5 mm for span length between 2 to 3 meter and 3 to 4 mm for span length between 4 and 10 meter

STEEL WIRE CABLE TRAY

General

Cable Tray Shall be manufactured from steel wires welded together and bent into shape prior to surface treatment.

Surface Treatments:

- Electro Zinc plated to EN 12329 for interior use.
- Hot dipped galvanized to EN ISO 1461 (formally BS EN 729)

- Stainless steel to EN 10088-2-AISI 316L
- Steel Wire Cable Tray Widths & Depths
- Cable Tray dimensions are all internal.
- Depths of 30mm , 54mm, 80mm, 105mm, & 150mm.
- Widths of 50mm , 100mm, 150mm, 200mm, 300mm , 400mm, 450mm, 500mm, & 600mm for depths of 30mm & 54mm.
- Widths of 100mm, 150mm, 200mm, 300mm , 400mm & 500mm for depths of 105mm & 150mm.
- All trays are 3005 mm long.

Specification

Steel Wire Cable Tray will be produced from lateral and longitudinal sidewall steel wires, with minimum diameters of

4mm for trays of widths up to 100 mm

4.5mm for trays of widths 150 mm and 200 mm

6mm for trays of widths of 300 mm, 400 mm, 450 mm, 500 mm and 600 mm.

Trays will be manufactured with a longitudinal 'T-welded' safety edge along the top wire of the side wall(excluding CF 3050).

Trays will be constructed with a 50mm x 100 mm mesh configuration.

All tray fittings (e.g. Changes in direction, level and size) shall be constructed on site, to the manufacturer's instructions, using side action bolt croppers and fastened using 25mm and 30mm counter clamps with M6 nuts and bolts, all surface treated as the tray.

Trays will be coupled together using either a fast spring clip coupler or a 25mm/30mm counter clamp combination with supporting lateral splice plate on trays over 300mm width. The coupling will have the same surface finish as the tray.

Trays shall be supported at a maximum span of 2.5m by trapeze, wall, floor or channel mounting methods and will not exceed maximum loads as specified by the manufacturer.

All welds will be manufactured to an average minimum tensile strength of 500kg per weld, and deflection characteristics of the tray are tested and the results published in accordance with the European standard CEI 61537.

The cable tray / ladder/accessories shall be of HOT DIP Galvanized DIN EN 10327 for installations in corrosive atmospheres both indoor and outdoor application. Sample tray / ladder / accessories / mounting accessories and supports should be salt spray tested according to ISO 9227 for > 500 hours. (*550 hours according to class 6 for Hot dip Galvanized surface as per ISO)

Testing and Certification

Cable tray / Ladder, bend, T Bend, cross, and all supports are to be tested for Safe Working Load (SWL), deflections, Impact resistance, Salt Spray & Electrical continuity test according to IEC 61537. The cable tray/ladder should not deflect more than 1/100th of the span length at SWL in Mid span and the transverse deflection of all mounting accessories at SWL shall not exceed 1/20th of the length. The cable tray / cable ladder should be tested up to 1.7 times SWL at minimum and maximum room temperature. The temperature classification of cable tray system should be - 5 to + 150°C. It should have ROHS certification.

VIII) EARTHING

The earthing shall comply with the relevant provisions in IS 3043/1987. All non-current carrying metal parts shall be effectively connected to earth through two separate and distinct connections, except in cases where otherwise specified. Masonry trough with cast iron / RCC covers shall be provided for the electrodes.

Earthing main conductor shall be provided around the buildings and interconnected as shown in the drawings.

For floor equipment earthing, two risers of 25 x 3 CU shall be run along the electrical

shaft and two (2) tap offs shall be provided for each floor to the designated location.

Specific Requirements for Lightning Protection System:

The joints in the run of the earthing conductors shall be bolted/riveting type. Connections with equipment/ structure shall be of bolted type. Cable trays, steel pipes / conduits, steel columns, etc., shall not be used as earth continuity conductors. Earth connections for all sections of installation shall be electrically and mechanically sound. Two separate earthing leads shall be provided for each of the transformer / generator neutral earthing. Each of earthing leads shall be directly connected to a separate rod /pipe electrode treated as earth it which in turn shall be connected to two different runs of main earthing grid.

Earthing terminal of each lightning down conductor shall be directly connected to rod/ pipe electrodes, which in turn shall be connected to main earthing grid.

Conductor of the lightning protection system shall not be connected with the conductor of the safety earthing system above ground level.

Down conductors shall be cleated on outer side of the building wall at 750mm interval or welded to outside building columns at 1000mm interval.

Connection between each down conductor and rod /pipe electrode shall be made via test link located within the earth pit.

Lightning conductor shall not pass through or run inside GI conduits.

All metallic structures within the vicinity of 2000mm in air shall be bonded to the conductors of lightning protection system.

Tenderer shall include the entire necessary items for earthing works such as earth benches, copper lugs, terminations of PE conductor and earth conductor.

1. PIPE EARTH STATION

Pipe earth electrode shall comprise of 2.5m long 40mm \square GI pipe buried vertically in a pit of size 350mm x 350mm x 3000mm depth and filled with a homogeneous mixture of charcoal, sand and salt and at the top with a funnel for watering, finished in level with the ground. The earth lead shall be properly clamped to the pipe electrode with brass bolt, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of 450mm x 450mm x 300mm deep. The chamber shall be provided with a cast iron chequered plate inspection cover of size 450mm x 450mm hinged to cast iron frame.

2. PLATE EARTH STATION

Plate earth electrode shall comprise of 1200 x 1200 x 12.5mm cast iron plate or 600 x 600 x 3.15mm copper plate, vertically in pit of 1.5m x 1.5m x 3.00m and filled with homogeneous mixture of charcoal, sand and salt. The plate shall be bolted with a pipe of 19mm \square and at the top with a funnel for watering. Two-earth leads shall be bolted/welded or braced with the plate and brought to the top level along the watering pipe and clamped at the top with brass bolts, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of size 450mm x 450mm x 300mm deep. The chamber shall be provided with a RCC/ cast iron manhole inspection cover of size 450mm x 450mm.

3. ROD EARTH STATION

Copper coated solid steel rods shall be made of high tensile low carbon steel rod, with molecular bonded with 99.9% electrolytic copper with minimum coating thickness of 250 microns. The minimum length of the earth electrode shall be of 3 meters which is either a single rod or smaller rods with couplers or similar arrangement. For dry areas, length of the rod can go up to 9 meters. The vendor should quote price of the rod in length of 3 meters. The rod as well as the couplers should satisfy the requirements as per the above-referred standards. For lightning protection application rods should have a diameter of 14.2mm or 17.2mm. In order to carry fault current, earth rods used in power networks should of diameter 20mm or 25mm. In case of applications more than 3 meters, diameter of the rod should be 20 or 25mm. These rods also should have facility to drive with an electric/hydraulic hammer.

4. EARTHING CONDUCTORS

All earthing conductors shall be of bare electrolytic grade Copper of required sizes. To facilitate easy connections suitable offsets shall be provided at required locations on the earthing buses. The earthing conductor shall as far as possible, be installed out of reach of persons. Joints on copper earth buses shall be riveted, tinned and brazed. Tap connections shall be bolted. Earthing round conductors shall be terminated at the equipment using suitable lugs, nuts and washers. Earthing shall be insulated conductor if specified by any equipment manufacturer.

5. TESTS FOR EARTHING

The earth resistance of each electrode and the combined earth resistance of the earthing grid shall be measured using appropriate earth megger in the presence of the Consultant and the values recorded in the completion certificate.

IX) AS-BUILT DRAWINGS

After completion of work, the contractor shall prepare and submit to the Owner all as-built drawings giving complete details of the electrical installations. The contractor should also supply a cable schedule giving details of the sizes and lengths of all cables laid and connected between various panel boards and distribution boards.

MAKE OF MATERIALS

1.	MCCB	Schneider(Easy Pact CVS/NSX), ABB(T-max), L&T(D Sine), Siemens 3VA
2.	Cubicle type Switch Disconnecter	Schneider, ABB, L&T, Siemens
3.	Voltmeter and Ammeter	Rishab, Meco, AE
4.	Digital Meters	Schneider, Secure, L&T, Rishab, Socomec
5.	Push button, actuators, toggle switch, LED Indicating lamps	Schneider, ABB, L&T
6.	Selector switches	Kaycee, Salzer, Vaishnav, L&T
7.	HRC fuse, base and carriers	ABB, L&T, Schneider, Siemens
8.	XLPE Power cables	Havells, Finolex, RR Kabel, Polycab,

9.	Cable glands/lugs	Gloster Lotus, Prabath, Comet, Dowells, Hex, Trident
10.	IP rated Cable glands/lugs	Hensel, Comet and other equivalent makes
11.	Cable Tray	OBO - Better man, Profab, Fixotech
12.	DB/MCB/RCCB/RCBO	Legrand DX3, Schneider Acti 9, Siemens,
13.	PVC Electrical Conduit and accessories.	A.K.G, Balco, Konseal, Polycab, Precision
14.	Fan Hook	Power guard, Balco, AKG
15.	Flexible copper wires(FRLS)	Finolex, RR kabel, Havells ,Polycab
16.	Modular Switch and Socket	Legrand-Myrius, ,Schneider-opale, L&T - entice, Panasonic-Roma Urban,Europa,Honeywell-Blenx
17.	Timer Switches IP55,65,66,67&68	Legrand, Schneider, ABB , Siemens Hensel, Spelsberg , Schneider
18.	polycarbonate junction boxes	
19.	IP 65 polycarbonate DB enclosures	Hensel, Spelsberg, Schneider, Legrand
20.	IP 65 polycarbonate panel enclosures	Hensel, Cape electric
21.	IP44/67 Industrial sockets/plugs	Hensel, Schneider, Menekkes
22.	Fire sealant mortar	Hilti , OBO-Better man, 3M
23.	Rubber mat	Dunlop, Hi tech, Hilti

FIRE - FIGHTING

1.1 FIRE HOSE REEL, FIRE HYDRANT, FIRE SPRINKLER AND CONNECTED EQUIPMENT

Fire Hose Reel:

Fire Hose Reel shall be manual and swing type, conforming to IS 884:1985 complete with:

- Heavy duty drum fabricated from mild steel, conforming to BS EN 671-1:2001, with bracket and all necessary accessories and protected with Red (RAL 3000) shade epoxy polyester electrostatic powder coating.
- 19mm dia. x 30 Mtr. long pressure hose, red coloured, 2-ply polyester yarn braided or equal.
- Heavy duty on/off jet/spray chrome plated nozzle, red coloured, nylon or equal.
- 22mm. heavy duty ball valve, bronze or equal.

Hydrant Valve:

Hydrant Valve shall be of gunmetal/SS, 80mm inlet with single outlet fitted with 63mm. oblique female instantaneous single outlet, 75mm N.B. flanged inlet, gunmetal/SS spindle, cast iron hand wheel, and complete with ABS blank cap and G.I. chain, bearing IS 5290 mark.

3/4-Way Fire Brigade Inlet:

Fire Brigade Inlet breeching shall be with cast iron body, four nos. of gunmetal/SS 63mm. male instantaneous inlets, conforming to IS 903, fitted with inbuilt non return valves, 220mm. flanged outlet, 25 mm. drain valve, rubber blank caps and G.I. chains.

Fire Hose:

Fire Hose shall be non percolating type conforming to IS 636:88, with 63mm. internal dia. rubberized fabric reinforced rubber lined (RRL) hose jacketed with circular woven synthetic fibre. The RRL hose shall be with Working Pressure 12 Kg/Cm², Proof Pressure 22 Kg/Cm² and Burst Pressure 38 Kg/Cm². The Fire Hose shall be with IS: 636 Type-A marking and 30 Mtrs. in length.

Fire Hose Couplings:

Couplings shall be gunmetal/SS, heavy duty, conforming to IS 903:1993, with 63mm. pair of male and a female instantaneous coupling, having IS: 903 mark and duly S.S. wounded.

Branch Pipe:

Branch Pipe shall be gunmetal/SS, conforming to IS 903:1993, short type, with 63mm. male instantaneous inlet, male threaded outlet, fitted with 15mm. bore nozzle, having IS: 903 mark.

Air Release Valve:

Air release Valve shall be gunmetal, conforming to IS 903:1993, ball operated and with 25mm. BSP threaded male inlet.

Automatic Fire Sprinkler:

Fire Sprinkler shall be automatic, 3/5mm dia. glass bulb type spray sprinkler with fixed temperature rating of 68 or 79 degree, as per requirement. The glass bulb contains liquid having high vapour pressure, which expands when, exposed to heat and expand sufficient to shatter the glass bulb at the rated temperature.

Fire sprinkler shall be of standard response and upright for car parking areas, pendant for lobbies and corridors and extended coverage side wall for rooms, as detailed in the tender drawings. The fire sprinklers shall be of chrome finish, with K-factors as specified in the B.O.Q. The maximum working pressure shall be 12 Bar. The Fire Sprinkler shall be UL Listed and FM approved.

Escutcheon for Fire Sprinkler:

Escutcheon shall be for semi recessed sprinkler installation with one-piece friction fit, stainless Steel/Chrome finish.

Flow Switch:

Flow Switch shall be suitable for monitoring water flow and with following specifications.

Control Type	: Vane Type
Maximum Static Pressure	: 10 Kg/Cm ² / 20 Kg/Cm ²
Ambient Temperature Limit	: 0 – 49 Degree C
Maximum Liquid Temperature	: 100 Degree C
Electric Switch	: SPDT, Rating: 220VAC, 15A.
Connection	: Screw Terminals
Protection	: IP 65
Case	: Plastic Cover with ½ Conduit Opening

Pressure Vessel

The contractor shall provide one air vessel 250 mm dia 6 mm thick with automatic air release cock, 25 mm dia drain pipe, drain valve and a shut off and 120 cm in height, complete with approved quality of pressure switches, pressure gauge and all other required accessories to operate commonly main fire pump, sprinkler pump and Jockey pump at drop of pressure, automatically at required pressure setting, outside with one coat of primer and two coats of synthetic enamel paint of approved shade.

Pressure Switch

The pressure switch shall be industrial type single pole double throw electric pressure switch designed for starting or stopping of equipment when the pressure in the system drops or exceeds the pre-set limits. It shall comprise of a single pole changeover switch, below element assembly and differential spindle.

All the pressure switches shall have 1/4" B.S.P (f) inlet connection and screwed cable entry for fixing cable gland.

The electric rating of the switch shall be as under:

Type of supply	Voltage	Non –Inductive	
Inductive			
A.C.	110-380	10 Amp	6 Amp
D.C.	24-250	12 Watts	12
Watts			

Pressure Gauge:

All pressure gauges shall be of dial type with bourdon tube element of SS 316. The gauge shall be of reputed make. The dial size shall be 150-mm dia and scale division shall be in metric units marked clearly in black on a white dial. The range of pressure gauge shall be 0 to 12 kg/sq.cm. All pressure gauges shall be complete with isolation cock, nipples, tail pipes etc.

Expansion Bellow:

Expansion bellow shall be heavy duty with flanges suitable for 200/150/65mm delivery lines for fire hydrant and sprinkler systems.

1.2 VALVES AND ACCESSORIES

Isolating Valves:

Isolating valves for fire lines 50mm. dia. and above shall be butterfly valves. Butterfly valves shall be with integrally moulded seat to the body and conforming to BS 5155/IS 13095 with following features.

- Pressure Rating : PN 16
- Body : Cast Iron (BS 1452 Gr.250.)
- Disc : S.S 316 (CF 8M) Disc / S.G Iron CF8
- Seat : EPDM / Nitrile
- Shaft : AISI 410
- Bearing : PTFE/Acetal

Isolating valves for fire lines below 50mm. dia. shall be ball valves, conforming to IS13095 with following features.

- Pressure Rating : PN 20
- Body : Bronze body/Cast Alloy
- Ball : Stainless Steel 316
- Seats : PTFE/Acetal
- Handle : Stainless Steel 316 / Cadmium Plated Steel.

Non Return Valves:

Non return valves for fire lines shall be hydraulically engineered, tight shut off, self acting, wafer type swing check valves, conforming to IS 13095 with following features.

- Pressure Rating : PN 16
- Body : Cast iron/SGI
- Disc : Cast iron/SGI
- Hing Pin : Cast iron/SS/AISI 304
- Seat : Nitrile "O" Ring
- End Facing : Plain.

1.3 PIPE WORK**General Requirements**

All materials shall be of the best quality conforming to the specifications and subject to the approval of the Consultants.

Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

Pipes shall be securely fixed to walls and ceilings by suitable clamps and supports (galvanized after fabrication) at intervals specified. Only approved type of anchor fasteners shall be used for RCC slabs and walls / floors etc.

Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

Pipe accessories such as gauges, meters, control devices, etc. shall have the same working pressure rating as the associated pipe work. All pipe work shall be free from burrs, rust and scale and shall be cleaned before installation. All personnel engaged on welding operations must possess a certificate of competence issued by an acceptable / recognized authority.

Piping (Galvanized iron / Mild Steel)

Pipes of following types are to be used:

Galvanized Iron/Mild Steel pipes as per IS:1239 heavy grade (for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall also be suitably be lagged with 2 layers of 400 micron polythene sheet over 2 coats of bitumen.

Steel pipelines upto 150 mm dia shall be as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be as per I.S.:3589.

All pipe clamps and supports shall be fabricated from MS steel sections.

Welding of galvanized clamps and supports shall not be permitted.

Pipes shall be hung by means of expandable anchor fastener of approved make and design. The hangers and clamps shall be fastened by means of galvanized nuts and bolts. The size/diameter of the anchor fastener and the clamps shall be suitable to carry the weight of water filled pipe and dead load normally encountered.

Hangers and supports shall be thoroughly galvanized after fabrication. The selection and design of the hanger & support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor braces, dampener, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultants.

The piping system shall be tested for leakages at 2 times the operating pressure or 1.5 time shut-off pressure, which ever is highest including testing for water hammer effects.

Flanged joints shall be used for connections for vessels, equipment, flanged valves and also on two straight lengths of pipelines of strategic points to facilitate erection and subsequent maintenance work.

For pipes under ground installation the pipes shall be buried at least one meter below ground level and shall have 230 mm x 230 mm masonry or concrete supports at least 300 mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand : 8 stone aggregate) of size 380x380x75 thick resting on firm soil. Mains below ground level shall be supported at regular intervals not exceeding 3.0 metres and shall be laid at least 2.0 metre away from the building.

Piping Installation & Support

Piping shall be properly supported on or suspended from, on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanized steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanized steel sections.

Pipe hangers maximum spacing:		
Pipe Dia (mm)	Hanger Rod Dia (mm)	Spacing between Supports (m)
Up to 25	6	2
32 to 50	6	2.5
65 to 80	8	2.5
80 to 100	10	2.5
125 to 150	10	3.0
200 to 300	12	3.5

The end of the steel rods shall be threaded and not welded to the threaded bolt.

All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

Cut-outs in the floor slab for installing the various pipes area are indicated in the drawings. Contractor shall carefully examine the cut-outs provided and clearly point out wherever the cut-outs shown in the drawings, do not meet with the requirements.

Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab

and annular space filled with fiberglass and finished with retainer rings.

The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

Pipe Fittings (Grooved Fittings above 50 mm & Threaded fittings below 50 mm dia)

Pipe fittings mean tees, elbows, couplings, unions, flanges, reducers etc and all such connecting devices that are needed to complete the piping work in its totality.

Grooved fittings shall be used for pipes above 50 mm dia & Threaded type fitting shall be used for pipes of 50 mm dia & below.

Fabricated fittings shall not be permitted for pipes diameters 50mm and below. They shall be inspected by Project Manager before dispatch from the workshop.

GROOVED FITTINGS

MECHANICAL GROOVED COUPLINGS: 1G, 1GS, 1N

1. Grooves to be made as per manufacturer recommendation. Remove one nut and bolt from housings. Loosen the other nut until it is flush with the end of the bolt. Remove the gasket from the housings.
2. Check suitability of gasket for intended service and apply a thin coat of silicone or other compatible pipe lubricant to gasket lips and outside of the gasket, if the gasket surface does not have lubricate.
3. Insert and push the gasket over one of the grooved ends of the two pipes to be joined. Gasket lip should not overhang pipe end.
4. Align and bring the pipe ends together and slide gasket into position centred between the grooves on each pipe. Gasket should not extend into groove on either pipe.
5. Place housings over gasket and apply pressure by hands to engage the keys into the grooves. Insert bolts and apply nuts finger tight. Make sure on the Rigid Coupling the tongue and groove match to avoid product failure.
6. Tighten nuts alternately and equally until housing bolts pads are firmly together, metal-to-metal. Uneven tightening will pinch the gasket. For 1G, 1GS couplings there may be a slight gap at bolt pads.
7. Do not make adjustments to grooved products while the piping system is under pressure.

MECHANICAL BRANCH OUTLETS: 3G, 3GS, 3J, 3JS

8. Cut or drill hole in pipe as per manufacturer's recommendation (Hole diameter for each mechanical branch out-let is listed on the chart pertaining to the product). Holes must be drilled on the centre-line of the pipe. Remove the cut piece and cutting chips. Make sure that the pipe surface within 7/8" of the hole is clean, smooth and free of indentations or projections which would affect proper sealing.

9. Remove one nut and bolt from assembled housings. Loosen the other nut until it is flush with the end of bolt. Remove the tape and lift the gasket.
10. Check suitability of gasket for intended service. Reposition the gasket into the housing using alignment tabs on the sides for proper positioning.
11. Rotate the lower housing approximately 90 degrees away from the upper or outlet section. Place the upper on to the surface of the pipe in line with the outlet hole prepared per instructions and rotate the lower section around the pipe and close the two halves.
12. Insert bolt in its hole and finger tightens both nuts, making sure that the locating collar is in the outlet hole. Also make sure that the positioning lugs are aligned properly.
13. Tighten nuts uniformly until the gasket pocket area of the upper housing is in complete contact with pipe surface and the assembly is rigid. Nuts must be tightened with even gaps between bolt pads. Torque more than what is recommended is not desirable.

REDUCING COUPLING: 1N

14. Grooves to be made as per manufacturer recommendation. Remove nuts and bolts from housings. Remove gasket from housings.
15. Check suitability of gasket for intended service and apply a thin coat of silicone or other suitable pipe lubricant to gasket lips and outside of gasket, if the gasket surface does not have lubrication.
16. Insert the large opening of the gasket over the larger pipe ends until the steel washer touches the pipe ends.
17. Align the pipe centreline and insert the smaller pipe end into the gasket. A slight twisting motion of the pipe eases assembly. Steel washer will prevent the movement of smaller pipe inside the larger pipe.
18. Position the housing halves over the gasket, making sure the housing keys engage the grooves on each pipe. Proper lubrication of the interior of the housing and exterior of the gasket is important to prevent gasket pinching.
19. Insert the bolts and start the nuts manually. Tighten the nuts uniformly, alternating side until housing bolts pads meet firmly metal-to-metal. Uneven tightening will pinch the gasket.

GROOVED FLANGE ADAPTER: 321

20. Grooves to be made as per manufacturer recommendation. Open the grooved flange and place hinged flange around the grooved pipe end with the circular key section locating into the groove.
21. Insert a standard bolt through the mating holes of the Flange to secure the Flange in the groove.
22. Check suitability of gasket for the intended service and apply a thin coat of silicone or Other compatible lubricant to gasket lips and outside of the gasket, if the gasket surface does not have lubrication
23. Press the gasket into cavity between the pipe O.D. and Flange recess.
24. Insert a standard Flange bolt in the hinge hole opposite the lock- bolt and direct the two-bolt assembly to mate with the Flange of the device to be joined.
25. Add the remaining standard Flange bolts and tighten all nuts evenly until faces contact firmly or bolts attain recommended joint torque values.

Fire Fighting System Installation

The following Tools and Equipment will be used for Fire Fighting System Installation:

Grooving Machine

1. Threading Machine
2. Welding Machine

3. HILTI Drill Machine Model TE-1 and TE-24
4. 12" Grinding Machine
5. Vice Table
6. Pipe Wrenches

FIRE FIGHTING SYSTEM DESCRIPTION

SYSTEM COMPONENTS

1. Network of pipes
2. Zone control valve assembly
3. Sprinkler
4. Air release valve
5. Fire Department Connection
6. Minimum one four-way inlet breaching connection – to 2 1/2" fire hose and two-way inlet breaching connection to 1" fire hose reel system will be connected according to the accessibility to connect with fire department vehicle.

WORK SEQUENCE AND METHODOLOGY

Installation of fire sprinkler system

- a. The installation of Fire Sprinkler System shall be according to the approved detailed shop drawings and also as per the recommendations of NFPA 13.
- b. Pipe hangers shall be spaced at intervals as specified in our approved shop drawing.
- c. Threaded piping will be made with a suitable pipe sealing compound (jute and mastic combination) applied on male threads only. Ends of pipe will be reamed out before being made up into fitting.
- d. 2" and below sizes of pipe are made threaded & 2 1/2" and above sizes are normally grooved type. Groove can be made cut groove or roll groove.
- e. All underground fittings will be welded type. All piping coming underground will be wrapped with polyvinyl chloride tape.
- f. All Piping must be rigidly supported by a combination network comprised of pipe hangers and rigid support brackets.
- g. Pipe hangers are used to support the 'dead load' of the pipe system. The spacing will be as per the scheduled attached.
- h. Sprinkler Head Location shall be installed in accordance with approved system plans and coordinated RCP layout.

Installation of Sprinkler Head:

- i. All the Sprinkler Heads must be installed according to current NFPA 13 standard.
- j. The system piping must be properly sized according to the approved drawings and calculation to insure the minimum required flow rate at the sprinkler head.

- k. Install the Sprinkler Heads after the piping is in place to avoid mechanical damage.
- l. In the event of a thread leak, remove the unit, apply new pipe sealing compound, and reinstall.
- m. The face of the sprinkler fitting should be installed a nominal 3/8" to 1" behind the finished ceiling line, adjustment may be made via the push-on escutcheon plate to compensate for variation in the fittings.
- n. Hand tightens the sprinkler into the fitting using the proper size of wrench.
- o. To install the escutcheon plate, align it with and press it over the sprinkler body until the outer edge of the escutcheon meets the mounting surface

Installation of Butterfly Valve:

- p. The Butterfly Valve should be located as per the approved drawings, also to make sure that it is located where it will be readily accessible for operation, inspection and maintenance.
- q. During Installation make sure that the valve disc does not interfere with the operation of other systems components immediately adjacent to the butterfly valve.
- r. When a valve "closes hard", it may be due to debris lodged in the sealing area. This may be corrected by backing-off the hand wheel and closing it again, several times if necessary. The valve should never be forced to seat by applying a wrench to the hand wheel as this may distort the valve components or score the sealing surfaces.
- s. The inlet and outlet piping adjacent to the valve should be properly supported to prevent excessive stress on the valve body. The valve should not be used to force a pipeline into position as this may result in distortion of the valve body.

Installation of Flow Switch:

- t. The flow switch should be located as per the approved drawings, also to make sure that it is located where it will be readily accessible for operation, inspection and maintenance.
- u. The flow switch may be mounted on a horizontal or vertical pipe. On Horizontal pipe they should be installed on the top side of the pipe where they will be accessible.
- v. Drain the system and drill a hole in the pipe using a circular saw in a slow speed drill. The hole size shall be 2".
- w. Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole.
- x. Roll the vane so that it may be inserted in the hole; do not bend or crease it.

- y. Insert the Vanes so that the arrow on the saddle points in the direction of the water flow.
- z. Install the saddle strap and tighten nuts alternately.
- aa. The vane must not rub the inside of the pipe or bind in anyway.

METHOD OF TESTING

- bb. Plug all the openings
- cc. Close all the drain valves.
- dd. Fill complete pipeline with water avoiding any air column. (For this purpose keep the drain valve at the highest elevation slightly open, while filling water when line is completely filled with water close the valve)
- ee. By a pressure pump pressurize the line to an intermediate pressure, say 100 psi. Wait for 5 minutes; check all major joints for any visible leak.
- ff. If the system is OK as per point No. 4 again pressurize the system to 150 psi and wait for 10 minute for any drop in pressure or leakage.
- gg. If the system is found to be leak proof as per item No. 5 pressurizes the line to the required testing pressure and keep for 2 hrs.

PAINTING

All above ground pipes, pipe fittings, hose cabinets structural steel work pipe supports etc. shall be painted as per specifications given below.

Painting shall be done only after the completion of fabrication work and testing.

The instructions of paint manufacturer shall be followed as far as possible otherwise the work is to be done as directed by the Engineer.

All cleaning materials, brushes, tools and tackles, painting, material etc. shall be arranged by the contractor at site in sufficient quantity.

All rust, dust, scales, welding slag or any other foreign materials shall be removed fully so that a clean and dry surface is obtained prior to painting. Any other oily containment shall be removed by use of a solvent prior to surface cleaning.

First coat of primer paint must be applied by brush on dry clean surface immediately or in any case within 3 hours of such cleaning.

Primer paints - one coat (minimum thickness 100 microns) self-priming epoxy mastic.

Finishing coats:

- a) For Pump Rooms - 2 coats (thickness minimum 50 microns each) of epoxy paint, fire red shade.
- b) For other than Pump Rooms - 2 coats of synthetic enamel paint, fire red shade

WELDING

The welding procedure, types of electrodes etc. shall be in accordance with the following IS specifications.

Welding Procedures IS: 823

Welding Electrodes IS: 814, but of approved makes only

Testing of Welders IS: 817

Only Welders fulfilling the requirements of IS: 817 and approved by the Engineer shall be employed by the Contractor at site.

Procedure For Pypkote / Coatek Application

- A) Surface Preparation - The pipe surface shall be cleaned by a wire brush.
- B) Application of Primer - Pypkote / Coatek primer is to be applied on pipes immediately after cleaning. This is to prevent any further accumulation of rust on the pipe. This is a cold applied primer and is applied by brush.
- C) Application of Pypkote / Coatek 4 mm Tape - After the primer is applied on the pipe, it is allowed to dry for about 30 min. till it becomes touch dry. Before adhering the tape to the pipe, it is advisable to gently heat the primer coated pipe by a run of LPG torch. Remove the bottom polyethylene from the tape & then heat bottom surface of the tape by LPG torch or any heat source & start wrapping the tape to the pipe by heating the primer coated pipe & by removing the bottom polyethylene from the tape before wrapping better adhesion between the tape & pipe is obtained. Overlaps are maintained with a minimum of 12.5 mm.
- D) Tape coating of weld joints - The tape is applied over the weld joints after the necessary welding & testing methods of the joints is completed. The procedure for application of tape shall be the same as bare pipe procedure. Overlaps on each side of the weld joints shall be 50 mm.
- E) All equipment, enclosures, housings, air ducts, piping, trunking, cable trays, conduits, etc. which are exposed to view (including those in plant rooms) shall be provided with colour paint finishes.
 - a. Generally, all metal surfaces requiring painting shall be provided with one (1) coats of red oxide paint, primer coated, and two (2) coats of zinc chromate paint.
 - b. No painting shall be done on damp surfaces.

- c. The Contractor shall submit colour scheme for the entire Works to the General Contractor for co-ordination and submission for approval by the Engineer.
- d. Painting requirements as stated in codes and regulations or generally required by local authorities shall also be provided

Flanged joints (65 mm dia and above)

Flanged joints with flanges conforming to IS: 6392 shall be provided on

- a) Straight runs at intervals not exceeding 25-30m on pipe lines of 50 mm dia and above and as directed by the Project Manager.
- b) For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and as required for good engineering practice and as shown/noted on the drawings.
- c) Flanges shall be with GI bolts and nuts and 3mm insertion gasket of natural rubber conforming to IS: 11149

Unions (upto 50 mm dia)

Approved type of dismountable unions shall be provided on pipe lines of 40 mm dia and smaller dia, in locations similar to those specified for flanges.

ROSETTE PLATE

Rosette plate should be double recessed escutcheons. It should be selected as per the size i.e., 1/2" or 3/4" fire sprinkler. It should be chrome plated.

EXHAUST PIPES

The material used for exhaust pipe including all the fixing accessories and hardware shall be Mild steel (Class 'C'). The exhaust pipes shall be insulated with 75 mm thick mineral wool (density 100 kg/m³) insulation wrapped in chicken mesh and clad with 26 gauge aluminum sheet including all hot dip galvanized support structural.

Adequately sized pipes and fittings shall be installed to carry away the exhaust discharge into the atmosphere at a height as indicated in the drawings & as per the requirement of Center / State Pollution Control Board or Pollution Control Committee as the case may be. The galvanized M.S. structural support and vibration arrestors to specify along with drawing for statutory clearance.

"Y"- Strainer, Basket Strainer

Cast Iron Top Flange Openable Filter Element can be replaced without Disconnecting Pipe Line, Filter Element Stainless Steel – SS-304/Brass/Bronze, A permanent magnet is also provided on demand. Pressure rating 10 kg/cm² to 21 kg/cm².

EXCAVATION

Excavation for pipe lines shall be in open trenches to levels and grades shown on the drawings or as required at site. Pipe lines shall be buried with a minimum cover of 1 meter or as shown on drawings.

On completion of testing in the presence of the Project Manager and pipe protection, trenches shall

be backfilled in 150 mm layers and consolidated.

Contractor shall dispose of all surplus earth as directed by the Project Manager.

Hose Cabinet

Hose cabinet shall be provided for all internal and external fire hydrants. Hose cabinets shall be fabricated from 16 gauge MS powder coated sheet of fully welded construction with hinged double front door partially glazed (3 mm glass panel) with locking arrangement, stove enameled fire red paint (shade No. 536 of IS:5) with "FIRE HOSE" written on it prominently (size as given in the schedule of quantities). Cabinet surfaces in contact with the walls shall not be powder coated but instead given two coats of anti-corrosive paint.

Internal Hose Cabinet

Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of 16 gauge thick MS sheet and spray painted to shade No. 536 of IS:5. The hose cabinet shall be of size to accommodate the following:

- i. Landing Valves (Single/double headed)
- ii. Hose pipe
- iii. Hose reel (36.5 mtr.)
- iv. Branch pipes, nozzles (2 sets)
- v. Fire man's axe and hand appliances
- vi. Potable Fire Extinguisher

External Hose Cabinet

The hose cabinet shall be of size to accommodate the following:

- i. Single/Double headed yard hydrant valve
- ii. Hose pipe (2 length of 15 m)
- iii. Branch pipes, nozzles (2 sets)
- iv. Fire man's axe

1.4 HAND HELD FIRE EXTINGUISHERS

ABC Type Dry Powder Extinguisher

The Extinguisher shall be filled with ABC grade 40, Mono Ammonium Phosphate 40% from any approved manufacturer.

The capacity of the extinguisher when filled with Dry Chemical Powder (First filling) as per IS 4308, Part II, shall be 5 Kg +/-2% or 10 Kg +/- 3%.

The distribution of fire extinguishers to be as per IS 2190 – 1992.

It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety clip, fitted with a pin, to prevent accidental discharge. It shall be pressurised with Dry Nitrogen, as expellant. The Nitrogen to be charged at a pressure of 15 Kg/cm².

Water Type Extinguisher (Gas Pressure Type)

The Extinguishing medium shall be primarily water stored under normal pressure, the discharge being affected by release of Carbon Dioxide Gas from a 120 gms cylinder.

The capacity of Extinguisher, when filled upto the indicated level, shall be 9 ltr +/- 5%

The skin thickness of the Cylinder shall be minimum 4.0 mm, fabricated from Mild Steel sheet, welded as required, with dish and dome, being of same thickness, and of size not exceeding the diameter of body. The diameter of body to be not less than 150 mm and not exceeding 200 mm. The neck shall be externally threaded upto a minimum depth of 16 mm, and leaded tin bronze.

The cap shall be of leaded tin bronze, and screwed on the body upto a minimum of 1.6 cm depth, with parallel screw thread to match the neck ring. The siphon tube to be of brass or G.I. and the strainer of Brass. The cartridge holder, knob, discharge fittings and plunger to be of Brass/Leaded tin bronze, and plunger of stainless steel, spring of stainless steel. The cap to have handle fixed to it. The discharge hose shall be braided nylon, of 10 mm dia and 600 mm long, with a nozzle of brass fitted at end.

The extinguisher shall be treated for anti-corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enamelled/powder coated. The cartridge shall be as per IS, and have 60 gm net carbon dioxide gas for expelling. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 Kg/cm². It shall have external marking with letter A, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground and discharge tube with nozzle held in one hand to give a throw of not less than 6 mtr, and continue so for atleast 60 secs. The extinguisher body shall be clearly marked with ISI stamp (IS 940).

Carbon Dioxide Extinguisher

The Carbon Dioxide Extinguisher shall be as per IS: 2878

The body shall be constructed of seamless tube conforming to IS:7285 and having a convex dome and flat base. Its dia shall be maximum 140 mm, and the overall height shall not exceed 720 mm.

The discharge mechanism shall be through a control valve conforming to IS:3224. The internal syphon tube shall be of copper aluminium conforming to relevant specifications.

Hose Pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 140 Kg/cm² and shall be approximately 1.0 meter in length having internal dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The hand grip of Discharge horn shall be insulated with Rubber of appropriate thickness.

The gas shall be conforming to IS:307 and shall be stored at about 85 Kg/cm². The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times.

MECHANICAL FOAM TYPE FIRE EXTINGUISHER

Mechanical foam fire extinguishers are suitable for Class A & Class B fire. In addition to this, these mechanical foam type fire extinguishers offered by us are known to extinguish wood, paper, cloth, textile, stationery & very special blanket effect on flammable & volatile liquids like oil, petrol, kerosene, solvent & chemical, wax, resins and allied.

1.5 FIRE PUMPS AND ALLIED EQUIPMENTS

1.5.1 Electric Fire Pump

General

The electric fire pump shall be suitable for automatic operation complete with necessary electric motor and automatic starting gear, suitable for operation on 415 volts, 3 phase, 50 Hz. A.C. system. Both the motor and the pump shall be assembled on a common base plate, fabricated M.S. channel type or cast iron type.

Drive

The pump shall be direct driven by means of a flexible coupling. Coupling guard shall also be provided.

Fire Pump

The fire pump shall be horizontally mounted multistage, multioutlet centrifugal type. It shall have a capacity to deliver 2850 lpm as specified, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet. The pump shall have its first outlet at 4th stage for low zone system pressurization and second outlet at 6th stage for high zone system pressurization.

The pump shall be capable of giving a discharge of not less than 150 per cent of the rated discharge, at a head of not less than 65 per cent of the rated head. The shut off head shall be within 120 per cent of the rated head.

The pump casing shall be of cast iron to grade FG 200 to IS: 210 and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel. Provision of mechanical seal shall also be made.

Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water. The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

Provision of Jockey Pump for low and high zone shall be made. The pump shall be vertical SS type and of detail as in schedule of quantity. Contractor shall verify that the capacity of the Jockey pump shall not be less than 3% (Minimum 180 LPM) and not more than 10% of the installed pump capacity.

Motor

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz. system. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 55. The class of insulation shall be F. The synchronous speed shall be 1500 RPM as specified. The motor shall be rated for continuous duty and shall have a horse power rating necessary to drive the pump at 150 per cent of its rated discharge with at least 65 per cent rated head. The motor shall conform to I.S.325-1978.

Motor Starter

The motor starter shall be as per detail in MCC. The unit shall include suitable current transformer and ammeter of suitable range on one line to indicate the current. The starter shall not incorporate under voltage, no voltage trip overload or SPP.

The starter assembly shall be suitably integrated in the power and control panel for the wet riser

system & sprinkler system. (Warranty period 24 month from date of commissioning)

1.5.2 Diesel Fire Pump

General

The diesel pump set shall be suitable for automatic operation complete with necessary automatic starting gear, for starting on wet battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common base plate.

Drive

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided. The speed shall be 1500 RPM as specified.

Fire Pump

The fire pump shall be horizontally mounted centrifugal multi stage, multi outlet. It shall have a capacity to deliver as specified, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet. The pump shall be multi stage as specified. The pump shall be capable of giving a discharge of not less than 150% of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of the rated head.

The pump casing shall be of cast iron to grade FG 200 to IS 210 and parts like impeller, shaft sleeves, wearing-ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be stainless steel. Provision of mechanical seal shall also be made.

The pump casing shall be designed to withstand 1.5 times the working pressure.

Bearing of pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

Diesel Engine

Engine Rating - The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or combustion chamber (for example, by wicks, cartridge, heater, plugs etc.). The engine shall be multi cylinder/vertical 4 stroke cycle, aircooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and the after correction for altitude, ambient temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum HP required to drive the pump at its duty point. It shall also be capable of driving the pump at 150% of the rated discharge at 65% of rated head. The engine shall be capable of continuous non-stop operation for 8 hours and major overhaul shall not be required before 3000 hours of operation. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run. The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS 649/IS 1601/IS 10002, all amended up to date.

a. Engine Accessories : The engine shall be complete with the following accessories:-

1. Fly wheel dynamically balanced.
2. Direct coupling for pump and coupling guard.
3. Corrosion Resistor.
4. Air cleaner.
5. Fuel service tank support, and fuel oil filter with necessary pipe work.
6. Elect. starting battery (2X24 v).

7. Exhaust silencer with necessary pipe work.
8. Governor.
9. Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting).
10. Necessary safety controls.

b. Fuel System - The fuel shall be gravity fed from the engine fuel tank to the engine driven fuel pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself or suitably wall mounted on bracket. The fuel filter shall be suitably located to permit easy servicing.

All fuel tubing to the engine shall be with copper, with flexible hose connections where required. Plastic tubing shall not be permitted.

The fuel tank shall be of welded steel construction (3 mm. thick) and of capacity sufficient to allow the engine to run on full load for at least 8 hours. The tank shall be complete with necessary wall mounted supports, level indicator (protected against mechanical injury) inlet, outlet, overflow connections and drain plug and piping to the engine fuel tank. The outlet shall be so located as to avoid entry of any sediments into the fuel line to the engine. As semi rotary hand pump for filling the daily service tank together with hose pipe 5 mtr. long with a foot valve etc. shall also form part of the scope of supply.

c. Lubricating Oil System- Forced feed Lub. Oil system shall be employed for positive lubrication. Necessary Lub. oil filters shall be provided, located suitably for convenient servicing.

d. Starting System- The starting system shall comprise necessary batteries (2x24v), 24 volts starter motor of adequate capacity and axle type gear to match with the toothed ring on the fly wheel. Bi metallic relay protection to protect starting motor from excessively long cranking runs suitably integrated with engine protection system shall be included within the scope of the work.

The capacity of the battery shall be suitable for meeting the needs of the starting system.

The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression.

The scope shall cover all cabling, terminals, initial charging etc.

e. Exhaust System - The exhaust system shall be complete with silencer suitable for outdoor installation and silencer piping including bends and accessories needed for a run of 15 metre from the engine manifold.(Adjustment rates for extra lengths shall also be given). The total back pressure shall not exceed the engine manufacture's recommendation. The exhaust piping shall be suitably supported.

f. Engine shut down mechanism- This shall be auto/ manually operated and shall return automatically to the starting position after use.

g. Governing System- The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.

h. Engine Instrumentation- Engine instrumentation shall include the following:-

- i) Lub. oil pressure gauge.
- ii) Lub. oil temperature gauge.
- iii) Water pressure gauge.
- iv) Water temperature gauge.
- v) Tachometer.
- vi) Hour meter.

The instrumentation panel shall be suitably resident mounted on the engine.

Engine Protection Devices- Following engine protection and automatic shutdown facilities shall be provided:-

- i) Low lub.oil pressure.
- ii) High cooling water temp.
- iii) High lub.oil temperature.
- iv) Over speed shut down.

i. Pipe Work - All pipe lines with fittings and accessories required shall be provided for fuel oil, lub.oil and exhaust systems, copper piping of adequate sizes, shall be used for Lub.oil and fuel oil. M.S. piping will be permitted for exhaust.

j. Anti Vibration Mounting- Suitable vibration mounting duly approved by Project Manager shall be employed for mounting the unit so as to minimise transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

k. Battery Charger-Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery in trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

Pump Sets Assembly

On the main fire sprinkler and hydrant headers near pump sets a 150 mm dia by-pass valve located in an accessible location shall be provided along with a rate of flow rota meter calibrated in 1 pm and able to read 200% of the rated pump capacity. The delivery shall be connected to the fire tank.

Each and every pump set assembly shall be provided with suction valve (only for positive suction head), discharge valve, non-return valve and 150 mm dia Bourdon type pressure gauge with isolation valve.

Flexible Connectors

On all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors shall be provided. Connectors should be suitable for maximum working pressure of each pipe line on which it is mounted and tested to a test pressure of 1:5 time the operating pressure. Length of the connector shall be as per manufacturers standard.

Interlocking

The following inter-locking between the two main fire pumps (i.e. wet riser pump & sprinkler pump), the jockey pump and the diesel engine driven pump.

Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (wet riser and sprinkler, both the wet riser and sprinkler can come up at a time) or diesel driven pump.

JOCKEY WET RISER SPRINKLER DIESEL DRIVEN

SR.NO.	PUMP	PUMP	PUMP	PUMP
i.	ON	OFF	OFF	OFF
ii.	OFF	ON	OFF	OFF
iii.	OFF	OFF	ON	OFF
iv.	OFF	ON	ON	OFF
v.	OFF	OFF	ON	ON
vi.	OFF	OFF	OFF	ON
vii	OFF	ON	OFF	ON

Annunciation Panel

One solid state electronic annunciation panel, fully wired with visual display and audible alarm unit shall be provided to indicate :

- Flow condition in any flow switch indicating the area of distress and fire alarm.
- Starting and stopping of each hydrant pump.
- Starting and stopping of each jockey pump.
- Starting and stopping of each sprinkler pump.
- Failure of Hydrant / Sprinkler pump to start.
- High level in fire water storage tank compartment.
- Low level in fire water storage tank compartment.
- Low level in HSD day tank of the fire pump.

The panel shall be factory fabricated, wired and tested. All details shall be submitted with the tender.

The annunciation panel shall be located in the security office / reception on the ground floor or as instructed by the Project Manager.

Vibration Isolation

The pumpset shall be mounted on rolled steel channels and 150 mm thick inertia block spring and ribbed neoprene vibration isolation mounting shall support the inertia block onto a 100 mm thick concrete plinths. The spring mountings shall have a maximum deflection of 15 mm. Reference shall be made to the section on "Noise and Vibration" for further technical requirements.

2. CODES AND STANDARDS

The design, manufacturing and performance of the horizontal centrifugal pumps as specified hereinafter shall comply with the requirements of the latest editions of the applicable codes and standards, in particular the following:

1S - 12469-1988	:	Specification for pumps for fire fighting system
IS – 9137	:	Code for acceptance test for centrifugal mixed flow and axial Pumps- Class c
ISO 3555/BS-5316, Part-2	:	Acceptance Test for Centrifugal mixed flow and axial Pumps. Class 'B' tests
ISO 2548/B5S5316, Part-1	:	do- Class 'C' test.
PTC 8.2	:	Power Test Codes - Centrifugal pumps.
ASTM-E-165-65	:	Standard Method for liquid Penetrant Inspection
NFPA No. 20	:	Standard for the installation and operation of centrifugal fire pump
		Standard for the Hydraulic Institute of USA

Fire Protection Manual, latest revision issued by TAC

Other international's standard such as DIN, VOL etc. shall also be accepted subject to the purchaser's approval for which the Bidder shall furnish along with the offer adequate information to justify that these standards are equivalent to or superior to the standards mentioned above. For such alternate standards which are not normally published in English, the Bidder shall also furnish a complete translation for them.

In case of any contradiction with the above standards and data specification sheets the stipulation in the data sheets shall prevail and shall be holding with the supplier.

3. TECHNICAL SPECIFICATIONS-FIRE ALARM SYSTEM

An Addressable Fire Alarm System (FAS) shall be provided to effect total control over the life safety services required in the building. The FAS shall be of the digital, distributed processing, real time, and multitasking, multi-user and multi-location type.

The FAS provided shall be able to tie-up the following Mechanical, Electrical & Low Voltage Services into an integrated system.

a. Air Handling Units

- b. Staircase pressurization fans, Lift shafts and lift lobbies pressurization fans.
- c. Public address system.
- d. Lifts
- e. Toilet Exhaust Fan
- f. Smoke evacuation system.

The system shall be provided with Addressable and Analog fire alarm initiating, annunciating and control devices.

The addressable and intelligent system shall be such that smoke sensors, beam detectors, thermal sensors, manual call points, etc., can be identified with point address.

The system shall be capable of:

- a. Setting smoke sensor sensitivity remotely (from the Fire Work Station) to either high sensitivity manually or on a pre-programmed sequence e.g. occupied/unoccupied period. The FAS shall be able to recognize normal and alarm conditions, below normal sensor values that reveal trouble condition, and above normal values that indicate either a pre-alarm condition or the need of maintenance.
- b. Read-out or address an actual space temperature at thermal detector points. The operator shall also be able to adjust alarm and pre-alarm thresholds and other parameters for the smoke sensors.
- c. Provide a maintenance/pre-alert alarm capability at smoke sensors to prevent the detectors from indicating a false alarm due to dust, dirt etc.
- d. Provide alarm verification of individual smoke sensors. Systems that perform alarm verification on a zone basis shall not be acceptable. Alarm verification shall be printed on the printer at the Control Station's printer to enhance system maintenance and identify possible problem areas.
- e. Provide local numeric point address and LED display of device and current condition of the point. Local annunciation shall not interfere with annunciation from the Fire Control System.
- f. Provide outputs that are addressable, i.e. outputs shall have point address. The operator shall be able to command such points manually or assign the points to Logical Point Groups (Software Zones) for pre-programmed operation.

In the event of a fire alarm, but not in a fault condition, the following action shall be performed automatically.

- a. The System Alarm LED on the main fire alarm control panel shall flash.
- b. A local piezo-electric sounder in the control panel shall be sounded.
- c. The LCD display on the main fire alarm control panel shall indicate all information associated with Fire Alarm condition including the type of alarm point and its location within the premises.
- d. Printing and history storage equipment shall log the information associated with the Fire Alarm Control Panel condition, along with the time and date of occurrence.

- e. All system output programs assigned via control-by-event programs that are to be activated by a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
- f. All lifts initiated through the systems will automatically be returned to Ground Floor.
- g. Air handling units on affected floors shall automatically be switched OFF and simultaneously respective fire dampers shall also be closed.
- h. Staircase pressurization fans shall be put on.
- i. Toilet exhaust fans on affected floors shall be put off.
- j. Pre-recorded alarm messages shall be played through interface with Public Address system.
- k. Start smoke evacuation system.

FIRE ALARM CONTROL PANEL (FACP)

- 26. The distributed Intelligent Fire Alarm Control Panel (FACP) shall function as fully stand-alone panel as well as providing a communication interface to the central station. FACP shall have its own microprocessor, software and memory and should be listed under UL-864. In the event of failure of the central or communication breakdown between the central station and the FACP, the FACP shall automatically operate on stand-alone mode without sacrificing any functions.
- 27. The memory data for panel configuration and operation shall reside in non-
- 28. volatile memory (EEPROM). Removal of the board shall not cause loss of memory. If such removal can cause loss of memory, then the card containing the memory shall have battery back-up for up to 100 hours on the board itself.
- 29. FACP shall supervise detection circuits and shall generate an alarm in case of abnormal condition.
- 30. FACP shall provide general purpose inputs for monitoring such functions as low battery or AC power failure. FACP shall provide tamper protection and commendable outputs, which can operate relays or logic level devices. Output commands shall take any of, but not limited to, maintained command, Momentary Command, Alarm Follow, or Alarm latch as required. Any relay in the FACP which is intended to be removable shall be supervised against removal.
- 31. Smoke detectors shall be powered using the FACP-based smoke detection circuits. FACP shall provide for resetting smoke detectors, fault-isolation and sensor loop operation. It shall be possible to mix different fire devices within the same FACP to optimize field wiring.
- 32. FACP shall provide indication for communication with the central console and alarm/trouble conditions in each sensor loops.
- 33. FACP shall provide monitoring and control of one floor or area or for multiple floors or areas. FACP shall meet the following requirements to assure the integrity and reliability of the system:
 - a. The FACP shall be UL or EN54 listed independently as a fire alarm control panel.
 - b. FACP electronics shall be contained in an enclosure made of minimum 16 gauge steel. Access to FACP switches and electronics shall be by key-lock. Usage of no other tools

should be required. Visual indicators of FSP status for each zone shall be visible without opening the key-locked cover.

34. All hardware and software to allow the FACP configuration and operation to be changed shall be provided. Memory data shall be contained in non-volatile memory (EPROM).
35. Alarm verification with field-adjustable time from 0 to 60 seconds for individual smoke detector shall be provided. During the alarm verification, the panel shall retard the alarm until the end of the period. If the alarm is only a transient smoke alarm, the panel shall automatically reset the alarm. Only a verified alarm shall initiate the alarm sequence for the software zone (Logical Point Group) or point. Final time setting shall be as per approval of the fire. When alarm verification is being performed on a smoke detector, the action shall be printed on the listed printer(s).
36. Digital numeric display at the FACP shall be provided to indicate point in alarm or trouble. In such systems, means for manually scanning the points in trouble shall be provided and a trouble and alarm LED shall be used to indicate that there are points in alarm/trouble. The alarm/trouble LED shall only extinguish when all alarm/troubles are cleared from the loop.
37. It shall be possible to command test, reset and alarm silence from both the FACP and the central console.
38. FACP switches shall allow authorized personnel to accomplish the following, independent of the central console :
 - a. Initiate a general alarm condition.
 - b. Silence the local audible alarm.
 - c. It shall be possible to acknowledge (Silence the local FACP audible without silencing the alarm indicating devices (hooters).
 - d. Reset all zones (Logical Point Group) / points, after all initiating devices have returned to normal.
 - e. Perform a complete operational test of the microprocessor and memory with a visual indication with each board.
 - f. Test all panel LEDs for proper operation without causing a change in the condition of any zone (Logical Point Group)
 - g. Walk Test
39. Software zones/loops shall be circuited and protected by Fault Isolation Modules such that in the event of a zone/loop short-circuit, not more than twenty (20) devices shall be left non-functional.
40. Intelligent Smoke and thermal sensors shall be located as shown and shall report sensed levels in analog form.
41. Monitor modules shall be provided to monitor and address contact-type input devices. The monitor module shall be supervised by FACP.

42. The FACP shall process the true continuous analog signal from the sensors. System using step setting to represent analog signal will not be accepted. The FACP shall be able to set dual alarms threshold for occupied and unoccupied periods. During unoccupied period, the alarm threshold shall automatically be lowered to facilitate quicker response. In addition, the FACP shall further process all analog values for pre-alarm limits to prompt the operator for early maintenance. If a sensor value increases to an above normal level or a pre-alarm limit for an extended duration, the FACP shall communicate a maintenance pre-alarm.
 - a. Any time sensor value transitions beyond the secondary and higher limit value, an alarm initiation and report shall be issued.
 - b. Limits and sensor values shall be displayed, modifiable, and reported in decimal values.
 - c. The FACP shall have Drift Compensation facility to compensate for environment. The FACP shall have the ability to recalibrate Pre-alarm and Alarm limits if required, after comparing each sensor's operating characteristics with the set sensitivity. This should be carried out at least once in every 24 hours. FACP should annunciate trouble conditions when sensor(s) is beyond compensation range (excessively dirty sensor).
 - d. The FACP should be UL listed approved to provide the sensitivity measurement and documentation required by NFPA72E.
43. FACP shall be backed up with its built in UPS power and shall also be connected to central DG Power available in the building.
44. FACP shall be provided with following features :

Charger Rate Control	
Control-by-Time	Non-Alarm Module Reporting
Day/Night Sensitivity	Periodic Detector Test
Device Blink Control	Remote Page
Drift Compensation	Trouble Reminder
NFPA 72 Sensitivity Test	Verification Counters
System Status Reports	Walk Test
Security Monitor Points	Maintenance Alert
Alarm Verification	System Configuration Report
Printer Interface	System Point Report
Event Historical log	Programmable Automatic Timed and
Manual Signal Silence	
Programmable Manual Signal	Control-By-Event with Boolean Logic
Silence Inhibit Timer	and Timer Control
45. FACP shall have real-time clock to prevent loss of time and date in case of failure of power supplies.
46. The display on FACP shall provide indication for AC Power, System Alarm, System Trouble/Security Alarm, Display Trouble and Signal Silence.
47. Minimum two different password levels will be provided to prevent unauthorized System control or programming.
48. Operator control switches for Signal Silence, lamp Test, Reset, System Test and Acknowledge shall be provided.

49. The FACP should truly field programmable. This would mean that in the event of change of any logic, detector / zone sequence alteration, the operator can initiate these by use of the alpha-numeric keys on the FACP panel to reconfigure the above parameters. Panels, which require external programming devices to perform the above function, will not be acceptable.
50. The FACP should have a degraded mode of operation. In the event of the CPU failure the field devices (detectors & modules) should report the condition on a simple digital communication mode to ensure reliability even during failure.
51. Power supply unit of FACP shall have following characters :
 - a. The main power supply shall be 230 V AC \pm 10%, 50 Hz \pm 1% and shall in turn provide all necessary power of the FACP.
 - b. It shall provide a battery charger for 24 hours for standby power using dual-rate charging technique for fast battery recharge.
 - c. It shall provide a very low frequency sweep earth fault detect circuit, capable of detecting earth faults on sensitive addressable modules.
 - d. It shall be power-limiting using Positive Temperature Coefficient (PTC) resistor.
 - e. It shall provide indication for battery voltage and charging current.
52. For ease of service, all wiring terminal blocks shall be plug-in type and shall have sufficient capacity for 18 to 12 AWG wire termination. Fixed terminal blocks shall not be acceptable.

DETECTORS & ADDRESSABLE DEVICES

General features common to all detectors:

- a. Compatibility: All automatic fire detectors shall be interchangeable without requiring different mounting bases or alterations in the signal panel.
- b. Response Spectrum: Combustion gas detectors shall respond to both visible and invisible aerosols; size and colour of the aerosols shall not have a decisive influence on the response of the detector.
- c. Sensitivity: On average 30 mgs of burned material per cu.m. (as measured in a 1 cu.m. chamber) shall release an alarm sensitivity which shall be adjustable according to the use of the space.
- d. Power Consumption: Each detector shall use the minimum of power, for economic circuits, so that it shall have capacity to connect at least 99 detectors, 50 modules and 20 fault isolator modules in one loop.
- e. Built-in-response indicator: Each detector shall incorporate indicator "LED" at the detector which shall blink during normal condition and light up on actuation of the detector to locate the detector which is operated. The detector shall not be affected by the failure of the response indicator lamp.
- f. Maintenance: All detectors shall be fitted either with plug-in system or bayonet type connections only, from the maintenance and compatibility point of view.

- g. Construction: The detector shall be vibration and shock proof. When disassembling for cleaning purposes, its components must not be damaged by static over voltage.
- h. Atmospheric and Thermal Disturbance: The detector shall so design as to be practically immune to environmental criteria such as air currents, humidity, temperature fluctuations & pressure and shall not trigger false alarm, due to the above conditions.
- i. Continuous Operation: An alarm release shall not affect a detector's functioning. After resetting the alarm, the detector shall resume operation without any readjustment.
- j. Adaptability to ambient conditions: Detectors shall be designed for adaptability to humid locations. No performance deterioration shall be acceptable.

Addressable Photoelectric Smoke Detectors

Smoke detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. Minimum to 99 intelligent detectors should connect to one loop. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog value for smoke density. The detectors shall be ceiling mounted type and shall include a twist-lock base.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may activate remotely on command from the control panel.

The detectors shall provide address-setting means on the detector head using rotary decimal switches. Systems which use binary jumpers or DIP switches to set the detector address shall not be acceptable. The detectors shall also store an internal identifying code, which the control panel shall use to identify the type of detector. Detectors providing address setting through hand held programmers shall also be accepted.

The detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the FACP, the detectors shall compensate for dust accumulation and other slow environmental changes which may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.

The area covered by each smoke detector shall be as per IS-2189.

Addressable Heat Detectors

Heat detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. Minimum 99 intelligent thermal detectors may connect to one loop.

The detectors shall use an electronic detector to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements. The detectors shall be ceiling-mounted type and shall include a twist-lock base.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated remotely on command from the control panel.

The detectors shall provide address-setting means on the detector head using rotary decimal switches. Systems which use binary jumpers or DIP switches to set the address shall not be acceptable. Detectors providing address setting through hand held programmers shall also be accepted.

The detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions. In certain applications, LEDs may be selected to be polled without flashing through system programming. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

An output connection shall be provided in the base to connect an external remote alarm LED.

Addressable Manual Stations

Addressable manual stations shall be provided to connect to the Fire Alarm Control Panel loops. Minimum 99 addressable manual stations may be connected to one loop.

The manual stations shall on command from the Control Panel send data to the panel representing the state of the manual station.

Press/break stations with resettable capability are also acceptable.

Manual stations shall be constructed of high impact LEXAN sheet with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters.

Stations shall be suitable for surface mounting as shown on the plans, or semi-flush mounting, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor unless

otherwise specified by applicable building codes.

Addressable Monitor Module

The monitor module shall provide address-setting and shall also store an internal identifying code which the Fire Alarm Control Panel shall use to identify the type of device. Modules using binary jumpers are not acceptable. An LED shall be provided which shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

Response Indicator

In addition to built-in response indicator in each detector, Secondary response indicator of LED type shall be provided outside the rooms wherever asked for by the Architect/Interior Designer, for indication of fire through detector in the room. The design & colour shall be as per Interior Designer approval.

Control Module

The control module shall provide address-setting and shall also store an internal identifying code which the control panel shall use to identify the type of device. Modules which use binary jumpers are not acceptable. An LED shall be provided which shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.

Addressable Hooters

All field hooters should preferably be addressable and software configurable. All hooters should be able to provide at least a minimum of 3 different tones, which should be user configurable. The minimum decibel level of each hooter should be 90db. All hooters should be UL/FM listed.

Beam Detector

The projected beam type smoke detector shall be a 4-wire 24 V DC device to be used separately supplied 4-wire control panels only. Unit shall consist of a separate transmitter and receiver capable of being powered separately or together. The detector shall operate in either a short range (30–100 ft.) or long range (100–330 ft.) mode. The temperature range of the beam shall be –22°F to 131°F. The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment of the unit without special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. The unit shall include both ceiling and wall mounting brackets. Testing shall be carried out using calibrated test filters or a magnet activated remote test station.

Duct Detector

- a. The Duct Casting Units are to be directly installed in the air conditioning ducts (Return air) for detecting any hazardous quantity of products of combustion being carried through the ducts.

- b. The complete unit shall consist of plastic housing to accommodate Photo Electric Detector with plug - in facility and sampling tubes, one for air inlet and other as the air outlet.
- c. The Inlet tube shall extend into and across the duct width (from 0.5 metre to 3.0 metre), the outlet tube shall be of fixed length of 7.5 cm length.
- d. When the AHU blower fan operates, a continuous cross sectional sampling of air from the duct shall flow through the housing containing the Detector. The outlet tube shall return the sampled air into the duct.
- e. The functional requirements of the Duct Casting Unit shall be:
 - i) Uniform Sensitivity - irrespective of air velocity - upto 1200 metres per minute.
 - ii) It shall function on the Venturi principle, with plastic venturi tubes.
 - iii) The Duct Casting Unit shall be compact, easy to install and with the facility to dismantle the cover or Detector for maintenance purposes.
 - iv) The housing shall be mounted outside the duct, the probe tubes shall be inserted through the duct by cutting precision sized holes into the duct and sealed with rubber gaskets.
 - v) The Duct Casting Unit shall be FM/UL Approved.

Addressable Fireman's Telephone Jack

Firefighters' telephones shall be typically installed in corridors, lobbies, mechanical rooms, stairways, or other strategic locations. When lifted from its cradle, the handset activates audible and visible signals at the Fire Fighter control Panel. Fire alarm telephones shall be rugged communications devices for emergency use. Enclosed key locked telephone stations shall comprise of three components: the handset assembly, the front plate, and the wall box. Front plates shall be break glass type. They shall be supervised for three or four state operation. The fire fighter shall have a module to give an address to individual Fire Fighter Telephone station.

CABLES

All PVC insulated FRLS copper conductor stranded cables shall be 650 volts grade and shall generally conform to IS-1554-1988 and meet the signal cabling requirement of the system manufacturer.

Strands of cables shall not be cut to accommodate & connect to the terminals. Terminals shall have sufficient cross-sectional area to take all the strands.

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturer's. All cables shall be laid with minimum one diameter gap and shall be clamped at every meter and shall be tagged for identification with aluminium tag and clamped properly. Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings. All cable shall be identified by embossing on the tag the size of the cable, place of origin and termination. If numbers of cables are >4 than cable tray of appropriate size to be used.

These shall be measured on linear basis including the fittings required like, end termination junction boxes.

EMERGENCY VOICE EVACUATION (EVAC)

The FACP shall contain all equipment required for audio, communication, signaling and supervisory functions. This shall include speaker zone indication, digital voice units, microphone.

a. Function : The EVAC system equipment shall perform following functions :

1. Operate as a supervised dual channel emergency voice communication system.
2. Operate as a two-way emergency communication system control center.
3. Supervise condition of every connection circuit.
4. Audibly and visually annunciate any trouble condition of tone generators and digital voice units required for normal operation of the system.
5. Provide all-call activities through activation of a single control switch. Provide selectable zone calling.
6. Provide automatic, digitally-recorded voice messages or field-programmed through the microphone.

b. The system shall be modular in construction and shall be capable of being field programmable without requiring the return of any components to the manufacturer.

c. The system and associated equipment shall be protected against unusually high voltage surges or line transients.

FUNCTIONAL REQUIREMENTS

Intelligent System Devices

a. Each device shall be assigned a unique address via easily understood decade (01 to 99) switch. Address selection via binary switches is not acceptable. Devices which take their address from their position on the circuit are unacceptable.

b. Devices shall receive power and communication from the same pair of conductors.

Sensors

a. All fire sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change. The base shall be incompatible with conventional detectors to preclude the mounting of a non-intelligent device.

b. Each sensor shall contain an LED which shall blink each time the sensor is scanned by the FACP. If the FACP determines that the sensor is in alarm, the FACP shall command the sensor LED to get latched on.

c. Each sensor shall be capable of being tested for alarm via command from the FACP.

d. Each sensor shall respond to FACP scan for information with its type identification to preclude inadvertent substitution of another sensor type. The FACP shall continue operation with the detector installed but shall initiate a mismatch (trouble) condition until the proper detector is installed.

e. Each sensor shall respond to FACP scan for information with an analog representation of measured fire-related phenomenon (smoke density, particles of combustion, temperature). Systems which only monitor the presence of conventional detector in an addressable base shall not be acceptable.

f. Photoelectric smoke sensors shall contain an optical sensing chamber with nominal sensitivity of 2.3%-foot obstruction.

g. Ionization smoke sensors shall contain a unipolar dual chamber with nominal sensitivity of 2.3% foot

obscuration.

Input Devices

- a. The input device shall provide an addressable input for N.O. or N.C. contact devices such as manual stations etc.
- b. The input device shall provide a supervised initiating circuit. An open-circuit fault shall annunciate at the FACP (subsequent alarms shall be reported).
- c. The device shall contain an LED which will blink upon being scanned by the FACP. Upon determination of an alarm condition, the LED shall be latched on.

Automatic Functions at FACP

The alarms shall be displayed at the FACP on an LCD display. The display shall indicate the device in alarm by ID number, the appropriate alarm state, and the current time and date. It shall also display a point description of minimum 32 characters and, the respective analog value. The display shall also contain a minimum 40 characters alarm message. It shall be possible to see the number of acknowledged alarms, number of current fire alarms, number of trouble conditions and number of other miscellaneous alarms in the system. The FACP printer shall print out same information displayed on the LCD display. The LCD display and printer shall be powered directly from the panel.

Manual Functions at FACP

- I. At any given time, operator shall have the following manual capabilities at FACP by means of switches located behind a key-locked cover :
 - a. Initiate an alarm summary display on the FACP LCD display. This display shall step through all currently active alarms in the system.
 - b. Initiate a summary printout of all currently active alarms on the FACP printer.
 - c. Initiate an "all-point summary" printout on the FACP printer recording the status of each system point (initiating circuits, indicating circuits etc.)
 - d. If the alarm is ignored by an operator than the history of same to be available
- II. At any time, the operator shall have following manual capabilities at the FACP under password control; Operator privileges and ID numbers of upto four digits shall assignable by the main operator or designated alternate. Actions taken by operators shall automatically be printed on the FACP printer with operator initials, time and date.
 - a. Commands output points to different mode. Such commands shall be printed with selected descriptors ON/OFF/AUTO, OPEN/CLOSE, DAY/NIGHT etc. In addition, command shall be used to ISOLATE or DISCONNECT points. When isolated, alarms and troubles shall be received but not acted upon.
 - b. Modify system parameters. Alphanumeric key pad shall be provided for operators to modify the following parameters :
 - ☐ change sensor alarm and pre-alarm threshold

- ☐ update date and time
 - ☐ change point descriptors
 - ☐ change action message
 - ☐ disable a point
 - ☐ change sensor verification time
 - ☐ change password
 - ☐ activate/deactivate indicating output control point
 - ☐ control-by-event programs on line
- c. Select a system status report for printing on the printer from the control station. The following real time reports shall be provided :
- ☐ all point log.
 - ☐ alarm summary
 - ☐ trouble summary
 - ☐ status summary
 - ☐ sensitivity log
 - ☐ disabled points log.
 - ☐ isolated points log
 - ☐ disconnected points log
 - ☐ logical group points log

The sensitivity log shall print the analog value of each addressable analog sensor.

d. Select printing of a trend sensitivity log which when enabled, shall print minimum last 24 analog values for every addressable analog sensor taken at predetermined intervals. Systems which limit the number of addressable analog sensors which can be trended are not acceptable.

e. Select a sequence of programmed commands which can be automatically executed, in sequence, via a single command.

f. Perform a walk-test function such that a operation can be periodically checked out for all initiating devices on a zone. In walk test mode, all initiators on the selected zone shall automatically be isolated. As each device is placed into an alarm or trouble condition, the FACP shall print the condition and automatically reset the device. No audible signals shall be initiated from the zone to prevent disruption of building occupants. If a zone is inadvertently left in the walk-test mode, it shall automatically reset to normal after a five-minute idle time is exceeded.

System Supervision

a. In the normal supervisory condition, only the "POWER" ON, and "RUN" conditions, shall be illuminated. The LCD display shall display "System Normal" and the current time and date.

b. The LCD display shall indicate the loss of power condition and the printer shall record the same. Following restoration of normal AC power, the trouble indicators shall be automatically reset and the printer shall record the 'return to normal condition'.

c. The LCD display shall indicate the loop in trouble and the printer shall record same.

d. The LCD display shall indicate trouble and the printer shall record same. Operation of a momentary "Silence" switch shall silence the audible trouble signal but the visual "Trouble" LEDs shall remain ON until the malfunction has been corrected and the system has reset. The FACP printer shall record this action.

Programming of FACP

The LCD display and printer programming shall be accomplished on site by means of lap-top personal computer which shall plug into the FACP. Modules requiring off-site programming are not acceptable. LCD shall initiate test of all addressable sensors in the system.

Programming functions shall include alarm/trouble type assignment, point descriptor assignment, alarm message assignment etc. Data file for the LCD display and a printer shall be stored in EEPROM.

Other Devices

Fault-isolation of fire zones (Logical Point Group) / circuit modules shall be provided to enable part of a fault-tolerant loop to continue operating when a short occurs in the loop.

Fire Alarm Graphics Software (FAS)

The status of each detector shall be monitored by the FAS.

Using the FAS, the operator shall be able to adjust the sensitivity of any detector.

Using the FAS, the operator shall be able to define the entire database for the file system. Fire system which are not field programmable shall not be accepted.

The FAS operator shall be able to acknowledge alarms or trouble messages at the FAS.

It shall be necessary for all alarm or trouble conditions to be acknowledge at the fire system central panel.

FAS software shall be upload/download type as well as with graphic facilities.

The contractor shall list out the graphic facilities being provided by him.

All devices & detectors shall be visible on building plans superimposed in FAS software.

Fire Control Sequences

Upon activation of fire alarm devices:

FACP will display the exact address & alarm in the panel.

The Central Control Station shall switch OFF the AHUs of the affected floor fire damper and toilet exhaust fans while the AHUs on the other floors shall remain operational so as to keep the area under positive pressure.

Staircase pressurization fans shall be operated through the fire alarm system.

Appropriate fire messages shall start to broadcast automatically (synthesized voice) after time delay.

Activate the fire alarm signaling devices.

Capture the lifts and return them to the ground floor.

The lifts and escalators alarms (provided by lift and escalator contractor) shall be tied to the Fire Alarm System. The Fire Alarm System shall function as follows :

In the event of a fire, a signal will be provided by the Fire Alarm System to return all lifts to ground floor.

Should an emergency alarm originate from an individual lift, an audible alarm shall sound at both Fire Control Stations, and print out at the printers.

When an alarm is detected

- ☐ all include annunciating devices on the floor one above and one below shall sound.
- ☐ Stairwell pressurization fans shall be started.
- ☐ the air handling unit for the floor shall be stopped.
- ☐ The air handling unit on the floor above and the floor below shall be started unless those floors are also in alarm.

If the alarm has not been acknowledged at the central panel within one minute, all audible annunciating devices on the floor above and the floor below shall sound.

If the alarm has not been acknowledged at the central panel within three minutes, all audible annunciating devices on the building shall sound.

It shall be possible to accomplish the following, independent of the central console :

- a. Initiate a general alarm condition.
- b. Silence the local audible.
- c. Silence the alarm signals. It shall be possible to acknowledge (silence) the local FACP audible without silencing the alarm indicating devices (hooters).
- d. Reset all zones, after all initiating devices have returned to normal.
- e. Perform a complete operational test of the microprocessor and memory with a visual indication of satisfactory communication with each board.
- f. Test all panel LED's for proper operation without causing a change in the condition of any zone.
- g. Print reports of all points based on Historical data.
- h. Read the status of each point based on LCD display and print the status information.
- j. Change passwords.
- k. Disable points/zones.
- l. Change sensitivity of sensors.
- m. Perform a walk test and generate walk test report.

4. CODES AND STANDARDS

The equipment and installation shall comply with the current provisions of the following codes and standards:

NFPA 70 - 2002 National Electric Code®

NFPA 72 - 1999 National Fire Alarm Code®

NFPA 90A - 1999 Air Conditioning Systems

NFPA 92A - 2000 Smoke Control Systems

NFPA 92B - 2000 Smoke Management Systems in Malls, Atria, and Large Areas

NFPA 101- 2000 Life Safety Code®

UL 864 - Control Units for Fire Protective Signaling Systems.

UL 268 - Smoke Detectors for Fire Protective Signaling Systems.

UL 268A - Smoke Detectors for Duct Applications.

UL 217 - Single and Multiple Station Smoke Alarms

UL 521 - Heat Detectors for Fire Protective Signaling Systems.

UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

UL 464 - Audible Signaling Appliances.

UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems

UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.

UL 1971 - Signaling Devices for the Hearing-Impaired.

UL 1481 - Power Supplies for Fire Protective Signaling Systems.

UL 1711 - Amplifiers for Fire Protective Signaling Systems.

UL 1635 - Digital Alarm Communicator System Units

Factory Mutual (FM) approval

ADDENDUMS thereafter in UL Code for Fire Detection (2007)

UL 9th Schedule certification.

International Standards Organization (ISO)

ISO-9000

ISO-9001

European Union (EU)

EMC Directive 89/336/EEC

Electromagnetic Compatibility Requirements

LIST OF APPROVED MAKES		
SL.NO	ITEM	MAKE
1	MAIN AND STANDBY PUMPS	KSB / KIRLOSKAR / LUBI / WILO
2	DIESEL ENGINE	KSB / KIRLOSKAR / LUBI / WILO
3	JOCKEY PUMP	KSB / KIRLOSKAR / LUBI / WILO
4	ELECTRIC MOTORS MAIN AND STANDBY	GRUNDFOS / KIRLOSKAR / CROMPTON / ABB
5	MECHANICAL SEAL	BURGMANN / SEALOL
6	FIRE PUMP PANEL SWITCH GEARS	L&T / ABB / SCHNIDER / GE
7	POWER CABLES	POLYCAB / FINOLEX / KEI / BONTON
8	G.I./M.S PIPE	TATA / JINDAL HISSAR
9	FITTINGS BELOW 50 MM DIA 'T', ELBOW, SOCKETS, REDUCERS	B&M / VS ENGINEERING / JK FORGING / RAJDHAN / DRP
10	FITTINGS ABOVE 50 MM DIA (GROOVED FITTINGS)	VICTAULIC / TYCO / MECH / EQUIVALENT
11	PIPE SUPPORTS	HI-TECH SUPPORTS
12	PAINTS	ASIAN / NEROLAC / BERGER
13	BUTTERFLY VALVE	INTERVALVE / AUDCO / KITZ / HONEYWELL
14	NON RETURN VALVE	AUDCO / INTERVALVE / SKS
15	BALL VALVE	RB / RASTELLI / ITAP / HONEYWELL
16	STRAINER	KALPANA / KIRLOSKAR / SANT
17	FOOTVALVE	RB / KALPANA / KIRLOSKAR
18	PRESSURE REDUCING VALVE	HAWK / HONEYWELL / RB / ITAP
19	PRESSURE GUAGE	WAREE / NATIONAL / H GURU / BAUMER
20	PRESSURE SWITCH	INDFOSS / DANFOSS / WAREE
21	PRESSURE VESSEL / AIR CUSHION VESSEL	FABRICATED TYPE
22	ANTI CORROSIVE WRAPPING	PYPKOTE / IWL
23	FIRE HYDRANT VALVE	WINCO / NEWAGE / MINIMAX / SHAH

		BHOGILAL
24	BRANCH PIPE	WINCO / NEWAGE / MINIMAX / SHAH BHOGILAL
25	C. P. HOSE	CRC / NEWAGE / MITRAS / MONSHER
26	HOSE COUPLING	WINCO / NEWAGE / MINIMAX / MONSHER
27	FIRE HOSE REEL DRUM	WINCO / NEWAGE / MINIMAX / SHAH BHOGILAL
28	HOSE BOX / FIRE DUCT SHUTTER	FRIENDS / MINIMAX / SAFEX / EQUIVALENT
29	PORTABLE FIRE EXTINGUISHERS	SAFEX / NEWAGE / MINIMAX / CEASE FIRE
30	SPRINKLER BULBS	HD / TYCO / VIKING
31	SPRINKLER ALARM VALVE	HD / TYCO / VIKING
32	FLOW SWITCH	SYSTEM SENSOR / TYCO / HONEYWELL
33	FLEXIBLE DROP	NEWAGE / MONSHER / HD
34	AIR RELEASE VALVE	NEWAGE / ITAP/ RB / SKS
35	WELDING ELECTRODES	ESAB / VICTOR / ADVANI
36	FIRE BRIGADE INLET	WINCO /NEWAGE / MINIMAX / SHAH BHOGILAL
37	SIGHT GLASS UNIT	LEVCON / KARTAR
38	ANTI VIBRATION PAD & FLEXIBLE CONNECTIONS	KANWAL / DUNLOP
39	SIGNAGES	PROLITE / SAFEX
40	FIRE SEALANT	BIRLA 3M / HILTI
<u>ADDRESSABLE FIRE ALARM EQUIPMENTS:</u>		
41	FIRE ALARM CONTROL PANEL	EATON / HONEYWELL / SIEMENS / FIRECLASS
42	DEVICES & DETECTORS	EATON / HONEYWELL / SIEMENS / FIRECLASS
43	FIRE ALARM CABLE	FINOLEX / HAVELLS / POLYCAB / BONTON
44	PVC CONDUIT	WITH ISI MARK
45	STANDBY BATTERY	EXIDE / AMARON / STANDARD
46	TWO WAY TALK BACK SYSTEM	ASES / SUMANA / INNOVATIVE
47	MANUAL CALL POINT (ADDRESSABLE)	EATON / HONEYWELL / SIEMENS / FIRECLASS

PREAMBLE TO SCHEDULE OF QUANTITIES

1. All items of work under this Contract shall be executed strictly to fulfill the requirements laid down under "Basis of Design" in the specifications. Type of equipment, material specification, methods of installation and testing and type of control shall be in accordance with the specifications, approved shop drawings and the relevant Indian Standards, however capacity of each component and their quantities shall be such as to fulfill the above-mentioned requirement.
2. The unit rate for all equipment or materials shall include cost in INDIAN RUPEES (INR) for equipment and materials including all taxes and duties and also including forwarding, freight, insurance and transport into Contractor's store at site, storage, installation, testing, balancing, commissioning and other works required.
3. The rate for each item of work included in the Schedule of Quantities shall, unless expressly stated otherwise, include cost of:
 - a. All materials, fixing materials, accessories, appliances tools, plants, equipment, transport, labour and incidentals required in preparation for and in the full and entire execution, testing, balancing, commissioning and completion of work called for in the item and as per Specifications and Drawings.
 - b. Wastage on materials and labour.
 - c. Loading, transporting, unloading, handling/double handling, hoisting to all levels, setting, fitting and fixing in position, protecting, disposal of debris and all other labour necessary in and for the full and entire execution and for the job in accordance with the contract documents, good practice and recognized principles.
 - d. Liabilities, obligations and risks arising out of Conditions of Contract.
 - e. All requirements of Specifications, whether such requirements are mentioned in the item or not. The Specifications and Drawings where available, are to be read as complimentary to and part of the Bill of Quantities and any work called for in one shall be taken as required for all.
 - f. In the event of conflict between Bill of Quantities and other documents including the Specifications; the Bill of Quantities shall apply. The interpretation of the Architect / Consultant / Project Manager shall be final and binding.
4. The Contractor shall procure and bring Materials/Equipment to the site only on the basis of drawings approved for construction and shop drawings and not on the basis of Bill of Quantities which are approximate only. This also applies to the Contractor's requisition for Owner supplied materials.
5. The contractor shall include for making all the opening in slabs, beams, walls etc. as required for his work. However, the contractor can coordinate with civil work to provide necessary sleeves. All openings shall be closed using water proofing compound or as specified by Project Manager.
6. The work shall be carried out in conformity with the Firefighting drawings and within the requirements of architectural, HVAC, electrical structural and other specialized services drawings.
7. The contractor shall cooperate with all trades and agencies working on the site. He shall make provision for hangers, sleeves, structural openings and other requirements well in advance to prevent

hold up of progress of the construction schedule. All supports to the civil structure shall be provided with anchor fasteners.

8. On award of the work, contractor shall submit a schedule of construction, organization chart, manpower histogram etc. as required by the project manager's construction procedure manual.
9. On award of the work the contractor shall be issued two (2) sets of consultant's drawings. The drawings shall be the basis of contractor's shop drawings.
10. Shop drawings are detailed working drawings coordinated with other trading work, which incorporate the contractor's details for execution of the work and incorporate equipment manufacturer's details and dimensions to ensure that the same can be installed in the space provided.
11. All shop drawings should detail pipe routing and levels, showing location of other services at crossings etc., cable runs, route cable trays and all allied works and must be fully coordinated with other services, before execution of the works.
12. All shop drawings will be made on AutoCAD and preferably coloured prints has to be produced for site work.
13. Any pipe crossing fire rated wall as per fire compartmentation will be provide with higher size of GI sleeve. All floor crossing pipes will be provided with higher size GI sleeve.
14. The contractor shall, from time to time, clear away all debris and excess materials accumulated at the site failing which the same shall be done by Project Manager at contractor's risk and cost and cost of cleanup shall be deducted from the contractor's pro-rata bill.
15. After the fixtures, equipment and appliances have been installed and commissioned; contractor shall cleanup the same and removes all plaster, paints, stains, stickers and other foreign matter or discoloration leaving the same in a ready to use condition.
16. On completion of all works, contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done by the Project Manager at the Contractor's risk and cost. Cost of the cleanup shall be deducted from the contractor's bills on pro-rata basis in proportion to his contract value. Contractor shall be responsible for the security and safety of his materials and installations until the handing though materials payments already has been paid by the owner... Contractor should relocate the stores/storage within two days of instruction from client/project manager to complete the construction works at storage.

PLUMBING INSTALLATION WORKS

PIPING - PREPARATION

Pipes and tubes shall be cut perpendicular to the axis, with approved cutting tools, the ends reamed and burrs removed. Scale and dirt, on inside and outside and weld splatter shall be removed before assembly. Piping connections to equipment shall be made with flanges or unions.

PIPING - SPACING AND LOCATION

Piping shall be installed in such a way that conserves building space and not interfering with the use of space. Exposed piping shall be installed parallel or at right angles to the building walls, except where otherwise shown on the consultant's drawings. Minimum clearances shall be provided between piping covered by this section and those of other trades. Adequate clearance shall be provided around piping for installation of insulation and access to valves and fittings. Piping shall be grouped at common elevations wherever possible. Piping shall be installed in such a way, that allows for expansion and contraction without stressing pipe joints or connected equipment. Access doors shall be provided where valves and fittings are not exposed. Size and location of access doors shall be coordinated with the Civil Work.

PIPE FITTINGS

Tapered reducer fittings shall be installed where changes in pipe sizes occur. Use of site fabricated fittings or bushings shall not be permitted. Tapered, factory manufactured reducer fittings (eccentric type at suction and concentric type at discharge) shall be installed at pump connections. Eccentric reducer fittings shall be installed with level crown. Factory manufactured fittings shall be installed where changes in pipe direction occur. Bending or forming of piping shall not be permitted without the written permission of the Engineer.

Test-tees shall be installed in soil, waste, vent and rainwater pipe risers at minimum 450 mm (18 inch) above the ground floor level, at every alternate level and at other locations as shown in the shop drawing Drawings.

Connections shall not be made between piping of different services, under any circumstance. The existence of any one such connection in the project, whether temporary or permanent, shall make the Contractor liable for an anti-confusion test for all of the concerned services.

SLOPES AND INVERTS

Invert elevations shall be established and drainage pipes sloped to one percent minimum unless otherwise stated. The minimum gradients that are shown on the Contract Drawings shall be maintained. Water supply piping shall be sloped to facilitate complete drainage of the piping for maintenance purposes. Elevations of buried piping, outside the building, shall be established to ensure not less than 900mm(3ft) of cover, especially in areas subject to traffic loading. The crown (or suffix) levels of the pipes shall be matched when joining horizontal drainage pipes of differing sizes, as far as possible. This shall apply to stepped reducers in drainage piping and connections in manholes (saddle joints in drainage mains excluded).

PROTECTION DURING CONSTRUCTION

Ends of piping shall be kept closed with factory manufactured plugs or blind flanges with integral indicating flange, to prevent entry of foreign matter, during the progress of the work such plugs or flanges shall be removed on completion of the work. Water supply piping outlets in wet areas shall be kept closed with threaded (PVC) pipe stub with one end crimped or closed otherwise until the time of installing the outlet fittings. The piping surface shall be protected from splashes of cement, plaster, paint and similar construction materials. The piping shall be blown out using dry compressed air, prior to testing.

SPECIALITY CONNECTORS

Chrome plated brass extension pieces shall be installed at the water supply piping outlets for

sanitary fittings in wet areas. These shall be of variable length for making the outlet flush with the wall finished and shall have internal hexagonal water way for fixation by Allen keys. Fixture waste adapters of rubber or neoprene shall be used to connect tail pipes of sanitary fixtures /drains to the waste piping .

SETTING OUT FOR EXTERNAL SERVICES

The existing ground shall be cleared along the line of piping , particularly at all manholes building connections and other appurtenances. Sight rails shall be set in position , using a surveyors level and properly established temporary bench marks alongside the work . The practice of transferring level by means of a straight edge and spirit level shall not be allowed. Where long lengths of slightly sloping sewers are to be laid in trenches , sight rails should be fixed across the trench at intervals of at least 20m at a height equal to the length of the boning rod to be used above the required invert level of the drain or sewer at the point where sight rail is fixed .there shall at no time be less than three sight rails in position on each length of sewer or drain under construction at any one gradient .

Deviations from given levels may not be greater than +2cm and in gradients not greater than 1/20 of given gradient .

LAYING OF EXTERNAL PIPING

Pipes shall be laid and connected at the required depth in straight line and true to the gradient on an even foundation , over the full length of the barrel , with the sockets facing up the gradient. When jointing pipes , a mark shall be made to check the position of the end of the barrel in view of the flexibility of the joint , a gap 5 to 10 mm shall be left between the end of the pipes. When pipes are laid in curves , the pipes may not be bent sideways until the connection has been made. Piping shall be kept free of earth , dirt and extraneous matter and every pipe shall be cleaned after installation by special cleaning tools approved by the Engineer to inspect the pipelines at any time during construction. No pipe shall be laid when, in the opinion of the Engineer, conditions are unsuitable.

ENCASEMENT FOR EXTERNAL PIPING

Foundation of cement concrete shall be provided under the pipes , hunching with similar concrete up to half the diameter of the barrel ; in weak soils ,as required . Pipes laid in areas subject to traffic loading shall be encased with concrete, as stated below. Pipes with 1000 to 4000mm earth cover need not be encased. hunching and encasing of pipes shall be done in two stages , after completion of tests .

1. Concrete bed of 50mm thickness shall be cast to scheduled slopes and levels.
2. Blocks of concrete (100mm thick and length equal to the external diameter of the pipe) shall be fixed on the bed with cement and sand mortar (1:3).
3. Hunching or encasing concrete shall be cast from one side of the pipe only, vibrating until it is raised on the opposite side by 50mm over the bottom of the pipe.
4. Expansion joints shall be made in the protective concrete with fiber board or other suitable filling material .

BACKDROPS TO MANHOLES

Drop connections shall be executed at the inlet to sewage manhole, when the drop exceeds 600mm and benching shall be provided at the bottom. These shall be constructed vertically adjacent to the external face of the manhole shaft in order to reach the level inside the manhole.

VALVES

Valves shall be installed with stem upright or horizontal, not inverted; except with the written permission of the Engineer for each location. Valves shall be same size as pipeline, except where shown otherwise on the Contract Drawings. Valves with flanged ends shall be used in valve pits and when directly buried , irrespective of size. Ball/gate valves shall

be used for shutoff and to isolate equipment part of systems or risers. Full bore ball valves shall be used for water storage tank , drain and for isolation purposes in gravity fed systems (which are not subjected to shock conditions). Globe valves shall be used for throttling , bypass or manual flow control services. Drain valves shall be installed at system low points and at the foot of risers. Appropriate valves gland packing, sealing and gasket materials shall be selected for the temperature and pressure encountered.

SUPPORTS AND HANGERS FOR PIPING

Horizontal pipes shall be supported independently. Supports shall be provided for fittings grouped together in horizontal runs, as appropriate. Piping shall be anchored at horizontal changes in direction, at clean outs and at start or horizontal lines. Floor clamps shall be provided at every floor and offset clamps below the branch take off joint in vertical risers.

SUPPORTS AND HANGERS FOR PLASTIC PIPING.

Horizontal piping shall be supported as scheduled below:

Pipe size	Maximum spacing	Hanger Rod Dia.
UP to 25mm nomadic	1.2m	8mm(5/16")
32 to 50mm nom .dial	1.5m	10mm(3/8")
65 to 75 mm nom. dial	1.8 m	10mm(3/8")
100 to 150mm nom .dial.	2.4m	12mm (1/2")

Risers of all sizes shall be supported at one quarter (1/4) points of floor to floor height support to spacing of 2.0 m shall not be exceeded. Manufacturer's recommendations (which will supersede this specification) shall be conformed to in major PVC drainage system).

SLEEVES

Sleeves shall be set in position in form work and additional reinforcement provided around sleeves. Where sleeves in concrete structural elements are omitted due to error , the required openings shall be cored only after obtaining written permission of the Engineer. Sleeves with puddle flanges resting on the concrete surface shall be placed and the sleeves fixed in position by non -shrink grout . Cutting of hole by chiseling shall not be permitted. All sleeves in wet areas shall be projected by at least 50mm(2inch) above the finish floor level. Sleeves shall be erected in the from work , perpendicular to the wall face and rigidly to resist displacement during pouring of concrete. Sleeves shall be large enough to allow for movement of pipe due to expansion or contraction, Provision of during of concrete .

PUDDLE FLANGES

Puddle flanges shall be erected in the form work perpendicular to the wall face and Rigidly to resist displacement during pouring of concrete. Verticality of the flange faces and alignment of bolt holes with connecting equipment (valves etc.) shall be checked and ensured. Openings in the form work , around puddle flanges , shall be sealed so as to avoid leakage (and resultant honey combing) and undesirable formation of concrete. Alignment of puddle flanges shall be checked (and adjusted if necessary) immediately after pouring of concrete

EXCAVATION TO BE TAKEN TO PROPER DEPTH

Trenches shall be excavated in all condition of soil and to such a depth that sewers shall be

set as described in the several clauses relating thereto and so that the inverts may be at the levels given on the section . In bad ground , the Engineer may order the contractor to excavated to a greater depth than shown in the drawings and fill up the excavation to the level of the sewer with concrete ; sand , gravel or other materials . For such work the contractor shall be paid extra at the rates laid down such works in the schedule , if the extra work was ordered by the Engineer in writing. But if the contractor should excavate the trench to greater depth than is required without a specific order to that effect in writing of the Engineer , the extra depth shall have to be filled up with concrete at the contractor's own cost to the requirements and satisfaction of the Engineer.

REFILLING

After the sewer or other work has been laid and proved to be water-tight , the trench or other excavation shall be refilled . Utmost care shall be taken in doing this ,so that no damage shall be caused to the sewer and other permanent works . Filling in the trenches up to 50cm above the crown of the sewer shall consist of the finest selected materials placed carefully and consolidated . After this has been laid , the trench and other excavation, each layer being watered and consolidated .

CONTRACTOR SHALL RESTORE SETTLEMENT AND DAMAGES

The contractor shall at his own cost make good promptly , during the whole period the work are in hand, any settlement that may occur in the surfaces of roads, beams, footpaths, gardens open spaces etc . whether public or private caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He also shall, at his own expense and charge repair and make good any damage done to buildings and other properties.

DISPOSAL OF SURPLUS

The contractor shall at his own cost dispose within the site or as directed all surplus excavated materials not required to be used on the work .

SHORING

The contractor shall at all times support efficiently the sides of trenches and other excavations by suitable timbering, piling, sheeting etc. Trenches shall be close timbered in loose or sandy strata and below the surface of the sub - soil water table. All timbering, sheeting and piling with their wailings and supports shall be of adequate dimensions and strength and fully braced and strutted so that there is no risk of collapse or subsidence of the walls of trenches. The contractor shall be held accountable and responsible for the sufficiency of all timbering, bracing, sheeting and piling used for all damages to persons and property resulting from the improper quality, strength, placing, and maintenance or removing of the same

BAILING OUT WATER

The contractor shall at all times, during the progress of work, keep trenches and excavations free from which shall be disposed off by him in a manner as will neither cause injury to public nor to public or private property nor to the work completed or in progress nor to the surface of any roads or streets nor cause any interference with the use of the same .

PROTECTION OF EXISTING SERVICES

All pipes, water mains, cables etc. met in the course of excavation shall be carefully protected and supported.

CONCRETING

All pipes at shallow road crossings and made -up ground shall be laid on a bed of 6"(150mm) concrete with one part of cement , four parts of sand and eight parts of stone metal of ¾"(20mm) or smaller gauge properly consolidated . Concrete shall be laid to full width of trench and also in haunches.

CONSTRUCTION ACROSS ROADS

All work across roads shall be carried out as per the directions of the Engineer.

WATER SUPPLY UPVC PRESSURE PIPES AND FITTINGS

LAYING AND FIXING

Pipes are to be cut to size and threaded with standard GI threading die . Pipes and fittings shall be jointed using Teflon tape as thread sealant. Pipes and fittings can be tightened by hand also to achieve leak -proof joint. Pipes shall be fixed by means of holder bat clamps keeping them 12mm off walls for easy maintenance. Pipes running on roof slabs shall be suitably supported blocks and to be projected from ultra violet radiation

TESTING

Pipes shall be tested to a hydrostatic pressure of 1.5 times of the maximum working pressure, pressure shall be maintained for at least eight hours without appreciable drop in pressure . In addition to sectional testing of water supply pipes, the contractor shall test the whole of the installation to the entire satisfaction of the Engineer.

PVC PIPES

LAYING AND JOINTING

For PVC pipes ,pasted joints are preferred .The socket length should be 1 1/2 times the outer diameter for size above 110mm diameter . The surface to be glued should be thoroughly scoured with dry cloth and preferably chamfered to 30°.Solvent cement is to be applied evenly with a brush outside surface of the spigot of one pipe and to the inside surface of the socket of the other . The spigot end should then be inserted immediately into the socket should be wiped out at once with a clean dry cloth . Jointing should be carried out quickly, taking not more than one minute to be completed. Joint should not be disturbed for at least 5 minutes. Gluing should be avoided in rainy or foggy weather to avoid water contamination of the solvent cement. Pipes should be supported at distance of 1.20 m for vertical runs with appropriate MS clips and support blocks or wooden plugs fixed on walls, floors or ceiling. Holder bat clamps are to be used to keep pipes 12mm clear off walls.

TESTING

Pipes should be tested to a hydrostatic test pressure of 3.5kg/sq cm in sections of lengths. Pressure should be maintained for 8 hours without appreciable drop. In addition to sectional testing of pipes , the contractor shall test the entire installation to the entire satisfaction of the Engineer.

CHLORINATED POLY VINYL CHLORIDE PIPES (CPVC PIPES)

The pipe may cut to the required lengths using circular tubing cutters, Ratchet type cutters or chop saws. The cuts shall be square. Burrs and fillings shall be removed from outside and inside the pipes using a chamfering tool. For jointing CPVC pipes special solvent cement is required. The surfaces are to be dry before solvent cement shall not be allowed puddle in the fitting and pipe assembly. The pipe may then be rotated to one quarter to half turn while inserting into the fitting socket. When the pipe end is seated it may hold in place for ten seconds to allow the joint to set. Teflon tape may be used as thread sealant. Water testing to a pressure of 10kg/cm² may be carried out for CPVC piping system. Air testing shall not be done

POLYPROPYLENE PIPES (PP PIPES)

The installation of PP pipes may be carried out similar to metal pipes . The pipes may be cut to the desired length using special cutters , the cuts being perpendicular to the axis. Jointing of PP pipes may be done using Fusion welding by special welding machines . The pipes can be bent by heating , but the pipes shall not put to flame . The welding Fusion joint process involves heating , fusion and cooling .Before welding, the pipe ends

may be cleaned with a cloth and alcohol water solution . after heating the ends on the welding machine for a few second , the pipe may be removed from the welding machine and the ends may be connected using a little pressure without twisting . It may be allowed to cool down for a few seconds. The joints may be kept in a tight condition during cooling. Water testing shall be adopted for testing PP pipes. The pressure applied shall be 10kg /cm² . The test time is to be 2 Hours.

WATER FITTINGS (TAPS, STOP COCKS ETC.)

All water fittings shall be of approved quality and design and shall generally comply with latest I .S. Specifications.

VALVES AND PRESSURE GAUGES.

Pressure gauges shall have not less than 115mm dia , 10mm BSP full threads , brass body siphon and gauge cock of 10mm size . Dial gauges shall be adequate for pressure encountered and specified (0-15 kg/sq cm) . Valves shall comply with IS:780 (Class I) for CI sluice valves and IS: 778 for GM valves and tested and approved by the Municipal Corporation .

BALL COCKS

Ball cocks used for storage tanks shall be high pressure brass/ gun metal ball cocks with brass lever rod and PVC floats.

SANITARY SYSTEM

PVC SWR PIPES AND FITTING

INSTALLING.

PVC Pipes shall be laid under floors , in suspended ceiling , in sunk slabs or on walls either buried or exposed as the case may be as shown on drawings. Fittings shall be pasted type or rubber ring type. Exposed pipes and fitting shall be capable of withstanding sun -rays without any cracks or de-colorization.

JOINTING

Jointing of pipes to fittings shall be done as per manufacturer's instructions/ recommendation .

TESTING

PVC pipe and fittings shall be tested for three meters of water head .Openings of pipes shall be sealed for the section to be tested .Water pressure shall be maintained for maximum of one hour. The Engineer shall examine carefully all the joints for leakage.

SEWER APPURTENANCES.

LOCATION AND SIZES

The sizes given on drawings shall be internal sizes of chamber, man -hole etc Unless otherwise specified, man - hole and inspection chambers shall be provided at all changes in direction of drain and where branch drain meets main drain .The Minimum internal sizes shall be taken as per detailed drawings, standards specified and local bye- laws if any

BED CONCRETE.

Bed Concrete shall be in 1:4:8 cement concrete 150mm thick for inspection chambers, 230mm for depths up to 2.1m and 300mm for greater depths in case of man-holes.

BRICK MASONRY

Brick work shall be with best quality table - moulded bricks in 1:6 cement mortar as per specification for brick masonry.

PLASTER

Inside of the walls of chambers / man-holes shall be plastered with 15mm thick cement plaster 1:3 mixed with waterproofing material and finished smooth with a flushing coat of neat cement .

BENCHING

Channels and benching shall be done in cement concrete 1:3:6 rendered smooth with neat cement . Following sizes of channels for the bench shall be adopted.

Size of Drain	Depth of Centre	Depth of outside i.e. at wall
100mm(4'')	150mm(6'')	250mm (10'')
150mm(6'')	200mm(8'')	300mm(12'')

CHAMBER / MAN HOLE COVER.

Covers shall be of FRP with lifting hooks and load tested as per IS: 1726-1967 and BSEN-124:1994, details given on drawings and fixed on frames embedded in concrete . Cover placed on the frames shall be air -tight. Height of frame and cover shall be as per schedule of quantities. Covers for chambers / man - holes coming within buildings should be Double Seal Type.

STEPS

CI /PVC steps duly painted shall be provided whenever depth of man - hole / chamber is more than 1.2m.

DROP CONNECTIONS.

In case the difference in invert levels between the main drain and the branch line requires a drop of more than 600mm , a drop connection should be provided with cast iron, stoneware or PVC four -way junction, fixed at right angles to the drop pipe at the level where branch pipe enters man- holes. Access for cleaning bends should be provided at finished ground level.

MODE OF MEASUREMENTS**CAST IRON, PVC (SWR) PIPES AND COPPER PIPES AND COPPER PIPES**

These pipes shall be measured along the centre line of pipes including all specials in (RM) Quoted rate for respective items shall include, the following:

- a) Cost of jointing materials.
- b) Laying, fixing and jointing with necessary clamps, brackets, screws etc .and curing. Making good all damages to the building to suit the surroundings. Painting buried surfaces of CI pipes with bit mastic paint (no painting for AC pipes). Testing and making good defects, if any.

INSPECTION CHAMBERS

Inspection chambers shall be measures in numbers and rate quoted shall also be per number only . Quoted rate shall include cost of all the following items.

- a) Bed Concrete
- b) Brick work
- c) Plastering
- d) Concrete benching channeling
- e) PCC bed for fixing the frame.
- f) Providing holes and embedding pipes for all connections

- g) Curing
- h) Testing

MAN-HOLES

Man -holes shall be measured in numbers. Depth of man - holes shall be reckoned from invert of channel to top of man- hole cover. Quoted rates shall cover the range of +/-240mm on the depth specified and also cost of all the following items.

- a. Bed concrete
- b. Brick work
- c. Plastering
- d. Concrete benching and channeling including drop connections
- e. Fixing steps
- f. Providing holes and embedding pipes for all connections.
- g. Curing
- h. Embedding frame in concrete bed
- i. Testing

GULLY TRAP CHAMBERS

Gully trap chambers shall be measured in numbers and rate quoted shall also be

Per

number only. Quoted rate shall include cost of all following items:

- a) Bed concrete
- b) Brick work
- c) Plastering
- d) Concrete to embed gully trap
- e) Chamber cover and frame
- f) Providing holes and embedding pipes for all connections.
- g) Excavation , refilling , necessary dewatering and disposing off extra materials to a place as directed by the Engineer

G.I PIPES AND FITTINGS

GI Pipes above ground shall be measured along the center line of pipes and fittings . Quoted rate for respective items shall be per (rm) and shall include the following:

Laying, fixing and jointing with necessary clamps. Cutting holes and chases in walls, floors, beams etc. and making good the same. All supporting arrangements, brackets etc. Testing and making good defects , if any .GI pipes below ground shall be measured as stated in (a) and (b).

UPVC, PVC PRESSURE PIPES AND FITTINGS

PVC pipes and UPVC pipes shall be measured along the center line of pipes and fittings quoted rate respective items shall be per (rm) and shall include the following.

- a. Laying, fixing and jointing with necessary clamps.
- b. Cutting holes and chases in walls, floors, beams etc. and making good the same.
- c. All supporting arrangements, brackets etc.
- d. Testing and making good defects, if any.

WATER FITTINGS (TAPS, STOP COCKS, ETC.)

These items shall be measured in numbers unless included as part of other items viz wash basins , inlets to cisterns etc . Cost of fittings shall include. Cost of fixing accessories like bolts, nuts, washers. Cost of thread or fixing taps.

VALVES AND GAUGES

Valves shall be measured in numbers and cost shall include.

- a) cost of jointing material

- b) Fixing and jointing material
- c) Testing and making good defects, if any.

BALL COCKS

Ball cocks shall be measured in numbers called for as part of other items.

INDIAN WATER CLOSETS

Indian Water Closets shall be measured in numbers and quoted rate shall include.

- (a) Setting the closets in plain cement including cost of cement concrete.
- (b) Painting brackets, if any.

EUROPEAN TYPE WATER CLOSETS

These items shall be measured in numbers and rate quoted shall be per number only

Quoted rate shall include .

- a) Plastic seat cover
- b) Jointing and fixing material

BIDETS

These items shall be measured in numbers and quoted rate shall include:

- (a) Fixing charges on wall /floor of Bidets and mixers and waste fitting .
- (b) Jointing & Fixing Materials.

URINALS

Urinals shall be measured in numbers and rate quoted per number shall include:

- 1) Fixing charges of urinal and partition plate with trap, waste fitting and water pipe and connecting it to soil pipe .
- 2) Fixing charges of automatic flushing cistern (proportionate rate per urinal in case of a flush tank serving more than one urinal.)
- 3) Cost of jointing & fixing materials.

WASH BASINS

These items shall be measured in numbers and quoted rate shall include:

- 1) Fixing charges of brackets on to walls by CP screws in case of wall hung basins and fixing charges on slab counter in case of counter top basins and fixing pedestals in case of pedestal mounted basins .
- 2) Jointing and Fixing Material

SHOWER UNITS

This item shall be measured as whole unit and rate quoted shall include all the items stated above

BATH TUBS

This item shall be measured in numbers and rate quoted shall be number only . Quoted rate shall include:

- a) Jointing and fixing materials.
- b) Waste coupling with CP P-trap

SINKS

Sinks shall be measured in numbers including all items stated above and shall include cost of all fixing materials and fixing in position .

TOILET ACCESSORIES (MIRROR, TOWEL RAIL, PAPER HOLDER, TOWEL RING, SOAP TRAY, CLOTH STAND ETC.)

All the items shall be measured in numbers and quoted rate shall be per number any of which shall include:

Fixing in position testing where necessary / specified.

SANITARY APPLIANCES AND FIXTURES.

Apart from piping , it is essential that each and every sanitary appliance and fixture is inspected and its performance tested prior to handing over the installation it is necessary to maintain a check list in respect of wet rooms (toilets ,baths , kitchenette ,laundry etc.) of every apartment / office. Main points to be looked into are enumerated below.

INSTALLATION

Check whether all installation are located as per drawing and in level.

FLUSH

Check whether flushing mechanisms for WC tanks, urinals are proper. Also no stagnation in WCs , baths ,bidets ,wash basins , sinks etc. when used . Fill wash basins, baths, sinks to brim and check overflows.

FACE

Check from damages , if any in the installation such and chipped vitreous appliances, discolored or disfigured baths , sinks , mirrors etc.

FASTENING

Check whether all appliances have been properly fixed. No rattling or loose bolts.

SLOPES

Check whether toilet floors and roofs are properly sloped towards floor drains/ roof drains and there is no stagnation of water.

LEAK PROOF

Check whether all joints within appliances and connection from appliances to pipes are leak proof. Particularly check connection between WC pan and cistern , WC trap and soil pipe, all traps including bottles traps , overflows, flexible connections to valves / taps etc. Check whether floor drains and roof drain are leak - proof.

COLD WATER

Check functioning of all cold water valves , taps and piping .

HOT WATER

Similarly check hot water valves , taps and piping .Check functioning of thermostats of heaters . Check whether non- return valves are functioning properly.

COMPLETION

It is desirable that sanitary works are completed in all respects at least 3 to 4 weeks prior to the scheduled overall completion of the Project so as to enable the systems to be properly tested , defects rectified and the systems operated.

LIST OF APPROVED MAKES OF MATERIALS

SL.NO	MATERIALS	MAKES
1.	PVC PIPES(IS 4985)	AJAY /ASTRAL/ FINOLEX / SUPREME/STAR
2.	PVC PIPES(IS 13592)	AJAY / ASTRAL/ FINOLEX / SUPREME/ STAR

3.	UPVC PIPES ASTM SCH40/80	AJAY /ASTRAL/ STAR
4.	POLYPROPYLENE PIPES(PP) & FITTINGS	GF / HAKAN SILENTA 3A / WAVIN /ASTRAL
5.	CPVC PIPES	AJAY /ASTRAL/STAR
6.	MULTI LAYER COMPOSITE PIPE/CROSSLINKED POLYETHEYLENE	GF/ASTRAL/JINDAL
7.	NITRILE RUBBER INSULATION	VIDOFLEX / AEROFLEX / K-FLEX
8.	BALL VALVES, PRV	RB / ITAP/RASTELLI
9.	SS BALL VALVES	ZOLOTO / CIM
10.	BUTTERFLY VALVE	INTERVALVE / KITZ / AUDCO
11.	AIR RELIEF VALVE	RB / ITAP/RASTELLI
12.	FOOT VALVE, NRV , Y STRAINER	RB / ITAP/RASTELLI
13.	WAFER TYPE CHECK VALVE	INTERVALVE/EQUIVALENT
14.	FRP MANHOLE FRAME & COVER	THERMODRAIN,HP,FIBROCAST
15.	ROOF DRAIN	SANJAY CHILLY / ELIGNA / SGE
16.	WATER LEVEL CONTROLLER	LEVCON / NUTECH
17.	WATER HAMMER ARRESTOR	WATTS / EQUIVALENT
18.	FLOAT VALVE	RB / ITAP/RASTELLI/PEX
19.	DUTY TRANSFER PUMPS	GRUNDFOS/ESPA/KIRLOSKAR/WILO
20.	BOSSTER PUMPS/HPS	GRUNDFOS/ESPA
21.	WATER METER	AQUAMET/ FEDREL / EQUIVALENT
22.	HEAT PUMP / WATER HEATER	RACOLD / AO-SMITH / EMMERSON
23.	FRP VESSEL	AVENTURA / PENTAIR / EQUIVALENT
24.	SUPPORTS	HITECH / HILTI /FISCHER/EQUIVALENT
25.	WATER SAVING AERATORS	NEOPERL/EQUIVALENT
25.	WATER SAVING AERATORS	NEOPERL/EQUIVALENT
26.	PRESSURE COMPANSATING REGULATORS	NEOPERL/EQUIVALENT
27.	CLAMPS, RAILS, LEGS AND ACCESSORIES	HITECH / HILTI /FISCHER/EQUIVALENT

28. SS GRATINGS 304 (125X 125MM)

VIEGA / WEIMAR / SANJAY CHILLY/
ELIGNA

NB: Contractors shall strictly follow the list of approved make of materials.
Any changes from the above shall bring to the notice of the
consultants before quoting for the project.

MEDICAL GAS REQUIREMENT

		QTY OF GASES PER ITEM		
DEPARTMENT NAME	ROOM NAME	NO: BED	O2 (Oxygen Outlet)	VAC (Medical Vacuum Outlet)
NS HOSPITAL KOLLAM -FIRST FLOOR				
U S S	Ultrasound	1	1	1
PATIENT REST ROOM	PATIENT REST ROOM	1	1	1
PROCEDURE ROOM	PROCEDURE ROOM	1	2	2
NS HOSPITAL KOLLAM -SECOND FLOOR				
ROOM	ROOM -1	1	1	1
ROOM	ROOM -2	1	1	1
ROOM	ROOM -3	1	1	1
ROOM	ROOM -4	1	1	1
ROOM	ROOM -5	1	1	1
ROOM	ROOM -6	1	1	1
ROOM	ROOM -7	1	1	1
ROOM	ROOM -8	1	1	1
IMMUNIZATION	ROOM -9	1	1	1
NS HOSPITAL KOLLAM -THIRD FLOOR				
ROOM	ROOM -1	1	1	1
ROOM	ROOM -2	1	1	1
ROOM	ROOM -3	1	1	1
ROOM	ROOM -4	1	1	1
ROOM	ROOM -5	1	1	1
ROOM	ROOM -6	1	1	1
ROOM	ROOM -7	1	1	1
ROOM	ROOM -8	1	1	1
ROOM	ROOM -9	1	1	1
ROOM	ROOM -10	1	1	1
ROOM	ROOM -11	1	1	1
ROOM	ROOM -12	1	1	1
ROOM	ROOM -13	1	1	1
ROOM	ROOM -14	1	1	1
ROOM	ROOM -15	1	1	1
ROOM	ROOM -16	1	1	1
NS HOSPITAL KOLLAM -FOURTH FLOOR				
ROOM	ROOM -1	1	1	1
ROOM	ROOM -2	1	1	1
ROOM	ROOM -3	1	1	1

ROOM	ROOM -4	1	1	1
ROOM	ROOM -5	1	1	1
ROOM	ROOM -6	1	1	1
ROOM	ROOM -7	1	1	1
ROOM	ROOM -8	1	1	1
ROOM	ROOM -9	1	1	1
ROOM	ROOM -10	1	1	1
ROOM	ROOM -11	1	1	1
ROOM	ROOM -12	1	1	1
ROOM	ROOM -13	1	1	1
ROOM	ROOM -14	1	1	1
ROOM	ROOM -15	1	1	1
ROOM	ROOM -16	1	1	1
GRAND TOTAL NO OF OUTLET			45	45
OUTLET DETAILS				
OXYGEN OUTLET - O2		45		
VACCUM - VAC		45		
GRAND TOTAL		90		

LIST OF APPROVED MAKE / MANUFACTURES & STANDARDS

Sl No	Item/Materials	Standard	Preferred Make - Indian
1	Manifold System-Oxygen	ISO 10524, ISO 7396-1 :2016/ISO, 7396-2/HTM 02-01	AKTIV / MR ENGINEERING / SKUMAR
2	Fully Automatic Control Panel-Oxygen	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM 02-01/DIN	AKTIV / MR ENGINEERING / SKUMAR
3	Emergency Supply System-Oxygen	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	AKTIV / MR ENGINEERING / SKUMAR
4	Oxygen Flow Meter With Humidifier Bottle	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	AKTIV / SKUMAR
5	Outlets	ISO	AKTIV / SKUMAR
6	Vacuum Regulator with 600 ml jar with all accessories.	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	AKTIV / SKUMAR
7	Digital Alarm System	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/EN ISO 7396-1:2007/EN 737/HTM 02-01	AKTIV / MR ENGINEERING

8	Vacuum Pump	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	IR
9	Air Receiver Tank	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	RELIABLE(Galvanized)
10	Matching Probe For Gas Terminal Units	ISO	AKTIV / SKUMAR
11	Area Valve Service Units (AVSU)	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01/DIN	AKTIV / MR ENGINEERING
12	Distribution System-Copper Pipe	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	MEXFLOW / MANDEV
13	Isolation Valve	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	RB ITALY / CIM
14	Wall Mounted Bed Head Unit	ISO 10524-2,ISO 7396-1:2016/ISO,7396-2/HTM02-01	TRIDENT / PARKER
15	Bacteria double filter	ISO	TRIDENT/PARKER/ULTRATECH

Part V- CONTRACT DATA

Sl. No	Item	Clause reference	Data
1	Identification No. Of the Contract	NIT	
2	Name of Work	NIT	Construction of hospital building (<i>can be more detailed as suggested in scope of work</i>)
3	Employer	GCC-1.1	NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES
4	Tender Inviting Authority	GCC- 1.2	THE PRESIDENT NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES
5	Estimated Probable Amount of contract		
6	Location of Work	NIT	NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES (MOTHER AND CHILDAVENUE) PALATHARA,KOLLAM
7	Type of Work(brief description about the nature of work)	NIT	CONSTRUCTION OF HOSPITAL BUILDING
8	Time of completion of work (in months)		12 months
9	Work Milestones		
10	Class/Registration of Bidder		Any firm registered in India
11	Pre-bid meeting date , venue and time	ITB-2.2.3	
12	Bid submission start date	NIT	
13	Last date and time for bid submission	NIT	
14	Cost of Tender	ITB-3.7	
15	Bid Security	ITB-3.6	
16	Performance Guarantee		5% of contract

17	Insurance requirements are	GCC -12	<p>a. The Contractor shall obtain insurance cover for a minimum of Rs:-10 Lakhs*per occurrence.</p> <p>b. The insurance cover shall be taken initially for a minimum of four occurrences, which shall be revised whenever an event involving Contractor's liability and Plant and Materials for payment arises, and additional insurances shall be taken so as to cover minimum four occurrences always.</p> <p>c. 0.2% of the Contract Amount shall be deducted in the event of failure to obtain the insurance by the contractor within 15 days of Start Date [*The value shall be generally 0.5% of the Contract Value subject to a minimum of Rs. 2.00 lakh and maximum of Rs. 5.00 lakh]</p>
18	Defects Liability Period	GCC-39	12 months
19	Liquidated damages	GCC-15	1% of the value of balance works to be completed /week limited to a maximum of 10% of the Contract amount.
20	Whether mobilization advance applicable	SCC-16.1	YES 10% IN TWO installments
21	Whether secured advance applicable	SCC- 16.3	Only for materials for MEP works
22	Price adjustment is applicable /not, if applicable give the Percentages for calculations	GCC 33	Applicable Refer Clause
23	Retention Amount	GCC 69	10 % of bill amount upto a maximum of 50 lakhs

Part VI- PRE-QUALIFICATION INFORMATION

1. General

- 1.1. The following criteria specified for pre-qualification shall be met by the Bidder in addition to the requirements specified elsewhere in the bidding document. The Bidder is required to submit all details as below along with his bid online and subsequently a signed hard copy of all these details shall be submitted to the tendering authority as detailed in the section "Instructions to the Bidders"
- 1.2. The financial bids of only pre-qualified bidders shall be opened.
- 1.3. Bidder has to bear all cost and expenses in making this PQ offer, in providing clarification or attending discussions, conferences or site visits.
- 1.4. Incomplete offers are liable to be rejected.
- 1.5. The language for submission of bid should be English.
- 1.6. The enclosed Forms/schedules should be filled in completely and all questions should be answered. If any particular query is not relevant, it should be stated as "not applicable".
- 1.7. If the offer is submitted by a Bidder backed up by specialized Sub- Contractors, the Bidder and each of the Sub Contractor should fill in all the schedules completed. The main Bidder should be clearly identified and the extent of responsibility of each of the Sub-Contractors should be defined.
- 1.8. Testimonials, audited financial etc. shall be in English and shall contain amounts in Indian Rupees only. Others shall not be considered.
- 1.9. If the application for bidding is made by a firm in Partnership, should be signed by all the Partners of the Firm, above their full name and current address, or by a Partner holding valid Power of Attorney for the firm by signing the application in which case a certified or notarized copy of the power of attorney shall accompany the application. A certified copy of the Partnership Deed or Memorandum of Understanding, current address of the Firm and the full name and current address of all the Partners of the firm shall also accompany the application.
- 1.10. If the application for bidding is made by a Limited Company or a Limited Corporation, it shall be signed duly by authorized person holding the Power of Attorney for signing the application in which case a certified copy of the power of attorney shall accompany the Bid. Such Ltd. Company or Corporation will be required to furnish satisfactory evidence of its existences before the contract is awarded.
- 1.11. If the application for bidding is made by a group of Firms, Joint Venture or Consortium, it shall be accompanied by a notarized document of Memorandum of Understanding signed by all parties to joint venture / consortium confirmed therein a clear and definite manner the proposed administrative arrangements for the management and execution of the Bidder, the definition of duties, responsibilities and scope of work to be undertaken by each such party, the authorized representative of the Joint Venture and an undertaking that the parties are jointly severally liable to the Employer. The Performance of each of the parties to the Joint Venture on works of a similar nature within the past five years, current works on hand and other contractual commitments shall also be submitted along with the Bid.
- 1.12. All the partners of the Bidding Firms/Joint Ventures/Partnership Firms/Consortiums shall be of Indian Nationals or Indian registered companies.
- 1.13. To be eligible for award of contract, Bidders shall provide evidence satisfactory to the Employer, notwithstanding any previously conducted pre-qualification of potential Bidders, of their capability and adequacy of resources effectively to carry out the subject Contract effectively. To this and all bids submitted shall include the following information which shall be submitted by all Bidders and their individual Partners/ Joint Venture Partners/Consortium Partners.

- a) Copies of original documents defining the constitution, legal status, place of registration and principal place of business of the company of firm or partnership or, if a Joint Venture or Consortium of each party there to constituting the Bidder.
 - b) Where the Bidder is a Joint Venture or Consortium of two or more firms a statement/ MoU signed by all parties to the joint venture of the proposed administrative arrangements to the management and execution of the Contract, the duties responsibilities, and scope of works to be undertaken by each party, the authorized representative of the joint venture, with an undertaking that the several parties are jointly and severally liable to the Employer for the performance of Contract.
 - c) Details of the experience and past performance of the Bidder or each party to a Joint Venture of works of similar nature within a past five years, and details of current work in hand and other contractual commitments.
 - d) Major item of construction equipment and key personnel proposed for use in carrying out the contract in the form as prescribed in schedule-D form.
 - e) The qualification and experience of key personnel proposed for administration and execution of the contract both on and off site in the form as prescribed in schedule-C supported by the copies of their professional qualification certificates.
 - f) Proposal for sub- contracting elements of the works amounting to more than 10 % of the tender amount for each elements the listed in Schedule-E
 - g) Reports on the financial standing of the Bidder/each party to a Joint Ventures/Consortium/Others including audited profit and loss statements and balance sheets for the past five years, their existing commitments and a written authority from the Bidder (or authorized representative of a Joint Venture) to seek reference from the Bidder's Bankers.
 - h) Information regarding any current litigation or arbitration proceedings in which the Bidder (including all partners or associates) is involved. If such details are not there for a Bidder or his partner, they shall submit a nil statement with regard to this.
- 1.14. The information furnished must be sufficient to show that the application (along with all parties to Consortium/ Joint Venture), has earlier carried satisfactorily work of similar size, nature and complicity. Each Bidder (along with all parties to Consortium/ Joint Venture) shall submit their pre- qualification application and supporting details invariably even though they have been qualified earlier in similar works Pre-qualification with the Employer.
- 1.15. The applicant is expected to have visited at the Work site before submitting Pre-qualification.
- 1.16. While submitting the schedule duly filled up, the applicant shall enclose latest copies of brochures and technical documentation giving more information about the firm and all the members of the consortium / joint venture.
- 1.17. The Employer/ Tender inviting authority reserves the right to reject any or all the pre-qualification applications, without assigning any reason and the Employer's decision shall be final and binding to all concerned.

2. Eligibility and qualification of Bidder

The Bidder shall possess a valid registration as provided in clause Of 1.3.1 Part I. The Bidder shall submit an attested true copy of his Registration Certificate along with the Bid.

- 2.1. The intending Bidder must have in his name as a prime contractor experience of having successfully completed at least one similar work costing 15 crores during the last 3 years. The bidder should have a minimum annual turnover of 5 crores for the last three years
- 2.2. Similar nature of works- Works of any magnitude with a minimum as stated above which is of the same nature and type of the work tendered as per the Contract Data.
- 2.3. In order to prove the above eligibility, a Certificate of experience from the Agreement Authority

of the completed similar work shall invariably be submitted along with the tender documents failing which the tenders will be rejected. The certificate should contain the details such as Name of work, Agreement number, Estimated cost, Contract Price, date of start and date of completion, whether the work has been completed satisfactorily, the salient features of the work like type of structure and foundation, number of stories and type of finishing in case of Building works. In all the above cases, while considering the value of completed works, the full value of completed work will be considered whether or not the date of commencement is within the said 3 year period. Certificates which do not contain the above details will not be considered for evaluation and the Bidder will be disqualified without notice.

- 2.4. The Bidder shall submit certified audited copies of its balance sheet and profit and loss account to demonstrate its annual financial turnover during the last 3(Three) years, With a minimum value of work of 10crores. Ending 31st March of the previous financial year. Annual financial turnover and cost of completed works of previous years shall be given a weightage of 5% per year (average annual rate of inflation) to bring them at current price level.
- 2.5. The Bidder should possess adequate working capital of more than 10% of the probable estimated cost of work for which he is bidding. For this the Bidder shall submit his Bank's certificates specifically showing access to lines of credit and valid proofs showing availability of other financial resources to meet the requirement. Bank's certificates does not showing the amount of credit limit sanctioned to the Bidder is liable to rejected and the Bidder will be disqualified without any notice. In case of bank certificates showing sanctioned credit limit and utilized credit limit, the Employer shall take the balance available credit limit only for evaluation purpose.
- 2.6. The Bidder shall provide evidence satisfactory to the Employer of its eligibility, capability and adequacy of resources to effectively perform the subject contract. To this end, the Bidder shall be required to submit the following information
 - a. The Bidder shall submit details of experience and past performance of works of similar nature in the last five years with certified/attested/notarized copies of certificates from the Clients as detailed in clause 2.4.
 - b. The Bidder shall provide the details of his ongoing works viz., Name of work, Client/Department, Agreement number, Estimated cost, Contract Price, date of start, amount towards work completed at the time of Bid submission and probable date of completion.
 - c. The qualifications and experience of Technical and Administrative personnel proposed for administration and execution of the contract both on and off site with copies of their Certificates to prove qualification.
 - d. Major items of construction plant and equipment proposed for use in the performance of the Contract. It shall be noted that, if the Bidder does not possess/intend to procure the minimum required plants and equipment as given in the special conditions of contract and Contract Data, he will be disqualified for this work. Hence, it is advised that the Bidder shall closely look in to the requirements of the subject work and the minimum required plants and machinery. Proof of purchase of such equipment in the Bidders name shall be submitted along with the technical proposal.
 - e. Details of subcontractors to whom it is proposed to sub-contract any portion of the contract and for whom authority will be required for such subcontracting in accordance with the conditions of contract, especially for specialized works, if any, in the contract.
 - f. A draft programme of works as described in this document, which shall form part of the contract if the tender is accepted. Any change in the programme or schedule shall be subject to the approval of the Engineer- in charge.
 - g. Details of any current litigation or arbitration proceedings or court cases in which the Bidder is involved as one of the parties. In case the Bidder is blacklisted or debarred from

any Government Works by any Government Department, the same shall be informed with details in the bid document. In such cases, the Employer reserves the right either to accept or reject the bid.

h.Duly filled Requisition for e-Payment form.

2.7. In addition to above, the intending Tenderer has to submit the following:

a.Permanent Income Tax Account Number and details of tax payment for the last five years.

b.Particulars of Registration with appropriate Sales Tax Authorities (in relation with Work Contract Tax) inapplicable.

c.Particulars of Registration / clearance from the appropriate Provident Fund Authorities, inapplicable.

d.Registration of the firm, in case of partnership firm, Joint venture and consortium. The details of registration shall be submitted (Tenders from unregistered firm/not accompanying requisite details will be rejected).

e.Service Tax Registration, if service tax is payable.

2.8. Copies of all the certificates and deeds are to be submitted duly authenticated by the Bidder.

3. Joint Venture/consortium:-

a. Tenders submitted by a Joint Venture/Consortium/Partnership of two or more Firms/Contractors as partners shall comply with the following requirements;

b.The tender and in case of a successful tender, contract form/agreement signed shall be legally binding on all partners.

c. One of the partners shall be nominated as being Lead Partner, and the authorization of the lead partner to submit the tender and deal with further correspondence or any other related matters shall be evidenced by submitting a Power of Attorney signed by legally authorized signatories of all the partners.

d.The Lead Partner shall be authorized to incur liability and receive instructions for and on behalf of any and all the partners of the joint venture/consortium and the entire execution of the contract including payment shall be done exclusively with the Lead Partner.

e.All partners of the joint venture/consortium shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and a relevant statement to this effect shall be included in the authorization mentioned in (b) above as well as in the form of tender and the contract form (in case of the accepted tender).

f. Parties should specify their role in the joint venture whether technical or financial and corresponding sharing percentage.

g.A copy of the registered contract/notarized MoU entered into by the joint venture/consortium/partnership partners shall be submitted with the tender.

h.A Bidder who gives false information in the tender document about its qualification or who refuses to enter into a contract after notification of contract award shall be considered for debarment from participating in future public procurement.

i. The qualification criteria parameter e.g. turnover details, financial resources etc. of the individual partners of the joint venture will be added together and the total criteria should not be less than as spelt out in the qualification criteria. Hence, the details of all the partners shall be submitted irrespective of their share in the joint venture or consortium.

j. The formation of joint venture or change in joint venture character / partner after submission of the bid and any change in the bidding regarding joint venture will not be permitted

k.The pre-qualification of a joint venture does not necessarily pre-qualify any of its partners individually or as a partner in any other joint venture or association. In case of dissolution of a joint venture, each one of the constituent firms may pre-qualify if they meet all the

pre-qualification requirements, subject to the written approval of the Tender Inviting Authority

- l.** The contract agreement, in case of successful Bidder, should be signed jointly by each Joint Venture partners.
- m.** An entity can be a partner in only one Joint Venture/consortium/partnership firm. Bid or bids submitted by Joint Ventures/consortium/partnership firm including the same entity as partner will be rejected.
- n.** In case of consortium / associate route of participation, consortium partners must collectively meet the technical and financial qualification requirements. In such a case the Bidder:
 - a) Shall furnish a registered/notarised Memorandum of Understanding with associates/ Consortium partners (as per format given)
 - b) Shall furnish a registered/ notarized JDU (Joint deed of undertaking) prior to signing of as per format given in bid documents. Bidders will be required to submit a registered Memorandum of Understanding (MOU) entered with the associates along with the bid in Technical bid.

4. PRE-QUALIFICATION DOCUMENT

Name of work.....

- 4.1. Bids for Pre-qualification or contract are invited for a Work which included in the Contract Data hereunder. General Bidders booked up by the specialist sub-contractors or alternatively Joint ventures of consortia, who wish to bid for the work should apply for Pre- qualification in the manner set out in this documents as per the above given conditions and criteria.

4.2. EMPLOYER:

Name:

Address:

.....

.....

.....

.....

Telephone:

4.3.Engineer name

Address:

.....

.....

.....

.....

Telephone:.....

Name:

.....

Address:
.....
.....
.....
.....

Telephone:

4.4. Name of work.....

4.5. Location of Work and Site Conditions:

.....
.....

4.6. Sope of work.....

1. Major items of improvements envisaged through this work

.....
.....

2. Salient Features

.....

4.7. PREQUALIFICATION APPLICATION CONTRACT

NO:.....

Name of work:.....

To,

.....
.....
.....
.....

Dear Sir,

Having examined the pre-qualification documents including scope of works and time frame of construction, I / We hereby submit all the necessary information and relevant documents for prequalification me / us for bidding for the above mentioned work. The application is made by me on behalf of

..... Group of firms in the capacity of

.....

..... Duly authorised to submit the offer.

The necessary evidence, admissible in law in respect of authority assigned to me / us on behalf of the group of firms for applying and for completion of the contract documents is attached herewith.

I / We understand that Engineer / Employer reserves the right to reject any applications without assigning any reason.

Place.....

Date.....

Name of Bidder :.....

Enclosed :

1. Schedule duly filled in the prescribed form.
2. Evidence of authority to sign.
3. Latest brochures.

4.8. STRUCTURE AND ORGANISATION

Schedule A

(Use extra sheet where required)

1. Name of Bidder or Company who is major Partner and is leading the joint Venture/consortium

Address:

.....

.....

.....

Telephone:

2. Description of Company (for eg: General Civil Engg. Bidder, supplier of equipment etc) :

.....

3. Registration and Classification

.....

4. Name and address of bankers

.....

.....

5. No. of years of experience as a General Bidder :

.....

6. No. of years of experience as a Sub Contractor:

.....

7. Name and address of partners or associated companies to the involved in the Work and Whether parent/subsidiary/other:

.....

8. Name and address of the companies of various items of civil works, namely:

.....

a) Pre-construction soil investigation:

.....

b) Earthwork :

.....

c) Concrete Work :

.....

d) Finishing Work :

.....

e) MEP Work :

.....

f) Miscellaneous work :

.....

9. Name and address of the companies who will be involved in :

.....

a) Electrical Installation :

.....

10. Attach an organization chart showing the structure of the company including names and position of Directors and key Personals :

..... Note : Particulars of 2,3,4,5,6,7,8,9 & 10 above should be separately for each partner of joint venture /Consortium.

4.9. SCHEDULE – B – FINANCIALSTATEMENT

(To be given separately for each partner of Joint Venture /Consortium)

1. Name of firm (Partners in case of Joint Venture / Consortium):

.....

2. Capital

i. Authorised:

ii. Issued and Paid Up :

3. Attach audited balance sheets and profit And loss statements for the past 5 years:

.....

4. Financial Stated (Exact amount in Rupees to be stated):

i. Cash:

ii. Current Assets:

iii. Current Liability:

iv. Working Capital:

v. Net Worth:

5. Financial Stated (Exact amount in Rupees to be stated):

i. Current ratio:

ii. Acid test ratio:

iii. Total liabilities to new worth:.....

Note : Information asked against each item to be carefully filled in . More reference to balance sheet in reply to above point is not acceptable.

6. Annual value of construction works, undertaken for each of the last five years and Work for current years.

YEAR	2019-2020	2018-2019	2017-2018	2016-2017
HOME				
ABROAD				

7. Net Profit Before Tax:

i. Current period:

ii. During the last financial year:.....

iii. During each of the four financial year :.....

The profit and loss statement have been certified through

.....

by

8. Applicant's financial arrangements for the proposed Work:

Exact amount of Rupees to be mentioned

i. Own Resources: Rs

ii. Bank Credit : Rs

iii. Others (Specify): Rs

9. Certificate of financial soundness from bankers of Applicants together with their full address

.....

10. Approximate value of works in hand

:Rs.....

11. Value of anticipated orders for next financial year :

.....

a) Home

b) Abroad

Note : Details of items 10 & 11 are to be given in Schedule 'E' Experience.

Schedule C – PERSONNEL

DETAILS OF PERSONNEL WITH THE APPLICANT Name of Applicant:

4.10. DETAILS OF PERSONNEL WITH THE APPLICANT

Name of Applicant:

Sl.No. Description Of the Applicant's payroll

1. Work manager

2. Works Manager (Main Civil Works)

3. No. of Engineering Graduates

a. Design

b. Construction Supervision

4. No. of Administrative Graduates

5. No. of skilled employees

6. No. of unskilled employees

7. Please indicate whether design, wherever required as per condition of bid, will be carried out in-house or with the help of consultants. If in house, please indicate the details of design carried out over the past five years. If to be done by back up consultants, please give the data such as name of company key personnel and professional qualifications, present position, total experience, number of Engg. Staff under each category of Specialization and details of work excavated.

(Use extra sheet)

8. For item at Sl. No. 1 to 6 data area necessary for each partner of venture/Consortium. In the case of Personnel at Sl. No. 1 and 2 Please give name, qualification present Posting professional experience and linguistic ability relevant to the Work.

(Use extra sheet)

4.11. SCHEDULE'D'

4.11.1 PLANT AND EQUIPMENT PROPOSED TO BE EMPLOYED BY THE APPLICANT FOR USE ON THEWORK

(Use extra sheet)

4.12. SCHEDULE'E'

4.12.1 Bidder's Experience

Company/Individual:

Experience : Geographical (To be given separately for each partner of Joint Venture / Consortium Summary of experience of company in the neighbourhood Work and / or neighbouring states.

(Use extra sheet)

EXPERIENCE	RELEVANT COMPLETED	PROJECT	COMPANY

Please Fill information about the relevant Works completed over the last six years

EMPLOYER	NAME OF	NAME OF	CONTRACT	PERCENTAGE	W
	LOCATION AND TYPE OF CONTRACT	ENGINEER RESPONSIBLE FOR SUPERVISION	PRICE AND DATE	OF PARTICIPATION	

Part VII- FORMS AND DECLARATIONS

1. FORM OF TENDER

Name of Work:

To

The President,

NS MEMORIAL INSTITUTE OF MEDICAL SCIENCES

Sir,

1.I/We do hereby tender to execute the works enumerated in the Schedule accompanying in accordance with the terms in your tender notification.....date.....and specification and conditions of contract in the bidding document.

2.I/We further agree to complete the whole work in..... weeks/ months from date of receipt of order to start work,

3.I/We do/do not agree to accept and carry out such portion of the work included in my/our tender as may be allotted to me /us if the whole work be not given tome/us.

4.In consideration I/We being registered as a Bidder in the Kerala STATE/GOI, I/We agree to keep the tender open for acceptanceDays from the date of submission thereof and not to make any modifications in its terms and conditions which are not acceptable to the employer. If after tender is accepted, I/We fail to execute the agreement as provided in clause..... of tender notifications or to commence the execution of the work as provided in the conditions. I/We agree that the Employer shall, without prejudice to any other right or remedy be at liberty to forfeit the said Bid security absolutely.

Acc :

1. Tender Schedule (submitted with Financial Bid).....

2. Bid Security : Rs

3. Signed copy of full tender/bid documents:

4. Signed copy of drawings

Nationality :

Signature :

Full name of Bidder.....

Place of Residence :

2. FORM OF PERFORMANCE GUARANTEE BY BANK

1. This deed of Guarantee made on the day of..... (Month and Year) between Bank of.....(hereinafter called the "Bank") represented by(name of authorized signatory) of the one part, and the (hereinafter..... Called "the Employer") represented by(name)of the other part.
2. Whereas Employer has awarded the contract for (Name of work as per Notice Inviting Tender) (hereinafter called the contract) to.....(Name of the Contractor) hereinafter called the "Contractor".
3. AND WHEREAS the Contractor is bound by the said Contract to submit to the Employer a Performance Guarantee for a total amount of (Amount in figures and words).
4. Now we the Undersigned (Name of the Bank and Branch) being fully authorized to sign and to incur obligations for and on behalf of and in the name of.....(Full name)of bank hereby declare that the said Bank will guarantee the Employer the full amount of..... Amount in figures as stated above .
5. After the Contractor has signed the aforementioned Contract with the Employer, the Bank is engaged to pay the Employer, any amount up to and inclusive of the aforementioned full amount upon written order from the Employer to indemnify the Employer for any liability of damage resulting from any defects or shortcomings of the Contractor or the debts he may have incurred to any parties involved in the Works under the Contract mentioned above, whether these defects or shortcomings or debts are actual or estimated or expected. The Bank will deliver the money required by the Employer immediately on demand without delay and demur and without reference to the Contractor and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the Contractor. The Bank shall pay to the Employer any money so demanded notwithstanding any dispute/disputes raised by the Contractor in any suit or proceedings pending before any Court, Tribunal or Arbitrator/s relating thereto and the liability under this guarantee shall be absolute and unequivocal.
6. This Guarantee is valid till (Valid till 28 (twenty-eight) days from the completion of defects liability period as per clause of bidding document).
7. At any time during the period in which this Guarantee is still valid, if the Employer agrees to grant a time extension to the Contractor or if the Contractor fails to complete the Works within the time of completion as stated in the Contract, or fails to discharge himself of the liability or damages or debts as stated under Para 5, above, it is understood that the Bank will extend this Guarantee under the same conditions for the required time on demand by the Employer and at the cost of the Contractor, without calling for the reasons for extending the Guarantee. The

Guarantee shall be unconditional and irrecoverable throughout the validity period.

8. If the Client so desires, upon written communication from him for discharge of the amount of Bank Guarantee while the same is in force, the Bank shall without asking any reasons, pass on the instrument of payment to the Client.

9. The Guarantee herein before contained shall not be affected by any change in the Constitution of the Bank or of the Contractor.

10. The neglect or forbearance of the Employer in enforcement of payment of any moneys, the payment whereof is intended to be hereby secured or the giving of time by the Employer for the payment hereof shall in no way relieve the bank of their liability under this deed.

11. The expressions "the Employer", "the Bank" and "the Contractor" Herein before used shall include their respective successors and assigns.

12. Notwithstanding anything contained herein:

a) Our liability under this Bank Guarantee shall not exceed

..... (Rupees

.....)

b) This Bank Guarantee shall be valid up to

.....

IN WITNESS WHEREOF I/We of the bank have signed and sealed this guarantee on the

..... day of

(Month & year) being herewith duly authorised. For and on behalf of

the..... Bank

.....

Signature of Authorized Bank official

Name :

Designation :

.....

Stamp and Seal of the Bank

.....

Signed, sealed and delivered for and on behalf

.....

of the Bank by the above named

in the presence of :

Witness 1

Signature :

Name :

Address :

.....
.....

Witness 2

Signature :

Name :

Address :

.....

3. Format for MoU for Consortium or Joint Ventures

FORMAT OF MEMORANDUM OF UNDERSTANDING WITH ASSOCIATE(s)

(Format for the MoU between the Bidder i.e. Lead Member & its Associate(s) and to be submitted along with the Bid by the Bidder)

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

Memorandum of Understanding

Name of Work :

.....
.....

Ref : NIT No

.....

We, M/s

(Name & Address of the Bidder i.e Lead Member) and

(i) M/s,

(ii) M/s.....and

(iii) M/s..... ,

* (Names and addresses of the Associate / Consortium partner) have formed a Consortium for the subject work and hereby undertake:

1. To be held jointly and severally responsible for the subject work as well as performance of the Contract.

2. that M/s..... (Bidder / Associate or Consortium partners)* have the experience as prime contractor for construction of the work whose details are given hereafter.

.....

me of Bidder / Associate (Consortium) partners:

.....

(Use extra sheet)

Sl.No	Name of similar Works	Details of work	Date of start and complete	Details of customer	Remarks

(The Bidder as well as each Associate / Consortium Partner with experience as prime contractor for the work as mentioned in this clause shall furnish their details separately).

3. That M/sshall be the Lead Member for this Associate/ Consortium.

4. That M/s... (name of the Bidder i.e. Lead Member)has associated with

(i) M/s.....

(ii) M/s.....and

(iii)M/s

*(name of Associate or Consortium partners) for the subject work as per their role, tenure & % share in association, given hereafter:

SL NO	Name of Bidder (LM) & Associate / Consortium partners	Role of Bidder/ Associate/ Consortium partners	Tenure of Association**	% share in Association
1	M/s..... (Bidder / LM) Financial & technical qualification For entire period			
2	M/s..... (Associate(s) Financial & technical qualification			

5. that M/s..... (Bidder i.e. Lead Member) have Formed consortium with (i) M/s..... & (ii) M/s..... (names of Associate / Consortium partners) having collective experience towards Technical & Financial Qualification as per the relevant clauses of NIT. We hereby undertake that this MoU followed by JDU as per the provision of the Bid Document shall remain valid for the tenure of association as specified at para 4.0 of this MoU.

6. That M/s (Bidder i.e. Lead Member) shall furnish the Joint Deed of Undertaking (JDU) duly executed between the Bidder and the Associate(s) as per the format given in the NIT by the date specified by the Employer.

7. That this MoU shall valid till a valid JDU is submitted.

8. That the above MoU shall governed by substantive and procedural laws in India.

For and on behalf of: (the Lead Member of Associate / Consortium)

Signature: (the Authorized Signatory)

Name of the Signatory:

Designation:

Company's Stamp / Seal:.....

For and on behalf of:

(i).....

(ii).....

(ii) (The Associates)

Signature:

(i).....

(ii).....

(iii)..... (the authorized Signatory)

Name of the Signatory: (i).....

(ii).....

(iii).....

Designation: (i).....

(ii).....

(iii).....

Company's Stamp / Seal:

Witness(1):

Witness (2):

Signature:..... Signature:.....

Name:..... Name:.....

Official Address:..... Official Address:

.....

.....

.....

.....

Date:

.....

Place:

Sign and seal of Notary with date :

** Strike out which is not applicable*

*** Association / Consortium formed for execution of this subject work will be effective from the date of signing of the Contract.*

4. Format for JDU for Consortium

PROFORMA OF JOINT DEED OF UNDERTAKING (JDU) TO BE JOINTLY EXECUTED BY THE BIDDER

i.e. LEAD MEMBER AND HIS ASSOCIATE(S)

(on the strength of other associate(s) collectively meeting both the Technical & Financial Qualification Requirement as per NIT)

(TO BE FURNISHED IN NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE IN ACCORDANCE WITH STAMP ACT) [To be submitted before signing of the Contract by the Bidder i.e. Lead Member] This JOINT

DEED OF UNDERTAKING (JDU) executed on this.....day
of..... (month) two thousand (year)

by.....M/s(Legal Status) having
its.....(registered/principal/head etc.*) office
at.....

..... (address of the Bidder) hereinafter called "the Bidder" i.e. Lead Member
(LM), which expression shall unless repugnant to the context or meaning thereof, include its successors-
in-interest, administrators, executors and permitted assigns and
M/s.....(Legal Status) registered under
the.....Act,.....having

its/their.....(registered/principal/head etc.*) office at

(1).....

(2).....hereinafter called "the Associate" which
expression shall unless repugnant to the context or meaning thereof, include its/their successors in-
interest, administrators, executors and permitted assigns in favour of the

.....(hereinafter called "Employer" which expression shall unless repugnant to the context or meaning thereof, include its successors in interest, administrators, executors and assigns). WHEREAS the Employer has invited.....Vide its NIT No..... dt.....ANDWHEREAS,M/s..... (the Bidder/LM) Has submitted its Proposal bearing Ref. No..... dated.....based on MoU dated.....in association with M/s,.....and this Deed of Joint Undertaking under these presents and the proposal, in accordance with the requirements of NIT,have been signed jointly by us.AND WHEREAS, M/s (the Bidder/LM) has requisite collective experience as prime contractor , of Technical/ Financial Qualification Requirement of NIT with associates

1) M/s.....

2)M/s and

Is entitled to bid (ii) under associates /Consortium Route of as the Bidder and thus after association, the Bidder & his Associate(s) collectively meet the requirements for.....

..... as per the Qualifying Requirements of Instructions to Bidders of NIT. The said Bidder (LM) and its Associate(s) hereby furnish an undertaking that they shall be held jointly and severally responsible

And bound unto Owner for.....

as well as performance of the Contract for the period for which the association has entered into this JDU, fully meeting the parameters guaranteed for the above work as per the bidding documents/ specifications including furnishing Financial Securities, in the event the Proposal is accepted by the Employer, resulting in a Contract (hereinafter called the "Contract").

The role, tenure & % share of the members of the Association/Consortium is as given hereafter:

Sl no	Name of Bidder (LM) & Associate / Consortium partners	Role of Bidder/ Associate/ Consortium partners	Tenure of Association**	% share in Association
1	M/s..... (Bidder / LM) Financial & technical qualification For entire period			
2	M/s..... (Associate(s) Financial & technical qualification			

NOW THEREFORE, THIS DEED Witnesses as Under:

1. That in consideration of the Award of the Contract by the Employer to

M/s.....(the Bidder i.e we ,the aforesaid Bidder (LM) and the Associate(s), will jointly and severally be responsible in accordance with the Contract to Owner for successful Construction of the work for.....

..... as well as performance of the Contract, fully meeting the guaranteed parameters required as per the Contract Specification.

2. The Bidder (LM) along with the Associate(s) shall have responsibility of the work of

3.

..... for entire term of the contract.

2.1 Without prejudice to the generally of the undertaking in paragraph 1.0 above, the manner of achieving the objective set-forth in paragraph 1.0 above shall be as follows:

a) M/s (name of the Lead Member/Associate(s) having Technical Qualification Requirement as per the Instructions to Bidders shall be required to furnish the details and to advise and provide necessary technical assistance to M/s (the Bidder i.e. LM) for the work for.....

Their quality surveillance during construction, Erection, Installation & commissioning and performance of the subject work. Lead Member / All such Associate (s) further shall depute their technical experts from time to time to the Work site to facilitate successful performance for the Work for..... as stipulated in the aforesaid Bidding Documents. Other Associate(s) shall also render all the assistance during the period of contract.

b) The Lead Member / Associate(s) will be responsible to deliver the work of for

..... in accordance with the Bidder's consent.

c) In the event, the Lead Member / Associate(s) and the Bidder (LM) fail to demonstrate successful performance of the work of for

..... as set forth in the Bidding Documents, the Associate(s) and the Bidder (LM) will be jointly responsible for taking proper corrective measures.

d) Implementation of the corrected design and all other necessary corrective repairs, replacements or modifications to the work of for

if required, shall be the joint responsibility of the Associate(s) & the Bidder (LM).

e) The Lead Member / Associate(s) will be fully responsible for the quality of all the works/ components Manufactured at its works or at its Vendor's works and, if necessary, their repair or replacement, for

incorporation in the work of for

.....

.....

and timely completion as per the Contract.

f) However, the Lead Member / Associate(s) having the qualification requirement in terms of Instructions to Bidders of NIT, shall have exclusive responsibility for the work of for

.....

.....

,as per the tenure specified in this JDU.

2.2 We, the Bidder(LM) and the Associate(s) are fully aware that for non- fulfillment of any of the obligations either towards

.....

.....the Employer is free to take up the matter either with the Lead Member and/ or any or all of the Associate(s) as per the Employer's convenience.

3. This Joint Deed of Undertaking shall be construed and interpreted in accordance with the Laws of India. The High Court of Kerala shall have exclusive jurisdiction in all matters arising there under.

4. We, the Bidder (LM) and the Associate(s), undertake not to revoke this Undertaking for the full term of the Contract and further stipulate that the undertaking herein contained shall terminate upon satisfactory completion of such period or the subject work.

5. In case of award, the Bidder (LM) & his Associate(s) shall furnish a Financial Security in favour of the Owner from any reputed commercial bank as indicated in the NIT. The value of such Financial Security Contract Performance Guarantee shall be guaranteed towards the faithful performance/ compliance of this Joint Deed of Undertaking in accordance with the terms & conditions specified herein. The guarantee shall be unconditional, irrevocable and valid as stipulated under the Contract. The guarantee amount shall be payable to Owner on demand without any demur, reservation, protest or contest.

6. That this Deed will form an integral part of the Contract awarded to the Bidder (LM) on acceptance of its Proposal and shall be operative from the date of the Contract coming into force. IN WITNESS WHERE OF, the Associate(s) and the Bidder (LM) have, through their authorized representatives, set their hands and seal on the day, month and year first mentioned above.

BIDDER

For and on behalf of M/s (name of the Bidder/LM)

Signature:

(the Authorized Signatory)

Name of the Signatory :

Designation :

Bidder's Stamp/Seal :

WITNEESS (1)

WITNEESS (2)

Signature: Signature:

Name :

Name :

Official Address : Official Address :

.....
.....

.....
.....

.....
ASSOCIATE(S)

.....
.....

For and on behalf of M/s..... (Name
of the Associates)

Signature :

(Authorized Signatory)

Name of the Signatory:

Designation :

Company's Stamp/Seal :

WITNEESS (1)

WITNEESS (2)

Signature: Signature:

Name :

Name :

Official Address : Official Address :

.....
.....

.....
.....

ASSOCIATE(S)

For and on behalf of M/s..... (Name

of the Associates)

Signature :

(Authorized Signatory)

Name of the Signatory:

Designation :

Company's Stamp/Seal:

** Association/Consortium formed for execution of this subject work will be effective from the date of signing of the Contract.*

**Part VIII -CHECK LIST
CIVIL**

Name of Project:

Running Account Bill No.:

Sl. No.	Items	Documents received	Remarks
1.	Materials Test Report		
	a) Cement		
	b) Sand		
	c) Reinforcement Steel		
	d) Bricks		
	e) Water for Construction		
	f) Timber		
	g) Aluminium section		
	i) Thickness/weight		
	ii) Microns of Powder Coating or anodizing		
2.	Joint Signature for all measurements for Bills		
	a) Employer		
	b) Architect		
	c) Contractor		
3.	Cubes Test Report		
	a) Compressive Strength Test		
4.	Application for Extension of Time		
	a) Submitted		
	b) Not Required		
5.	Insurance		
	a) Submitted as per Contract		
	b) Valid up to		
6.	Safety Measures		
	a) Taken at Site by Contractor		
	b) Certified by P.M.		
7.	Approval of Extra/Substituted Items from Employer		
	a) Received		
	b) Under Scrutiny		
	c) Under Checking of Employer		
8.	Reasons of Extra Items		
9.	Analysis of Extra Items		
10.	Deviation Statement		
	a) Submitted		
	b) Not Required at this Stage		
11.	Cement and Steel Consumption Statement		
	a) Submitted		
	b) Not Required		

12.	Defect List		
	a) Submitted by P.M.		
13.	Rectification of Defective Works		
	a) Rectification started at Site		
	b) Rectification under program		
	c) Rectification not yet started		
14.	As built drawing (in case of final bill)		
15.	Completion certificate from the Employer (in case of final bill)		

Project:					
<u>CONCRETE POUR CARD</u>					
Employer:		Date:		Pour No:	
Contractor:		Max.Aggregate size:		mm	
Structure:					
Drg. No:		Start/Completion Time:			
Concrete Grade/Quantity:		M / M ³		Mixing Time :	

Sl. No	DESCRIPTION	YES	NO	NA	REMARKS
1	Check levels and sizes of beams and slabs as per drawings is it ok.				
2	Thickness of beams and slabs provided as per drawings is it ok.				
3	Whether opening sealed properly.				
4	Whether supports provided are adequate.				
5	Whether reinforcement steel provided as per drawings.				
6	Laps provided as per specification.				
7	Whether cutouts and sleeves provided as per drawings.				
8	Whether cover block provided as per specific:				
9	Is admixture/ plasticizer needed to be added?				
10	Check for transportation/ placing of concrete is it ok				
11	Is proper vibrator being done?				
12	Is concrete being consumed within the initial setting time of cement?				
13	Check for leveling and finishing of exposed concrete surface for planer structures like slabs etc.				
14	Dowels provided if any.				
	a No of cubes taken.				
	b Slump of concrete noted.				
	c Actual consumption of Cement Bags				

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

DETERMINATION OF SILT CONTENT IN SAND

Date of receipt _____
Source of sand _____
Name of Supplier _____

Date of testing _____
Location of
unloaded material _____

SAMPLE NO.	1	2	3
Height of sand layer (d1)			
Height of silt layer (d2)			
Silt content (%) = $\frac{d2}{d1} \times 100$			

Tested by

Checked by

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

TEST REPORT FOR BRICKS/CC BLOCKS

Date of receipt _____
Name of Supplier _____
Brand Name _____

Date of testing _____
Location of
unloaded material _____

Test Details:

Sl. No	Tests	Results	Limits	Remarks
1	Compressive strength		>35 kg/cm ²	
2	Water absorption (%)		<20% of its weight	

Sample approved/rejected

Action taken, if any

Checked by

Tested by

Employer/Consultant

QC Engineer/Site In-Charge

QC Lab In-Charge

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

COMPRESSION TEST FOR BRICKS/ CC BLOCKS

IS: 3495 (PART-I), 1992

Date of receipt _____
Name of Supplier _____
Brand Name _____

Date of testing _____
Location of
unloaded material _____

Sample Nos.	Maximum load at failure (N or Kgf)	Average area (mm ² or cm ²)	Compressive strength (N/mm or kgf.cm ²)

Tested by

Checked by

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

WATER ABSORPTION FOR BRICKS/ CC BLOCKS

IS 3495 (PART II) - 1992

Date of receipt _____ Date of testing _____
Name of supplier _____ Location of _____
Brand name _____ unloaded material _____

Sample Nos.	Weight of dry brick (M1)	Weight of wet brick (M2)	Water absorption ("o) $\frac{(M2-M1) \times 100}{(M1)}$

Checked by

Tested by

Employer/Consultant

QC Engineer/Site in-Charge

QC Lab In-Charge

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

COMPRESSIVE STRENGTH OF CONCRETE
IS: 516, 1959

Date _____

Location (Description of concreting) _____

Sr. No	Location	Grade of Concrete	Slump	Date of Casting	Due Date of testing		Compressive Strength (Kg/Sq. Cm2)		Average Strength		Remarks
					7 days	28 days	7 days	28 days	7 days	28 days	

Checked by

Tested by

Employer/Consultant

QC Engineer/Site in-Charge

QC Lab In-Charge

Note: This is a sample format to be maintained in the register.

PROJECT : _____

EMPLOYER : _____

CONTRACTOR : _____

SLUMP TEST
IS: 1199-1959

Date: _____

Location (Description of concreting) _____

No. of Samples	I	II	Remarks
Grade of Concrete			
Water Cement Ratio			
Slump recorded			
Mix design requirement			

Note (a) 40mm for medium work ability
(b) 20mm for low work ability
(c) 40mm for high work ability with 40mm sized aggregate.

Sample approved/rejected _____

Action taken if any

Checked by

Tested by

Employer/Consultant

QC Engineer/Site in-Charge

QC Lab In-Charge