No: CCHS/COLLEGE/2024-1

Date: 10.12.2024

TENDER DOCUMENT

College Building of Indira Gandhi College Of Nursing

For M/s Cochin Co Operative Hospitals Society Ltd No: E 288

ADDRESS

Secretary,

Cochin Co Operative Hospitals Society Ltd No: E 288,

Kadavanthra, Kochi 682020

Phone: 0484 220 6734

NOTICE INVITING TENDER FOR WORKS:

(SINGLE STAGE-TWO ENVELOPE)

Indira Gandhi College Of Nursing at Thiruvaniyur Panchayath, Ernakulam District

[SH: Civil, Electrical, Plumbing, Sanitary, etc.]

Probable Amount of Contract: Rs. 168745955/- (Rupees Sixteen Crore Eighty Seven Lakh Forty Five Thousand Nine Hundred and Fifty Five Only)

Invitation for Bids

Date of Bid: 10.12.2024

Tender No.: CCHS/COLLEGE/2024-1

Construction of College Building of Indira Gandhi College Of Nursing
Deadline for Submission of Bids: 15-Jan-2025 @ 3 PM

The Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288, Kadavanthra, Kochi 682020 invites **sealed 'Item Rate' bids** from 'A' class registered Contractors under State PWD / CPWD / BSNL / Indian Railways, for the Construction and Completion of College Building of Indira Gandhi College Of Nursing at Thiruvaniyur Panchayath, Ernakulam District. The key features of the work are as per the following Bid Data Table:

1.	Estimated PAC	Rs. 168745955/-
2.	Bid Security (EMD)	Rs. Rs. 42.18 Lakh (Rupees Forty Two Lakh Eighteen Thousand only)
3.	Cost of the Bid Document & Processing Fee	Rs. 15,000/- Excluding of GST (18%)
4.	Period of Completion	16 Months
5.	Last Date and Time for Submission of bid	15-Jan-2025 @ 3 PM
6.	Opening of Technical Bid	16- Jan-2025 @ 11AM
7	Standard Schedule of Rates	DSR 2018 with cost index applicable

1. Only eligible Bidders with the following key qualifications should participate in this bidding:
   Eligibility Citeria:
   A. Experience of having successfully completed similar works (Building works including Civil, Electrical, Plumbing and Fabrication) during last 5 years ending 30/06/2024 should be either of the following. 70% OF the Pre qualification work should be Cvil works, brick works, concreting works and certified by the Engineer in Charge.
   Three similar completed works costing not less than 650Lakhs
   Or
   Two similar completed works costing not less than 817
   Or
   One similar completed work costing not less than 131 Laks% of the estimated cost.
2. The average financial turnover from construction contracts of the bidder should not be less than PAC for the last 3 financial years ending 31.03.2024 and shall show profit for the last two financial years. The statement shall be duly signed and endorsed by statutory auditor/ CFO.
3. The bidder should have sufficient men and machinery and shuttering materials of at least 30000 sqm which should be submitted as a separate undertaking.
4. To obtain further information and inspect the bidding document, Bidders should contact:

The Secretary,
Cochin Co Operative Hospitals Society Ltd No: E 288
Kadavanthra, Kochi 682020
Phone: 0484 220 6734
e-mail: Igchhospitalcochin@yahoo.com

5. This tender is in offline mode. The tender document can be downloaded from website http://igchkochi.com/. Submission of bids shall be in offline mode only. The bids prepared in accordance to the instructions given in this tender document should be submitted to the office of the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288, Indira Gandhi Co Operative Hospital, Kadavanthra, Kochi -682020. . The Bidders should follow necessary instructions in the tender documents while submitting the bids.
6. If the tender opening date happens to be on a holiday or non-working day due to any other valid reason, the tender opening process will be done on the next working day at same time and place.
7. The Bidder should pay online (i) tender submission fee of Rs.15,000 plus GST (18%) Non-refundable) and (ii) Bid Security of Rs. Rs. 42.18 Lakh (Rupees Forty Two Lakh Eighteen Thousand only) (Refundable) by way of NEFT Transfer, DD, Bankers Cheque, Bank Guarantee. Non submission of the above fees will result in rejection of bids.
8. Account details of the Cochin Co Operative Hospitals Society Ltd No: E 288 ,Kadavanthra, Kochi 682020, A/ C Name: Cochin Co- Operative Hospitals Society Ltd No E 288. A/C No-50200022925676. IFSC - HDFC0000295. A/C Type - Current Account
9. The Employer/Client will not be responsible for any costs or expenses incurred by Bidders in connection with the preparation or delivery of Bids.
10. The Employer/Client reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders.
11. Pre-bid meeting will be held at Indira Gandhi Co Operative Hospital, Kadavanthra, Kochi -682020 at 11 AM on 06 -Jan 2025. Bidders interested in participating in the bids are advised to attend the same. Bidders are encouraged to visit the site, at their own cost, before the pre-bid meeting / submission of bid.
12. Joint Venture applications are not allowed.

Secretary,
Cochin Co Operative Hospital Society Ltd No. E 288

Contents

Abbreviations:

BDF	Bidding Forms
BDS	Bid Data Sheet
COF	Contract Forms
ELI	Eligibility Form
EMD	Earnest Money Deposit (Bid Security)
EQC	Evaluation and Qualification Criteria
EQR	Employer's Requirement
EQU	Equipment Form
EXP	Experience Form
FIN	Financial Data Form
GCC	General Conditions of Contract
GOK	Government of Kerala
ICB	International Competitive Bidding
IFB	Invitation for Bidders
ITB	Instructions to Bidders
LIT	Pending Litigation Form
LOA	Letter of Acceptance
NCB	National Competitive Bidding
OAI	Office of Audits and Investigations
PAC	Probable Amount of Contract
PCC	Particular Conditions of Contract
PER	Personnel Form
SBD	Standard Bidding Document

Volume II Bidding Procedures

Section 1 - Instructions to Bidders

This section specifies the procedures to be followed by Bidders in the preparation and submission of their Bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of contract.

Table of Clauses

A. General

a. Scope of Bid

a.1 In connection with the Invitation for Bids indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues these Bidding Document for the procurement of Works as specified in Section 5 (Employer's Requirements). The name, identification, and number of contract of this Bidding are provided in the BDS.

a.2 Throughout this Bidding Document:

(a) the term "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

(c) "day" means calendar day.

b. Source of Funds

b.1 Funded by Cochin Co Operative Hospital Society Ltd No. E 288

c. Fraud and Corruption

c.1 Government of Kerala – Corrupt and Fraudulent Practices

The Client follows Government of Kerala's policy for anti-corruption and fraudulent practices to maintain sound procurement principles of open competition, economy and efficiency, transparency, and fairness. The Client requires the Consultant to observe the following Government manuals (amended from time-to-time) during the selection process and in execution of such contracts

(i) The Kerala Financial Code (KFC), 2008 (7th Edition, 1st Edition was in 1963),

(ii) The Stores Purchase Manual (SPM), 2013,

(iii) Guidelines issued by Government from time to time

c.2 Furthermore, Bidders shall be aware of the provisions of GCC 27.3 and 69.2(i).

d. Eligible Bidders

d.1 A Bidder may be a natural person, private entity, government-owned entity or any combination of them and shall be as per BDS with a formal intent to enter in to an agreement: provided the Bidder is an Indian National .

d.2 A Bidder shall not have conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be consider to be in a conflict of interest with one or more parties in this bidding process if including but not limited to:

(a) they have controlling shareholders in common; or

(b) they receive or have received any direct or indirect subsidy from any of them; or

(c) they have the same legal representative for purposes of this bid; or

(d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influenced the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or

(e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a joint venture except for alternative offers permitted under ITB clause 8 of the bidding document. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of ITB 4.3(a) - (d) above, this does not limit the participation of a Bidder access of Contractor in another bid or of a firm as a sub-Contractor in more than one bid; or

(f) a Bidder or any affiliated entity, participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or

(g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract.

d.3 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.

d.4 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the Employer.

B. Contents of Bidding Document

1. Sections of bidding Document

1.1 The Bidding Document consist of Parts I, II, III and IV, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 3.

Volume I Bidding Procedures

Section 1 - Instructions to Bidders (ITB)

Section 2 - Bid Data Sheet (BDS)

Section 3 - Evaluation and Qualification Criteria (EQC)

Section 4 - Bidding Forms (BDF)

Volume II Requirements

Section 5 – Employer's Requirement (ERQ)

Volume III Conditions of Contract and Contract Forms

Section 6 - General Conditions of Contract (GCC)

Section 7 – Particular Conditions of Contract (PCC)

Section 8 - Contract Forms (COF)

Volume IV Bill of Quantities, Drawings & Reports

Section 9 – Drawings

Section 10 –Bill of Quantities

1.2 The Invitation for Bids issued by the Employer is not part of the Bidding Document.

1.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the Invitation for Bids.

1.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.

2. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting

2.1 A prospective Bidder requiring any clarification of the Bidding Document shall contact the Employer in writing at the Employer's address indicated in the BDS or raise his inquiries during the pre-bid meeting if provided for in accordance with ITB 1.4. The Employer will respond in writing to any request for clarification, provided that such request is received prior to the deadline for submission of bids, within a period given in the BDS. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 17.2.

2.2 The Bidder is advised to visit and examine the Site of Works located as provided for in the BDS and its surroundings and obtain for itself on its own risk and responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

2.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

2.4 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage

2.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than one day before the pre-bid meeting. (by e-Mail only)

2.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly as Corrigendum in the e-tender site. Any modification to the Bidding Document that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an addendum/ corrigenda pursuant to ITB 3 and not through the minutes of the pre-bid meeting. No further queries/clarifications shall be entertained beyond the date of pre-bid meeting.

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

3. Amendment of Bidding Document

3.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Document by issuing addenda/ corrigenda.

3.2 Any addendum/ corrigendum issued shall be part of the Bidding Document and shall be submitted to the e-tender site.

3.3 To give prospective Bidders reasonable time in which to take an addendum/corrigendum into account in preparing their bids, the Employer may, at its discretion, extend the deadline for the submission of bids, pursuant to ITB 17.2

C. Preparation of Bids

4. Cost of Bidding

4.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

5. Language of Bid

5.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the English. Supporting documents and printed literature that are part of the Bid may be in English.

6. Documents Comprising the Bid

6.1 The Technical Bid shall comprise the following:

a) Letter of Technical Bid;

b) Completed schedules, in accordance with ITB 6 & 8, or as stipulated in the BDS;

c) Bid Security or Bid Securing Declaration, in accordance with ITB 14;

d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 15.2;

e) documentary evidence in accordance with ITB 12 establishing the Bidder's qualifications to perform the contract;

f) Technical Proposal in accordance with ITB 11;

g) Tender submission fee of Rs. 18,000/- + GST (18%);

h) Any other document required in the BDS;

7. Letters of Bid, and Schedules

7.1 The Letters of Bid, schedules and all documents listed under clause 6, shall be prepared using the relevant forms in section 4 (Bidding Forms) if so provided. The forms must be completed without any alterations to the text, and no substitute shall be accepted. All blank spaces shall be filled in with the information requested.

8. Alternative Bids

8.1 Unless otherwise indicated in the BDS, alternative bids shall not be considered.

9. Bid Prices and Discounts

9.1 The prices and discounts quoted by the Bidder in the Letter of Bid and in the schedules shall conform to the requirements specified below.

9.2 The Bidder shall submit a bid for whole of the works described in ITB a.1 by filling in prices for all items of Works, as identified in Section 4 (Bidding forms). In case of admeasurement contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities. In case of discrepancy between rate quoted and the amount, the rate quoted shall prevail.

9.3 The price to be quoted in the Letter of Bid shall be the total price of the Bid, excluding any discounts offered.

9.4 Unconditional discounts, if any, and the methodology for their application shall be quoted in the Letter of Bid, in accordance with ITB 6.1.

9.5 All taxes & duties including Swatch Bharath CESS, GST, WCT, KCWWF, and labour cess at prevailing rates and other levies payable by the Contractor under the Contract, or for any other cause, as on the date to the deadline for submission of bids, shall be deemed to have been included in the rates and prices submitted by the Bidder. Any variation in taxes that may occur eventually shall be adjusted from the forthcoming bills of the Contractor. However, GST at actuals will be reimbursed to the Contractor on each running bill on production of proof of remittance.

9.6 The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Bid and the rates and prices stated in the Bill of Quantities, all of which shall, except in so far as it is otherwise provided in the contract, cover all his obligations under the contract and all matters and things necessary for the proper execution and completion of the works and the remedying of any defects there in.

10. Currencies of Bid and Payment

10.1 The currency of the bid and payment shall be in Indian Rupees.

11. Documents Comprising the Technical Proposal

11.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidder's proposal to meet the work requirements and the completion time.

12. Documents Establishing the Qualifications of the Bidders

12.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).

13. Period of Validity of Bids

13.1 Bids shall remain valid for the period of 120 days after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

13.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 13, it shall also be extended to 28 days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid.

14. Bid Security

14.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its bid, in original form, a bid security as specified in the BDS. In case of bid security the amount shall be as specified in the BDS.

14.2 If a bid security is specified pursuant to ITB 13.1, the bid security shall be in any of the following forms:

By NEFT transfer to (A/ C Name: Cochin Co- Operative Hospitals Society Ltd No E 288, A/C No-50200022925676,IFSC - HDFC0000295, A/C Type - Current Account), Demand Draft, Bank Guarantee, Banker's Cheque , favouring the The Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288,

14.3 Any bid not accompanied by a substantially compliant bid security in accordance with ITB 13.3, shall be rejected by the Employer as non-responsive.

14.4 If a bid security is specified pursuant to ITB 13.1, the bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the performance security.

14.5 If a bid security is specified pursuant to ITB 13.1, the bid security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required performance security.

14.6 The bid security may be forfeited or the Bid Securing Declaration executed:

a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letter of Bid.

b) if the successful Bidder fails to:

i. sign the Contract

ii. furnish a performance security; or

iii. accept the arithmetical corrections in accordance with ITB 23;

15. Format and Signing of Bid

15.1 The Bidders should follow necessary instructions in the tender document while submission of bids.

15.2 The Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid, except for unamended printed literature shall be signed or initialed by the person signing the bid.

Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

D. Submission and Opening of Bids

16. Sealing and Marking of Bids

16.1 The Bids should be submitted directly to the office of the Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288, Kadavanthra, Kochi 682020. Phone: 0484 220 6734 before the prescribed time. No online submission of bids will be considered.

16.2 PART-I entitled as TECHNICAL BID. The technical bid shall be submitted in a separate sealed cover.

16.3 PART II tilted as PRICE BID (BOQ) has to be submitted in a separate sealed cover. The BOQ is specific to the tender and is not interchangeable. The Price Bids submitted in any other formats will be treated as non responsive and not for tabulation and comparison.

16.4 If the bids are not submitted as per the requirement of the above clauses, the Cochin Co Operative Hospitals Society Ltd No: E 288, shall assume no responsibility for the offer's misplacement and consequential rejection.

17. Deadline for Submission of Bids

17.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the NIT.

17.2 The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document in accordance with ITB 2, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

18. Late Bids

18.1 The Employer shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB 16. Any bid received by the Employer after the deadline for submission of bids shall be declared late, rejected, and unopened.

18.2 No bid can be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof.

19. Bid Opening

19.1 Bids will be opened as per schedule given in the Tender Notice. On the day of bid opening only the pre-qualification bid, in presence of bidders who are present, will be opened. If EMD and cost of Bid is not enclosed the bid will not be considered. At this time only names of the bidders who have quoted and furnished EMD will be read out and no other information will be given.

19.2 In the event of the tender and claims in the submitted documents are materially missing or of substantial error or unqualified for want of required qualifications, shall stand disqualified and rejected.

19.3 The tenderer shall be responsible for properly arranging and submitting the relevant documents in the format specified in the Tender document and the Cochin Co Operative Hospitals Society Ltd No: E 288 shall not be held liable for errors or mistakes done while submitting the bid.

19.4 The date and time of Opening the Price Bid will be announced only after the opening of the Technical Bid and demonstration of the features, operation etc of the equipment by the tenderers.

19.5 The Price bid opening is offline. The Price bids of the short-listed technically qualified tenderer(s) will be opened only after evaluation of Technical Bids. The opening of the price bid shall be done offline by the Cochin Co Operative Hospitals Society Ltd No: E 288Tender or its authorized representative and only the Price Bids of those firms qualified in the Technical bid. Tenderer shall download the available price bid format, and quote the prices in the respective fields before submitting it. The Price bids submitted in any other formats will be treated as non-responsive and not considered for tabulation and comparison.

19.6 Price Offered shall be all inclusive and in Indian Rupees. The total amount will be calculated and will be taken for evaluation and bid ranking.

E. Evaluation and Comparison of Bids

20. Confidentiality

20.1 Information relating to the examination, evaluation, comparison, and post qualification of bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.

20.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its Bid.

20.3 From the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.

21. Clarification of Bids

21.1 To assist in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, the Employer may at its discretion ask any Bidder for a clarification of its bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall through email or written format only by The Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288No change in substance of the bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids, in accordance with ITB 24.

21.2 If a Bidder does not provide clarifications of its bid by the date and time set in the Employer's request for clarification, its bid may be rejected.

22. Deviations, Reservations, and Omissions

22.1 During the evaluation of bids, the following definitions apply:

a) "Deviation" is a departure from the requirements specified in the Bidding Document;

b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and

c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

23. Preliminary Examination of Technical Bids

23.1 The Employer determination of a bid's responsiveness is to be based on the contents of the bid itself as defined in ITB 5.

23.2 A substantially responsive bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that,

a) if accepted, would:

i. affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or

ii. limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the Bidder's obligations under the proposed Contract; or

b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive bids.

23.3 The Employer shall examine the technical aspects of the bid submitted in accordance with ITB 11, Technical Proposal, in particular, to confirm that all requirements of Section 5 (Employer's Requirements) have been met without any material deviation, reservation.

23.4 If a bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

24. Nonconformities, Errors, and Omissions

24.1 Provided that a bid is substantially responsive, the Employer may waive any nonconformities in the bid that do not constitute a material deviation, reservation or omission.

Provided that a Technical bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Technical bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the bid. Failure of the Bidder to comply with the request may result in the rejection of its bid.

25. Qualification of the Bidder

25.1 Provided that a bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis;

a) Only for unit price contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

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

c) if there is a discrepancy between the bid price in the summary of Bill of Quantities and the bid amount in item (c) of the letter of bid, the bid price in the summary of bill of quantities will prevail and the bid amount in the item (c) of the letter of bid will be corrected and

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

25.2 If the Bidder that submitted the lowest evaluated bid doesn't accept the correction of errors, its bid shall be disqualified and its bid security may be forfeited, or its bid securing declaration executed.

26. Evaluation of Price Bids

26.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

26.2 To evaluate a bid, the Employer shall consider the following:

a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts, or Schedule of Prices for lumpsum contracts, but including Day work items, where priced competitively;

b) price adjustment for correction of arithmetic errors in accordance with ITB 23.1;

c) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria);

26.3 If the bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

27. Comparison of Bids

27.1 The Employer shall compare all substantially responsive bids to determine the lowest evaluated bid in accordance with ITB 24.2.

28. Qualification of the Bidder

28.1 The Employer shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated and substantially responsive bid meets the qualifying criteria specified in section 3 (evaluation & qualification criteria.)

28.2 The determination shall be based up on an examination of the documentary evidence of the Bidder 's qualifications submitted by the Bidder, pursuant to ITB 11.1.

An affirmative determination shall be prerequisite for award of the contract to the Bidder. A negative determination shall result in disqualification of the bid, in which event the Employer shall proceed to the next lowest evaluated bid to make a similar determination of that Bidders qualification to perform satisfactorily.

29. Employer's Right to Accept Any Bid, and to reject any or All Bids

29.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.

F. Award of Contract

30. Award Criteria

30.1 The Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

31. Notification of Award

31.1 Prior to the expiry of the period of bid validity, the Employer shall notify the successful Bidder, in writing, that its bid has been accepted.

31.2 At the same time, the Employer shall also notify all other Bidders of the results of the bidding. The Employer will publish in their notice board the results identifying the bid and lot numbers and the following information; (i) name of each Bidder who submitted a bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each bid that was evaluated; (iv) name of Bidders whose bids were rejected and reasons for their rejection; and (v) name of the successful Bidder, and the price it offered, as well as the duration and summary of the scope of the work awarded. After publication of the award, the unsuccessful Bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.

31.3 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

32. Signing of Contract

32.1 Promptly after notification, the Employer shall send the successful Bidder the Contract Agreement.

32.2 Within twenty-eight (28) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

33. Performance Security

33.1 Within twenty-eight (28) days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the conditions of contract, subject to ITB 24.3, using for that purpose the Performance Security Form included in Section 8 (Contract Forms), or another form acceptable to the Employer.

33.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the bid securing declaration. In that event the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.

33.3 The above provision shall also apply to the furnishing of a domestic preference security if so required.

34. Margin of Preference Not applicable

The Secretary,

Cochin Co Operative Hospitals Society Ltd No: E 288

Section 2 - Bid Data Sheet

This section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section I. Instructions to Bidders.

A. General

ITB a.1	The Tender No: **CCHS/COLLEGE/2024-1 Dated, 10.12.2024– Construction of College Building of Indira Gandhi College Of Nursing**
ITB a.1	The Employer is: Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288, Kadavanthra, Kochi 682020.
ITB a.1	The Name of the bidding process is**: Tendering – Single stage Two cover – Technical Bid and Financial Bid.**
ITB a.1	**The name of the Work is 'Construction of College Building of Indira Gandhi College Of Nursing** **SH: Civil, Electrical, Plumbing, Sanitary, Road Work, Compound wall, Gate etc.**
ITB d.1	"A-class" registered Contractor s under State PWD / CPWD / BSNL / Indian Railways
ITB d.2	The Bidder, Partners of the bidding company, and the sub contractors employed by the Bidder should be Indian Nationals only.

B. Contents of Bidding Documents

ITB 2.1	The Employer's address is: City: Kochi PIN Code: 682020 Country: INDIA Telephone: 0484 220 6734 e-mail: igchhospitalcochin@yahoo.com Request for clarification after pre-bid meeting shall not be entertained.
ITB 2.2	The Location of the site of the work is: situated at Mattakkuzhy – Vennikkulam Road, Thiruvaniyur Panchayath, Mamala, Ernakulam District.
ITB 2.4	A Pre-Bid meeting shall take place. Date: 06-Jan-2025 Time: 11.00 AM Place: Indira Gandhi Co Operative Hospital, Kadavanthra, Kochi.682020 Telephone: 0484 220 6734, e-mail: igchhospitalcochin@yahoo.com

C. Preparation of Bids

ITB 5.1	The language of the bid is: English.
ITB 6.1 (b)	In accordance with ITB 7 and ITB 9, the following schedules shall be submitted with the bid, including the priced Bill of Quantities along with schedule of Equipment, Key personnel and Sub Contractor s and Data on financial resources for meeting the required financial resources.
ITB 6.1 (h)	The Bidder shall submit with its Price Bid any other document(s) he feels relevant for the sufficiency of the bid
ITB 8.1	Alternative bids shall not be permitted.
ITB 10.1	The unit rates and the prices shall be quoted by the Bidder both in words & figures entirely in Indian Rupees only. The payment in this contract will also be made in Indian Rupees only.
ITB 13.1	The bid validity period shall be 120 days after the submission of the bid.
ITB 14.1	A bid security is required. The amount and currency of the bid security shall be Rs. Rs. 42.18 Lakh (Rupees Forty Two Lakh Eighteen Thousand only)
ITB 14.2	The bid security shall be in the following form: (a) NEFT Transfer to (A/ C Name: Cochin Co- Operative Hospitals Society Ltd No E 288, A/C No-50200022925676,IFSC - HDFC0000295, A/C Type - Current Account), Demand Draft, Bank Guarantee, Banker's Cheque , favouring the The Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288,,
ITB 15.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: A Power of Attorney from the authorized person to issue from the company. All the pages of the bid shall be signed or initialed by a person signing the bid along with the seal.

D. Submission and Opening of Bids

ITB 16.1	The Bids should be submitted manually at the office of the Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288, Kadavanthra, Kochi 682020 located at Indira Gandhi Co Operative Hospital, Kadavanthra, Kochi.682020
ITB 17.1	For **bid submission purposes** , the Employer's address is: Secretary, Cochin Co Operative Hospitals Society Ltd No: E 288, Kadavanthra, Kochi 682020 Country: INDIA Telephone: 0484 220 6734, e-mail: igchhospitalcochin@yahoo.com The deadline for bid submission is: Date: 15-Jan-2025 Time: 3.00 PM
ITB 18.2	The bid once submitted will not be modified or withdrawn.

ITB 19.1	The opening of the Technical Bid shall take place at/on: Indira Gandhi Co Operative Hospital, Kadavanthra, Kochi.682020 Date: 16-Jan-2025 Time: 11.00 AM

E. Evaluation and Comparison of Bids

ITB 19.6	The bid should be quoted in Indian Rupees only and will be evaluated in Indian Rupees only.

F. Award of Contract

ITB 33.1	The Amount of Performance Security Shall Be 5 % (Five Percent) of Contract Value.
ITB 33.4	The amount of Additional Performance Security shall be the difference in percentage, between the actual percentage falling below the PAC less 10% of the PAC, multiplied by the PAC.
ITB 34	A margin of preference shall not apply to this contract.

Secretary
Cochin Co Operative Hospitals Society Ltd No: E 288

Section 3 - Evaluation and Qualification Criteria

- Post qualification -

Table of Criteria

1. Evaluation

In addition to the criteria listed in ITB 26.2 (a) – (e) the following criteria shall apply:

1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section 5 (Employer's Requirements).

Non-compliance with equipment and personnel requirements described in Section 5 (Employer's Requirements) shall not normally be a ground for bid rejection and such non-compliance will be subject to clarification during bid evaluation and rectification prior to contract award.

1.2 Multiple Contracts

Works are grouped in multiple contracts and pursuant to ITB 26.4, the Employer will evaluate and compare Bids on the basis of a contract, or a combination of contracts, or as a total of contracts in order to arrive at the least cost combination for the Employer by taking into account discounts offered by Bidders in case of award of multiple contracts.

If a Bidder submits several successful (lowest evaluated substantially responsive) bids, the evaluation will also include an assessment of the Bidder's capacity to meet the following aggregated requirements as presented in the bid:

- Construction Experience (value of similar contracts previously undertaken by the Bidder),
- Financial Resources Requirements,
- Equipment to be allocated, and
- Personnel to be fielded

1.3 Completion Time

16 months from the date of award of contract

1.4 Technical Alternatives

Not Permitted.

1.5 Quantifiable Nonconformities, Errors and Omissions

Applicable

1.6 Margin of Preference Not applicable

2. Qualification

Unless specifically indicated otherwise, it is the legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries or affiliates, that must satisfy the qualification criteria described below.

2.1 Eligibility

Criteria	Compliance Requirements				Documents
Requirement	Individual	- Partners/ Directors			Submission Requirements

2.1.1 Nationality

Nationality in accordance with ITB Sub-Clause d.1.	Must meet requirement				Forms ELI - 1; ELI - 2 with attachments

2.1.2 Conflict of Interest

No conflicts of interest in accordance with ITB Sub-Clause d.2	Must meet requirement				Letter of Technical Bid

2.1.3 Government-Owned Entity

Bidder required to meet conditions of ITB Sub-Clause d.4	Must meet requirement				Forms ELI - 1; ELI - 2 with attachments

2.2 Pending Litigation

Pending Litigation criterion shall apply.

2.2.1 Pending Litigation and Arbitration

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Partners/Directors			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
All pending litigation and arbitration, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than 50 percent of the Bidder's net worth calculated as the difference between total assets and total liabilities should be positive.	must meet requirement by itself or as partner to past or existing JV				

2.3 Financial Requirements

2.3.1 Historical Financial Performance

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Partners/Directors			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Submission of audited financial statements for the last five years to demonstrate the current soundness of the Bidders financial position. As a minimum, the Bidder's net worth for the	must meet requirement				Form FIN - 1 with attachments

last year, calculated as the difference between total assets and total liabilities should be positive.					

2.3.2 Average Annual Construction Turnover

Criteria	Compliance Requirements	Documents
Requirement		**Submission Requirements**
Minimum average annual construction turnover of INR 5 Crores calculated as total certified payments received for contracts in progress or completed, within the last 3(three)financial years ending 31.03.2024 and shall show profit for the last two financial years.	must meet requirement	Form FIN - 2

2.3.3 Financial Resources Requirement

Criteria	Compliance Requirements	Documents
Requirement		**Submission Requirements**
Using Forms FIN-3 and FIN-4 in Section 4 (Bidding Forms), the Bidder must demonstrate access to, or availability of, liquid assets[1], lines of credit, or other financial resources (other than any contractual advance payments) to meet the Bidder's financial resources requirement indicated in Form FIN-4.	must meet requirement	Form FIN – 3 and Form FIN – 4

1 *Liquid Assets mean cash and cash equivalents, short-term financial instruments, short term available-for-sale-securities, marketable securities, trade receivables, short-term financing receivables and other assets that can be converted into cash within ONE YEAR.*

2.4 Construction Experience

2.4.1 Contracts of Similar Size and Nature

Criteria	Compliance Requirements	Documents
Requirement	**Single Entity**	**Submission Requirements**
(i) Three similar completed works costing not less than the amount equal to 40650Lakhs% of the estimated cost.	must meet requirement	Form EXP - 1

Or		
(ii) Two similar completed works costing not less than the amount equal to 50817% of the estimated cost.		
Or		
(iii) One similar completed works costing not less than the amount equal to 80131 Laks% of the estimated cost.The --similarity of the Bidder's participation shall be based on the physical size, nature of works, complexity, methods, technology or other characteristics as described in Section 5 (Employer's Requirements).		

2.4.2 Construction Experience in Key Activities

(May be complied by Specialist Sub Contractor s. Employer shall require evidence of subcontracting agreement from the Bidder. Specialist Sub Contractor is a specialist enterprise engaged for highly specialized processes which cannot be provided by the main Contractor.)

Criteria	Compliance Requirements				Documents
Requirement	Single Entity				Submission Requirements
For the above or other contracts executed during the period stipulated in 2.4.1 above, a minimum construction experience in the following key activities:	must meet requirements				Form EXP - 2
Participation as prime Contractor in at least 1 contract within the last five years, that has been successfully or are substantially completed, and that include Construction of reinforced concrete framed structures, steel trusses Electrical works, Plumbing works etc.	100%				

Secretary

Cochin Co Operative Hospitals Society Ltd No: E 288

Section 4 - Bidding Forms

This Section contains the forms that are to be completed by the Bidder and submitted as part of his Bid

Table of Forms

1. Letter of Bid

-Note-	*The Bidder must submit the Letter of Bid in its letterhead clearly showing the Bidder's complete name and address.*

Date:.....

Invitation for Bid No.: .....

To: .....

We, the undersigned, declare that:

We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 3;

(a) We offer to execute in conformity with the Bidding Documents the following Works:

Construction of College Building of Indira Gandhi College Of Nursing

(b) The total price of our Bid, excluding any discounts offered in item (d) below is:

.....

The discounts offered and the methodology for their application are:

Our bid shall be valid for a period of 120. . . .*[insert validity period as specified in ITB 13.1]*. . . days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(c) If our bid is accepted, we commit to obtain a performance security in accordance with the Bidding Document;

(d) Our firm, including any subcontractors or suppliers for any part of the Contract, are Nationalities from INDIA in accordance with ITB d.1.

(e) We, including any subcontractors or suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB d.2 ;

(f) We are not participating, as a Bidder in more than one bid in this bidding process in accordance with ITB d.2(e).

(g) Our firm, its affiliates or subsidiaries, including any Sub Contractors or Suppliers for any part of the contract, has not been declared ineligible by Government of Kerala, under the Government of Inda laws or official regulations.

(h) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: [2]

Name of Recipient	Address	Reason	Amount
.....nil.....	.....	.....	.....
Cost of the documents.....	.....	.....	..... .

(i) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed;

(j) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and

(k) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 5 (Employer's Requirements) and our technical proposal, or as otherwise agreed with the Employer.

Name to be filled by
Bidder..... In the capacity of .....
Signed .....
Duly authorized to sign the Bid for and on behalf of
.....
Date .....

2. Bid Security

Bank Guarantee

Bank's Name, and Address of Issuing Branch or Office

Beneficiary: ..... *name and address of Employer* .....

Date: .....

Bid Security No.: .....

We have been informed that . . . . . *name of the Bidder . . . . .* (hereinafter called "the Bidder") has submitted to you its bid dated . . . . . (hereinafter called "the Bid") for the execution of . . . . . *name of Contract* . . . . . under Invitation for Bids No. . . . . (" the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we . . . . . hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *amount in figures* . . . . . (. . . . . *amount in words* . . . . .) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

(a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Bid; or

(b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or

(c) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the performance security, in accordance with the ITB, or (iii) fails or refuses to furnish the domestic preference security, if required.

This guarantee will expire: (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the performance security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful Bidder , upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder; or (ii) twenty eight days (28) after the expiration of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458[1].

. . . . . *Bank's seal and authorized signature(s)* . . . . . .

3.Technical Proposal

Technical Proposal – Personnel

Form PER – 1: Proposed Personnel

Bidder shall provide the details of the proposed personnel and their experience records in the relevant Information Forms below for each candidate:

Position		
Personnel information	Name not applicable	Date of birth
	Professional qualifications	
Present employment	Name of Employer	
	Address of Employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present Employer

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant Technical and Management Experience

4. Technical Proposal - Equipment

Form EQU: Equipment

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 5 (Employer's Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of Equipment not applicable				
Equipment Information	Name of manufacturer			Model and power rating
	Capacity			Year of manufacture
Current Status	Current location			
	Details of current commitments			
Source	Indicate source of the equipment			Specially manufactured
	o Owned	o Rented	o Leased	

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Not applicable	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

5. Technical Proposal – Site Organization

Note: add additional sheets wherever necessary if space is a constraint

6.Technical Proposal – Method Statement

Note: add additional sheets wherever necessary if space is a constraint

7.Technical Proposal – Mobilization Schedule

Note: add additional sheets wherever necessary if space is a constraint

8.Technical Proposal – Construction Schedule

Note: add additional sheets wherever necessary if space is a constraint

9.Bidder's Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder

Bidder's Information	
Bidder's legal name	
Bidder's country of constitution	India
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative	
(name, address, telephone numbers, fax numbers, e-mail address)	
Bidder's Registration No. Date of Registration,	
Date of Expiry with State PWD/CPWD/ BSNL / Indian Railways	
Attached are copies of the following original documents.	
q 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB d.1.	
q 2. Registration Certificate with State PWD/CPWD/ BSNL / Indian Railways	

Specialist Sub Contractor is a specialist enterprise engaged for highly specialized processes which cannot be provided by the main Contractor.

•			
• ,			
•			
•			
•			

11.Form FIN - 2: Average Annual Construction Turnover

The information supplied should be the Annual Turnover of the Bidder in terms of the amounts billed to clients for each year for work in progress or completed.

Annual Turnover Data for the Last …… Years[1] (Construction only)			
Year	**Amount in INR**		
	Average Annual Construction Turnover[2]		

12.Form FIN-3: Availability of Financial Resources

Specify proposed sources of financing, such as liquid assets, lines of credit, and other financial resources (other than any contractual advance payments) available to meet the financial resources requirement indicated in Form FIN-4.

Financial Resources		
No.	**Source of financing**	**Amount in Rupees**
1		
2		
3		

a. Liquid Assets mean cash and cash equivalents, short-term financial instruments, short term available-for-sale securities, marketable securities, trade receivables, short-term financing receivables and other assets that can be converted into cash within one year.

13.Form FIN-4: Financial Resources Requirement

Bidder should provide information indicated below in order to calculate the aggregated financial resources requirement, which equals the sum of: (i) the Bidder's current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued and (ii) financial resources requirement for subject contract as determined by the Employer. Bidder must also disclose any other financial obligations that could materially affect the implementation of subject contract if such contract were to be awarded to the Bidder.

Financial Resources Requirement						
No.	Name of Contract	Employer's Contact (Address, Tel, Fax)	Contract Completion Date	Remaining Contract Period *1* in months (A)	Outstanding Contract Value *2 In Rupees* (B)	Monthly Financial Resources Requirement *3* (B / A)
1						
2						
3						
4						
						INR
A. Cumulative Financial Resources Requirement for Current Contract Commitments						
B. Financial Resources Requirement for Subject Contract (Employer to specify*)						INR 500,00,000 (Five Hundred Lakh only)
Financial Resources Requirement (Sum of A and B)				INR		

Notes:

1 Remaining contract period to be calculated from 28 days prior to bid submission deadline.

2 Remaining Outstanding Contract Values to be calculated from 28 days prior to the bid submission deadline.

3 Bidder should calculate this amount based on the sum of Monthly Financial Resources Requirements for Each Current Works Contract based on the following calculation:

$$\frac{\text{Estimated Contract Value (Inclusive of Taxes and Duties)}}{\text{Completion Period in Months}}$$

Note
* *The Employer shall specify financial resources requirement for the subject contract based on the following calculation:* $\frac{3 \times \text{Estimated Contract Value (Inclusive of Taxes and Duties)}}{\text{Completion Period in Months}}$

14.Form EXP – 1: Contracts of Similar Size and Nature Fill up one (1) form per contract.

Contract of Similar Size and Nature (Completed)										
Name of work	Contract No:	Name of Client	Location	Date of award of work	Completion Date as per contract	Actual date of completion	Estimated cost at the time of award of work	Cost of extra items	Cost at the time of completion	Litigations if any connected with the work

15.Form EXP - 2: Construction Experience in Key Activities Fill up one (1) form per contract

Contract of Similar Size and Nature (Ongoing)										
Name of work	**Contract No:**	**Name of Client**	**Location**	**Date of award of work**	**Completion Date as per contract**	**Executed date of completion**	**Estimated cost at the time of award of work**	**Expected Cost of extra items**	**Expected Cost at the time of completion**	**Litigations if any connected with the work**

Note:

1 *Contractor to submit copies of Work Order, Completion Certificate or any other relevant documents as poof of his claims for meeting the PQ criteria and any other claims mentioned in these forms.*

Secretary

Cochin Co Operative Hospitals Society Ltd No: E 288

Volume II Requirements
Section 5 - Employer's Requirements

This Section contains the Specifications, the Drawings, and supplementary information that describe the Works to be procured, Personnel Requirements and Equipment Requirements.

Table of Contents

1. Specifications:

A. 1 A. CIVILGeneral

All the works in the contract shall be carried out as per CPWD 2009 (Civil), CPWD 2013 (Electrical).
The following additional specifications are provided as Employer's Requirements specific to this project in case of any conflict to these provisions and the CPWD specifications, these provisions shall prevail.

1.1 In case of construction joints, the cost of applying cement slurry over the concrete surface before fresh concrete is laid as per para 5.4.4.4. of CPWD Specification 2009 is included in the relevant items of the Bill of quantities and nothing extra shall be paid on this account.

1.2 Water supply pipe lines shall not be embedded in floor. PVC pipe casing of next bigger diameter shall be provided in full width of wall (including finishing) when GI pipe line crosses the wall, to protect it from corrosion. The gap between the PVC and GI pipes shall be sealed at the ends with poly-sulphide or other suitable sealant. Nothing extra shall be paid on this account.

1.3 Stone slabs for risers and treads of staircases and steps, where specified, shall be of single piece of required width and length. No joint shall be permitted. The holes of required shape and size shall be drilled in the single piece stone slabs of treads for fixing balustrades wherever necessary. Pattern of stone slabs for landings of staircase shall be decided by the Engineer-in-Charge. Nothing extra is payable on this account.

1.4 Stone slabs used for treads of staircase shall be provided with three machine cut grooves of size 3mm wide x 2mm deep, 25 mm apart near the nosing of the steps. Nothing extra is payable on this account.

1.5 To protect the flooring and steps of staircases during construction and until the completion of the work, finished/semi-finished surface of flooring shall be covered with a thick layer of plaster of Paris and this layer shall be maintained in good condition till its removal. The removal of the layer of plaster of Paris and cleaning the surface shall be done as and when decided by the Engineer-in-Charge. After the removal of plaster of Paris and cleaning of the surface, damage, if any, shall have to be made good by the Contractor. No extra payment shall be made for protection with plaster of Paris, removal of plaster of Paris, cleaning and making good the damages.

1.6 The Contractor shall give a performance test of the entire installation (s) as per standing specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the Contractor for the test.

1.7 The steel work in railing includes fish tailing of the section to be embedded in concrete and fixing the same.

1.8 In RCC work, to avoid displacement of reinforcement bars in any direction and to ensure proper cover, only factory made round / square type cover blocks should be used.

1.9 Nothing extra will be paid for centering; shuttering, reinforcement and RCC work for sloped slabs and beams, unless otherwise specified in the item.

1.10 Steel bars shall be stored about 30 to 45 cm above ground and where the storage is for more than 3 months, a coat of cement wash shall be given to the bars. Nothing extra shall be paid towards cost of application of cement wash.

1.11 To facilitate gas connection, holes (if required by the Engineer-in-Charge) including suitable rubber gasket shall be provided in the kitchen platform of RCC slab/granite /marble/ other stone slab etc. Nothing extra will be paid on the account and rates quoted for relevant items are inclusive of making such provision.

1.12 Concrete mixers to be used on the work shall have arrangement for weigh batching and controlling water cement ratio.

1.13 Any cement slurry added over base surface (or) for continuation of concreting for better bond is deemed to have been in built in the items and nothing extra shall be payable nor, extra cement considered in consumption on this account.

B. Quality Assurance

1.14 The proposed project is a prestigious work and quality of work is of paramount importance. Contractor shall have to engage well-experienced skilled labours and deploy modern T&Ps and other equipment in the execution of the work.

1.15 Many items like specialized flooring work, silicon sealant and backer rod fixing in expansion joints, factory made door- window shutters, proper slope maintaining in toilet units, sanitary- water supply installation, water proofing treatment, will specially require engagement of skilled workers having experience particularly in execution of such items.

1.16 The Contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond the set out tolerance limit shall be summarily rejected by the Engineer-in-charge and the Contractor shall be bound to replace / remove such sub-standard / defective work immediately. If any material, even though approved by Engineer-In-Charge is found defective or not conforming to specifications shall be replaced / removed by the Contractor at his own risk & cost.

1.17 In addition to the supervision of work by CDM Smith engineers, Special attention should be paid towards quality of materials, workmanship of execution of required standard and finish, lines and levels internal and external plastering, finish of exposed smooth surface of RCC members by providing fresh shuttering plates, rubberized linings to all the shuttering joints, accurate joinery work in wooden doors and windows, accurate joints in stone/ tiling / cladding work, non-hollowness in floor and dado tiles work, protection of scratches over flooring by providing layer of plaster of Paris, water tight pipe linings, proper joints in brick masonry, proper compaction of filled up earth etc. as per specification to achieve prescribed standards, Quality assurance for the project shall be of paramount importance.

1.18 Third party quality assurance.

The the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288 may decide to engage third party quality assurance system and the Contractor shall render all the necessary assistance and render arrangement for the inspection of work. There shall be minimum two such inspections by Third Parties during the currency of the Contract – (i) on completion of 40% of work, (ii) on completion of 80% of work. The cost on account of third party inspection if any, shall be borne by the Employer.

1.19 The Contractor shall submit, within 15 days after the date of award of work, a detailed and complete method statement for the execution, quality plan including testing and Quality Assurance, of such items of works, as directed by the Engineer-in-Charge.

1.20 All the materials to be used in the work, to make the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per codal specifications as applicable or such specifications / standards as directed by the Engineer-in- Charge. However, keeping the Quality Assurance in mind, the Contractor shall submit, on request from the Engineer-in- Charge, his own Quality Assurance procedures for basic materials and such items, to be followed during the execution of the work, for approval of the Engineer-in-Charge.

1.21 All materials and fittings brought by the Contractor to the site for use shall conform to the specification and the samples approved by the Engineer-in-charge. The Contractor should get the samples of all the materials got approved from the Engineer in charge before bringing the bulk quantity,

which shall be preserved at site of execution till the completion of the work. If a particular brand of material is specified in the item of work in Bill of Quantity, the same shall be used after getting the same approved from Engineer-In-Charge. Wherever brand / quality of material is not specified in the item of work, the Contractor shall submit the samples as per approved list of brand names given in the tender document / particular specifications as per Annexure-II for approval of Engineer-In-Charge. For all other items, materials and fittings of ISI Marked shall be used with the approval of Engineer-In-Charge. Wherever ISI Marked material / fittings are not available, the Contractor shall submit samples of materials / fittings manufactured by firms of repute conforming to relevant specifications or IS codes and use the same only after getting the approval of Engineer-In-Charge.

1.22 The Contractor shall procure and provide all the materials from the manufacturers / suppliers as per the list attached with the tender documents, as per the item description and particular specifications for the work. The equivalent brand for any item shall be permitted to be used in the work, only when the specified make is not available. This is, however, subject to documentary evidence produced by the contactor for non-availability of the brand specified and also subject to independent verification by the Engineer-in-Charge. In exceptional cases, where such approval is required, the decision of Engineer-in-Charge as regards equivalent make of the material shall be final and binding on the Contractor. No claim, whatsoever, of any kind shall be entertained from the Contractor on this account. Nothing extra shall be payable on this account. Also, the material shall be procured only after written approval of the Engineer-in-Charge.

1.23 All materials shall be got checked by the Engineer-in-Charge or his authorized supervisory staff on receipt of the same at site before use.

1.24 To avoid delay, Contractor should submit all samples well in advance so as to give timely orders for procurement.

1.25 The Contractor has to establish field laboratory at site including all necessary equipment for field tests such as cubes, slumps, sieve analysis and any other tests as required by BIS codes of practice (ANNEXURE 6.1). All the relevant and applicable standards and specifications shall be made available by the Contractor at his cost in the field laboratory. The Contractor shall designate one of his technical representatives possessing required qualification and experience as Quality Assurance Engineer, who shall be responsible for carrying out all mandatory field/laboratory tests. The Contractor shall also provide adequate supporting staff at his cost for carrying out field tests, packaging and forwarding of samples for outside laboratory tests and for maintaining test records.

1.26 All the registers of tests carried out at Construction Site or in outside laboratories and all material at site (MAS) registers including cement register shall be maintained by the Contractor which shall be issued to the Contractor by Engineer-in-charge. All the entries in the registers will be made by the designated Engineering Staff of the Contractor and same should be regularly reviewed by Engineer in charge or his authorized representative. Contractor shall be responsible for safe custody of all the registers.

1.27 The Contractor shall at his own cost submit samples of all materials sufficiently in advance and obtain approval of Engineer-in-Charge. The materials to be used in actual execution of the work shall strictly conform to the quality of samples approved by the Engineer-in-Charge and nothing extra shall be paid on this account. The acceptance of any sample or material on inspection shall not be a bar to its subsequent rejection, if found defective.

1.28 The Contractor shall at his cost, make all arrangements and shall provide necessary facilities as the Engineer-in-Charge may require for collecting, preparing, packing, forwarding and transportation of the required number of samples for tests and for analysis at such time and to such places as directed by the Engineer-in-Charge. Nothing extra shall be paid for the above operations including the cost of

materials required for tests and analysis. Testing charges, if any, will be borne by the Employer in case the test passes. In case it fails, the same shall be borne by the Contractor.

1.29 The necessary tests shall be conducted in the laboratory approved by the Engineer-in-Charge. The samples for carrying out all or any of the tests shall be collected by the Engineer-in-charge or on his behalf by any other officer of the Client. The Contractor or his authorized representative shall associate himself in collection, preparation, packing and forwarding of such samples for the prescribed tests and analysis. In case the Contractor or his authorized representative is not present or does not associate him in the aforesaid operation the results of such tests and consequences thereon shall be binding on the Contractor.

1.30 Materials used on work without prior inspection and testing (where testing is necessary) and without approval of the Engineer-in-Charge are liable to be considered unauthorized, defective and not acceptable. The Engineer-in-Charge shall have full powers to require the removal of any or all of the materials brought to site by Contractor which are not in accordance with the contract specifications or do not conform, in character or quality to the samples approved by the Engineer-in-Charge. In case of default on the part of the Contractor in removing rejected materials, the Engineer-in-Charge shall be at liberty to have them removed at the risk and cost of the Contractor.

1.31 A Quality Assurance Plan (QAP) is attached. A model QA Plan has been drawn up and enclosed as Annexure 6.2. The QA plan enclosed is not exhaustive and will be broadened to include all mandatory tests for all materials as processes that are involved in execution of this work. The contractor is therefore bound to carry out all such test that will be require for the execution of work irrespective of whether the same is included in the QA plan or not.

C. Additional Specifications for Cement

1.32 The Contractor shall procure Portland Pozzolana Cement/OPC conforming to IS: 1489 (Part-I) as required in the work, from reputed manufacturers of cement as mentioned in the

1.33 The cement godown of the capacity to store a minimum of 2 months requirement shall be constructed by the Contractor at site of work for which no extra payment shall be made. The Contractor shall be responsible for the watch and ward and safety of the cement go-down. The Contractor shall facilitate the inspection of the cement go-down by the Engineer-in-Charge or his authorized representatives.

1.34 The cement shall be got tested by the Engineer-in-Charge and shall be used on the work only after satisfactory test results have been received. The Contractor shall supply free of charge the cement required for testing including its transportation cost to testing laboratories. The frequency and details of the tests shall be decided by the Engineer-in-Charge depending on the quantum of supply in each batch. The cost of tests shall be borne by the Contractor / Employer in the manner indicated below:

a) By the Contractor, if the results show that the cement does not conform to the relevant BIS codes.

b) By the Employer, if the results show that the cement conforms to relevant BIS codes.

1.35 The actual issue and consumption of cement on work shall be regulated and proper accounts maintained as provided in the contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in the contract and shall be governed by the conditions laid therein. In case the cement consumption is less than theoretical consumption including permissible variation, recovery at rate so prescribed shall be made. In case of excess consumption no adjustment shall be made.

1.36 Cement brought to site and cement remaining unused after completion of work shall not be removed from site without written permission of the Engineer-in-charge.

1.37 Damaged cement shall be removed from the site immediately by the Contractor on receipt of a notice in writing from the Engineer-in-charge. If he does not do so within 3 days of receipt of such notice, the Engineer-in-charge shall get it at the cost of the Contractor.

1.38 The cement bags shall be stacked on proper floors consisting of two layers of dry bricks laid on well consolidated earth at a level of at least one foot above ground. The stacks shall be in rows of 2 and 10 bags high with minimum of 0.6m clear. Bags should be placed horizontally continuous in each line. Actual size / shape of go down shall be as per site requirement and nothing extra shall be paid on this account. The decision of Engineer-in-charge regarding capacity shall be final.

1.39 Cement register for the cement shall be maintained at site. The account of daily receipts and issues of cement shall be maintained in the register in the proforma prescribed and signed daily by Contractor or his authorized agent.

D. Additional Specifications of Steel

1.40 The Contractor shall procure TMT bars of Fe 500D grade from primary producers such as SAIL, Tata Steel Ltd., Jindal Steel & Power Ltd. and JSW Steel Ltd. or any other producer as approved by the Engineer-in-charge who are using iron ore as the basic raw material/input and having crude steel capacity of 2.0 Million tonnes per annum and above.

1.41 In case of non-availability of steel from primary producers the NIT approving authority may permit use of TMT reinforcement bars procured from steel producers having integrated Steel Plants (ISPs) using iron ore as the basic raw material for production of crude steel which is further rolled into finished shapes in-house having crude steel capacity of 0.5 Million tonne per annum and more.

1.42 In case of non-availability of steel from Primary producers as well as the NIT approving authority may also permit use of TMT reinforcement bars procured from secondary producers. In such cases following conditions are to be stipulated in the NIT by NIT approving authority.

a) The grade of the steel such as Fe 500D or other grade to be procured is to be specified as per BIS 1786-2008.

b) The secondary producers must have valid BIS license to produce HSD bars conforming to IS 1786: 2008. In addition to BIS license, the secondary producer must have valid license from either of the firms TEMPCORE, THERMEX, EVCON TURBO & TURBO QUENCH to produce TMT bars.

c) The TMT bars procured from Primary Producers and ISPs shall conform to manufacture's specifications.

d) The TMT bars procured from secondary producers shall conform to the specifications as laid by TEMPCORE, THERMEX, EVCON TURBO & TURBO QUENCH as the case may be.

e) TMT bars procured either from Primary Producers, ISPs or secondary producers, the specifications shall meet the provisions of IS 1786: 2008 pertaining to Fe 500D or other grade of steel as specified in the tender.

1.43 The Contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.

1.44 Samples shall also be taken and got tested by the Engineer-in-charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the Contractor does not conform to the specifications as defined under Para 2.1 above, the same shall stand rejected, and it shall be removed from the site of work by the Contractor at his cost within a week's time of written orders from the Engineer-in-charge to do so.

1.45 The steel reinforcement bars shall be brought to the site in bulk supply of 10 tonnes or more or as decided by the Engineer-in-Charge.

1.46 The steel reinforcement shall be stored by the Contractor at site of work in such a way as to prevent distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

1.47 For checking nominal mass, tensile strength, bend test, re-bend test, etc., specimen of sufficient length shall be cut from each size of the bar at random, and at frequency not less than that specified below:-

Size of bar	**For consignment**	**For consignment**
	below 100 tonnes	**over 100 tonnes**
Under 10mm dia	One sample for each 25 tonnes or part thereof	One sample for each 40 tonnes or part thereof
10 mm to 16mm dia	One sample for each 35 tonnes or part thereof	One sample for each 45 tonnes or part thereof
Over 16 mm dia	One sample for each 45 tonnes or part thereof	One sample for each 50 tonnes or part thereof

1.48 The Contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories. The cost of tests shall be borne by the Contractor

1.49 The steel brought to site and steel remaining unused shall not be removed from site without the written permission of the Engineer-in-Charge.

1.50 The Contractor should submit pre measurement of existing exposed reinforcement to the Engineer-in-charge before taking up any further reinforcement work on the portion and nothing extra shall be paid on this account.

1.51 The standard section weight referred to as standard tables in CPWD specifications 1996 Volume –II to be considered for conversion of length of various sizes of MS bars and High yield strength deformed bars into weight are as under.

Size (Diameter mm)	**Weight in Kg/ Meter**
6	0.222
8	0.395
10	0.617
12	0.888
16	1.579
18	1.999
20	2.467
22	2.985
25	3.855
28	4.836
32	6.316
36	7.994
40	9.869
45	12.49
50	15.424

1.52 For steel, measurement will be regulated on sectional weight basis, weight being calculated with help of the above tables. The weight shall be taken as per actual weight basis if found lower than the standard weight but within tolerance limit as per relevant IS codes. Nothing extra shall be paid for over weight of steel sections than given in the table.

The Contractor has to produce the cash bills to the Engineer in charge as and when he brings the cement and steel to the site.

E. Additional Specifications for RMC and DMC

1.53 The cost of packaging, scaling, transportation, loading, unloading, cost of samples and the testing charges for mix design in all cases shall be borne by the Contractor.

1.54 The various ingredients for mix design / laboratory tests shall be sent to the lab / test houses through the Engineer-in-Charge and the samples of such ingredients sent shall be preserved at site till completion of work or change in Design Mix / Ready Mix whichever is earlier. The sample shall be taken from the approved materials which are proposed to be used in the work.

1.55 For each change of source or quality / characteristic properties of the ingredients during the work, from that approved and used in the concrete mix, a fresh mix design shall be got done by the Contractor . Revised trial mix test shall be conducted and shall be submitted by the Contractor as per the direction of the Engineer-in-Charge.

1.56 The items of RMC and DMC shall be inclusive of all the ingredients including admixtures if required, labour, machinery T&P etc., (except shuttering which will be measured and paid for separately) required for a ready mix concrete of required strength and workability. The rate quoted by the agency shall be net and nothing extra shall be payable on account of change in quantities of concrete ingredients like cement aggregates and admixtures etc., as per the approved mix design.

1.57 Sampling and Testing

Quantity of concrete delivered (cum)	Number of sample
Less than 15	1
16 to 30	2
31 to 50	3
51 and above	Three plus one sample for each additional 30 cum or part thereof.

1.58 Minimum ordinary Portland cement / Portland pozzolana cement for Mix -25 grade concrete shall be 330 kg/m3.

F. Additional Specifications for Batching Plants and Batching Equipment

1.59 Hoppers for weighing cement, mineral admixtures, aggregates and water and chemical admixture shall consist of suitable containers freely suspended from a scale or other suitable load measuring devices and equipped with a suitable discharging mechanism. The method of control of the loading mechanism shall be such that, as the quantity required in the weighing hopper is approached, the material may be added at a controllable rate and shut off precisely within the weighing tolerances specified in Annexure-6.3. The weighing hoppers for cement, mineral admixtures, and aggregate shall be capable of receiving their rated load, without the weighed material coming into contact with the

loading mechanism. The weighing hoppers shall be constructed so as to discharge efficiently and prevent the buildup of materials. A tare adjustment up to 10 percent of the nominal capacity of the weigh scale shall be provided on the weighing mechanism so that the scale can be adjusted to zero at least once each day. Dust seals shall be provided on cement hoppers between the loading mechanism and the weigh hopper, and shall be fitted so as to prevent the emission of cement dust and not to affect weighing accuracy. The hopper shall be vented to permit escape of air without emission of cement dust.

1.60 Vibrators or other attachments, where fitted, shall not affect the accuracy of weighing. There shall be sufficient protection to cement and aggregate weigh hoppers and weighing mechanisms to prevent interference with weighing accuracy by weather conditions or external build-up of materials.

1.61 Where chemical admixture dispensers are used, they shall be capable of measurement within the tolerances in Annexure-6.3 and a calibrated container or weigh scale shall be provided to check the accuracy of measurement at least once a month.

1.62 Each control on the batching console and weigh-dial or display shall be clearly labeled with its function and where concerned with the batching of materials, the material type.

1.63 When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch.

1.64 Where a batch weighing system is utilized to weigh materials a system shall be in place so as to prevent materials being loaded during the process of weighing.

1.65 It is envisaged to use only Ready Mix Concrete (RMC) for all RC concreting works. The RMC plant shall be got approved by the Project Manager. Nevertheless, the Plant from where the concrete is to be delivered shall have QCI certification. Prior approval need to be taken for the supplier from where the RMC is proposed to be delivered. (ULTRATECH, RMC, DURATECH are some of the reputed RMC suppliers)

G. Additional Specifications for Aluminium Work

1.66 Anodized aluminium doors, windows, ventilators and fixed glazing shall be generally as per the architectural drawing and shall be fabricated using aluminium alloy standard extruded sections of "JINDAL", "INDAL", “HINDALCO” or equivalent as approved by the Engineer-in-Charge. Alternatively, the Contractor shall submit the drawings indicating the sections proposed to be used by him and the fixing arrangement for approval. The Engineer-in-Charge shall have the right to reject or modify these drawings before approval and the Contractor is bound to execute the work in accordance with drawings approved by the Engineer-in-Charge.

1.67 Samples of doors, windows and ventilators as per the drawings approved by the Engineer-in-Charge shall be fabricated and got approved by the Engineer-in-Charge before taking up the execution of these items of work.

1.68 The aluminium sections shall be jointed to each other wherever required with extruded aluminium angle cleats of suitable size and of thickness not less than 6mm for doors and 4mm for windows and ventilators with stainless steel screws. Unless otherwise specified all joints shall be mitred.

1.69 Various tests on aluminium sections shall be conducted in accordance with the relevant provisions of IS: 1868 (anodic coatings on aluminium and its alloys) and IS: 5523 (Method of testing anodic coating on aluminium and its alloys).

1.70 The fabricated aluminium frame work shall be given a laquer coating which shall be maintained during the entire period of construction to prevent damage to the anodic coating of aluminium sections. The surface shall be cleaned and polished before handing over the works.

1.71 The doors, windows, ventilators, fixed glazing etc. individually or forming composite unit shall be provided with glazing and paneling as specified with PVC weather sealing gaskets/neoprene felt. Glazing and paneling shall be fixed with aluminium snap beading. The sliding shutters of windows shall be provided with nylon pullers with concealed bearings, aluminium stoppers and special locking arrangements as approved by the Engineer-in-Charge. The interlocking styles of sliding windows shall be provided with PVC/ neoprene weather sealing gaskets. The windows with side hung shutters shall be provided with best quality heavy type anodized aluminium hinges with stainless steel pins/bolts, anodized aluminium peg stays and fasteners of suitable size and shape.

1.72 For the purpose of payment, the weight of each door, window, ventilator, louvered window, fixed glazing etc. individually or forming composite unit shall be the actual weight of extruded aluminium sections, cleat angles and aluminium snap beading excluding the weight of all fittings & fixtures. If the variation between the actual unit weight and unit weight specified in the manufacturer's catalogue is more than +10%, the materials shall be rejected as being substandard. The cost of hinges, locking arrangements, gaskets, stainless steel screws, pins/bolts etc and the wastage of extruded aluminium sections shall be deemed to be included in the agreement rate and nothing extra whatsoever shall be payable. Paneling and glazing shall be paid separately.

H. Additional Specifications for Structural Glazing Facades

The work of structural glazing hereinafter called the 'façade system' include aluminium frame work with specially designed aluminium extrusions for frames, accessories and fixing of solar control glass. The scope of work under the item façade system include, for executing the structural glazing work, the Contractor shall associate with/engage specialist agency/curtain wall fabricator as approved by the Engineer-in-charge.

1.73 Design

a) The Aluminium frames shall be designed to conform to the following:

i. Wind loads as per IS 875 Part III re-affirmed 2003

ii. Deflection restriction of L/175 or max 19mm for a span of 4115mm or L/240 + 6.35 mm for spans greater than 4115mm.

iii. The mullions (vertical members) should not be less than 50mm wide x 125mm deep.

iv. The transoms (horizontal members) should not be less than 50mm wide x 130mm deep.

v. Alloy grade 6061 T6 or 6063 T6 or EN AW-6060 (ALMgSi 0.5 F22) T66 in accordance with DIN EN 573, DIN EN 755 and extrusion tolerance in accordance with EN 12020-2.

b) All fasteners to be 304 grade stainless steel.

c) All anchor bracket design must be coordinated with civil reinforcement layouts.

d) Structural calculations for frame, anchors and fasteners have to be prepared by a qualified structural engineer and shall be approved by the Engineer-in-charge.

e) Shop drawings to be submitted for approval along with the structural calculations and shall be approved by the Engineer in charge.

f) Tag drawings for the fabricated materials must be submitted to the Engineer for reference and verification.

g) All materials are to be tested as per table enclosed.

1.74 Surface Protection:

All internal aluminium frames (mullion and transom) are to be polyester powder coated with a minimum of 60 microns thickness and conforming to AAMA 2604. All external exposed aluminium are to be coated

with Kynar 500 XL or Hylar 5000 resin (polyvinylidene fluoride, PVDF) conforming to AAMA 2605. All steel anchor brackets are to be hot dip galvanized to IS 2629.

1.75 Fabrication

All mullions are to be prepared with "T" cleats in the factory. All transoms are to be stepped on both ends to overlap the mullion. 90° cut ends of the transom is not allowed. Inner glazing EPDM gaskets are to be installed in the transom. Shortening of gaskets before or after glazing would not be acceptable. All anchor brackets must be fabricated in the factory. Anchor brackets shall be aluminium alloy 6061/6063 or steel grade 836 and should be in compliance with the submitted structural calculations. All fabricated material must be tagged in accordance with the Tag drawings. For preparation of doors or vents, all fittings must be installed in the factory. If fittings from different suppliers are used then the Shop drawings are to be reviewed by each fitting supplier for conforming to their application instructions. All aluminium sub frames bonded to glass should have corner cleats and must be Dark bronze anodized or Kynar coated (colour to be same as transom/mullion).

Glass should be bonded to sub frame in the factory under the bonding guidelines stipulated by structural sealant supplier. The sub frame must be assembled with aluminium corner cleats.

1.76 Mobilization

All materials must be protected with low tack tape and securely fastened at the time of transport. All frames must be accompanied with a Tag ID and a tag drawing. Site storage and handling plan along with the schedule of deliveries are to be submitted for approval.

1.77 Installation:

A site survey has to be conducted prior to commencement of anchor bracket installation. All anchor brackets must be in accordance with the structural calculations. Any deviation from the approved structural calculations due to site changes or any other reason must have an approved supplemental structural calculation. Installation of anchor must be in accordance with approved shop drawings. Increase in shims for leveling beyond a thickness of 12mm should be accompanied with structural calculations for check on localized bending stress on anchor bolts. No drilling into reinforcement bar will be allowed. Pull out test for anchor bolts to the concrete structure is to be conducted prior to installation of Glazing on the frame.

All tolerances in floor slab/columns/beams/walls are to be absorbed in the anchor brackets. All fasteners of anchor brackets to the mullion must be in A2 stainless steel. Glazing should commence only after inspection of alignment by the Engineer.

Install 2 number aluminium glass supports per glass unit at a distance of a minimum of 150mm from the center of mullion to center of glass support. This distance must not exceed ¼ of the mullion center to centre. The distance used in the transom dead load structural calculation should match with site installation. Glass setting blocks should be 80 to 90 Shore A durometer hardness. Glass setting block should be of material compatible with the sealant used in the insulating glass or bonding of glass to sub frame.

EPDM gasket seal shall be provided between the transom and mullion at the overlap. Inner glazing EPDM gasket shall be installed on the mullions after cleaning of the mullions and transoms. All mullion/transom gasket intersection shall be sealed with EPDM compatible sealant.

A minimum of 3mm gap is to be present all around glass. A minimum of 13mm glass bite is to be ensured. Glass should be held in place using temporary patch plates, minimum 100mm long. The glass unit with the sub frame should be fixed to the mullion using concealed mechanical cleats. The joint between the glass shall be sealed using a recessed silicone gasket held by a thermal break attached to the mullion. Along the transom the glass shall be held by aluminium pressure plate and EPDM gaskets. The cover cap shall be fixed to the pressure plate using snap fit mechanism.

1.78 Performance

a) Minimum class A2 of EN 12152 for air permeability

b) Minimum class R7 of EN 12154 for water tightness

c) Copy of test report from the manufacturer of the system for testing the air permeability and water tightness conducted in internationally recognized laboratory should be produced by the Contractor.

Handover: The façade must be cleaned and inspected by the Contractor prior to submission to the Engineer for final inspection. A snag list shall be prepared by the Engineer. All items in the snag list should be cleared by the due date mentioned in the snag list.

As built drawings incorporating all approved changes done during the course of installation shall be submitted. A copy of the full set of approved structural calculations with all approved supplemental structural calculations shall also be submitted with the As-built drawings. Operations and Maintenance manual shall be submitted along with the As-built drawings.

1.79 Performance Guarantee

The Contractor shall be solely responsible for the design including shop drawing and performance of the installed structural glazing façade system. The installations shall be guaranteed by the Contractor during the guarantee period for materials used, workmanship, water tightness (wherever specified), structural design, performance requirements and other requirements as given in the specifications. The Contractor shall submit in the enclosed format a written guarantee for the same for a period of 10 years from the date of completion of the work. In addition, the Contractor shall obtain and submit to the Engineer-in-Charge a similar back-to-back guarantee for same duration from the specialist agency/structural glazing fabricator engaged by him/them.

a. The design, fabrication, supply and installation of the system shall be to the best of national/international standards and shall be guaranteed to take the dead loads, wind and seismic loads, storms, air pollution, thermal stresses, building movements and the consequent deflections without compromising the performance characteristics. It shall be water tight, wherever specified and prevent ingress of water/moisture, pollutants etc. Further, the individual members of the structural framing shall be deflect beyond permissible limits as specified.

b. In addition, guarantee for 10 years for all the material used for the structural glazing system and their performances shall be submitted by the Contractor. Besides, the Contractor shall obtain and submit similar back to back guarantees from the specialist agency/structural glazing fabricator and also from the manufacturers/suppliers/processors, as applicable, of various materials to the tune that they conform to the specifications and other criteria as specified herein for:

i. Glass (Single, laminated or IGUs) – substrate, coatings, lamination, assembly for IGUs etc. and that regarding suitability of single soft coated glass in the spandrels.

ii. (ii)Sealants – usage as per requirement of structural design and functional requirements, compatibility with different substrates and sealants, bite size, quality assurance during sealing of IGUs and fixing glass to glass and glass to the aluminium frame, etc.

iii. (iii)EPDM/Silicone gasket – for ozone resistance and other properties are specified etc.

iv. (iv)Aluminium – material quality, tempering requirement, suitability of aluminium grade and anodizing etc.

v. (v)Anchor fasteners – suitability and strength requirement as per manufacturers' specifications etc.

c. The Contractor shall also submit guarantee in the enclosed format for replacement of glass during the guarantee period of 10 years from the date of completion of work. All the Guarantees shall

be submitted before final payment is released after the date of the completion of work and shall not in any way limit any other rights which the Engineer-in-charge may have under the Contract.

d. In addition 2% (two percent) of the cost of all the items under this sub-head, as mentioned in the scope of work under para (1) above, shall be withheld from the bills towards guarantee as specified above. This amount to be withheld towards guarantee, shall be in addition to the other amounts to be withheld as mentioned elsewhere in the contract agreement. However, half of this amount (withheld) would be released after five years from the date of completion of the work, if the performance, as required, is satisfactory. The remaining withheld amount shall be released after 10 years from the date of completion of work, if the performance, as required, is satisfactory. If any defect is noticed during the guarantee period, it shall be rectified by the Contractor within seven days of issue of notice to the Contractor, at least temporarily, to the satisfaction of the Engineer-in-charge, till the permanent rectification of the defects/replacement of defective materials is carried out by the Contractor, in maximum four months period. If not attended to, the same shall be got done by the Engineer-in-charge through other agency at the risk and cost of the Contractor and the cost, which shall be final and binding on the Contractor , shall be recovered from the amount withheld towards the guarantee as mentioned above or any other amount due to the Contractor . In any case, during the guarantee period, the Contractor along with specialist agency/curtain wall fabricator shall inspect and examine the work at least once in every year and make good any defects observed. The Contractor shall submit a written certificate in this regard. A recovery of Rs.10,000/- per year shall be made from the amount, withheld towards guarantee or any other amount due to the Contractor , in event of not fulfilling this provision. However, the amount withheld as guarantee can be released in full, if irrevocable bank guarantee, from a Schedule/Nationalized Banks, of the same amount, for the guarantee period is submitted by the Contractor to the Engineer-in-charge. The defects, if any, shall be rectified in a workmanlike manner, retaining the same aesthetics and other functional parameters of the original work.

I. Additional Specifications for Vacuum Dewatered Concrete Flooring

1.80 This specification defines the material, mixing, placing, curing, and constructional and other performance requirements for VACUUM DEWATERING CONCRETE SYSTEM for concrete floor slab. Any other special requirements shown or noted on the drawings and directed by the Engineer-in-Charge shall govern over the provision of this specification.

Actual work shall be carried out in accordance with this specification and in consultation with specialized firm undertaking the job to suit specific requirement at site such as rise and fall of the floor slab, providing dowels for pedestals etc.

In case of conflict between clauses mentioned in this specification and those in any Indian Standard, this specification shall prevail.

1.81 Water-Cement Ratio:

Water-cement ratio up to 0.65 shall be allowed to obtain better slump & workability. Actual ratio shall be decided with approval of the PMC/Engineer-in-charge. Only measured quantity of water shall be used in the mix.

1.82 Special Requirement:

All works covered by this specification shall be carried out by an experienced agency having sufficient expertise in vacuum dewatering concrete system. Only skilled and experienced operators shall be employed for the purpose. Prior approval of the agency shall be obtained from the Engineer-in-Charge

before starting the work. All the equipment shall be of approved and proven types and suitable for the work involved.

1.83 Concrete Laying:

Concrete laying pattern shall be decided in consultation with the PMC/Engineer-in-Charge and with his approval. The maximum width of a slab strip shall not generally exceed 4 metres and minimum number of construction joints shall be used. Alternate slab strips shall be sequentially laid. Any damage to the already finished top surface shall be avoided. At construction joints no overflow of mortal or slurry on the already hardened surface shall be allowed while concreting the intermediate slab strip. Such construction joints shall be marked with a thread in a straight line while the concrete is still green. Continuity of reinforcement shall be maintained while laying concrete in slab strips. Edges at expansion joints shall be protected and proper arrangement of shear-transfer shall be provided as per standards.

1.84 Concrete Compaction:

After placing concrete in position, it shall be vibrated thoroughly using poker/needle vibrators and thereafter leveled with surface vibrators to produce a homogeneous and smooth concrete surface. In order to achieve a smooth surface, surface vibrators shall be very carefully used by skilled operators. Over vibration resulting in excess mortar near the surface shall be avoided.

1.85 Dewatering:

Suction mats shall be spread over the levelled fresh concrete surface and shall be connected by suction hose to the vacuum pumps for De-watering of surplus water in the concrete. During De-watering it shall be ensured that no cement/cement slurry is pumped out.

1.86 Floating & Troweling:

This shall be done after De-watering by using skim floater (power floater). After this, surface shall be troweled with minimum two passes of power trowel to achieve a wear resistant surface.

1.87 Approach Working Platform & Form Work:

The Contractor shall arrange approaches, scaffolding, working platforms etc. for carrying out the entire operation safely and in a work-man-like manner. The working area shall be neatly maintained and all the facilities required by the Engineer-in-Charge for proper supervision of the work shall be provided.

1.88 Treating Construction Joints

6mm wide groove shall cut with mechanical saw true to line upto 1/4th depth of the concrete thickness. The grove shall be cleaned by air blower. Approved grade of pre molded polysulphide sealant shall be filled in the cleaned grove up to 10 mm depth with a backing rod below and allowed to cure before any movement over the joints.

1.89 Testing of Finished Floor:

Contractor shall arrange for core cutting and testing of finished concrete over and above other field tests. Number of test samples and testing procedures shall be as described for RCC work.

1.90 Measurement

The work shall be measured in area of the flooring (sqm). The rate shall include vacuum dewatering, cutting of grove, providing baker rod, polysulphide sealant etc. all complete as required for the complete item of work. The reinforcement used shall be measured and paid separately.

1. B. Electrical

GENERAL SCOPE OF ELECTRICAL INSTALLATION WORK

1.91 SCOPE

This specification details the broad guidelines for supply, receive, store, erect, testing and commissioning of all the equipments required for the Electrical Installation. The Contractor shall furnish

all the materials, labour, tools and equipments for the electrical works, as shown in the accompanying drawings and in the bill of quantities and specifications hereinafter described and execute the works as directed by the Engineer-in-charge and completed to their entire satisfaction.

1.92 CONTRACTOR

The Contractor shall be a licensed Class One or 'A' class HT Electrical Contractor, possessing a valid Electrical Contractor's license in the State, employing licensed supervisors and skilled workers having valid permits as per the Regulation of Indian Electricity Rules and Local Electrical Inspectors requirements. He should have executed electrical works of this magnitude earlier and shall have qualified engineers to produce execution drawings and to supervise the work at site.

1.93 DETAILED SCOPE OF WORK

Supply of various equipment, unloading, receiving inspection, storing, transportation to work site, handling, assembling, cleaning, mechanical erection, chipping of foundations, installation, alignment, testing and commissioning and handing over in working condition of all items covered below but not limited to it.

Power tapping from KSEB system.

11 KV – HV cabling, & terminations.

11 KV Switch Gears

11 KV/433V – 200 KVA Transformer

Metering Panels, L.V.cables, cable terminations, cable trays.

Small power installation.

Lighting installation

External area lighting system.

Earthing and bonding installation.

Liaison with KSEB & KSEI authorities for Power supplies & Installation Approvals.

Residual Design, Detailed Engineering, co-ordination with clients, consultants and other Contractor s

Any other items specified in Bill of Quantities.

Minor civil works like drilling and punching holes and openings in concrete floors, slabs, chasing of brick walls, fabrication of supporting structures, drainage of water from cable trenches, cleaning and clearing of all debris due to electrical installation.

Excavation, scaffolding, back filling for direct burial of cables and earthing conductors as applicable.

Preparation of execution drawings and as built in drawings.

Coordination with other Contractor s with regard to installation of items in Electrical Contractor s scope.

The extent of work services under the contract include all items shown on the drawings, indicated in companion with specifications, notwithstanding the fact that such items have been omitted from the price schedule. All equipments and services which are required to complete the intent of the contract shall also be deemed to be within the scope of the contract.

After receiving/inspections of not only the materials supplied by him but also those supplied by the Owner, shall be reported to the Engineer-in-charge with his comments.

1.94 MATERIALS

The materials listed under "APPROVED MAKE" only shall be used. All materials, equipments, fittings, etc. used in the installation shall conform to the latest relevant IS. In case of materials for which standard specifications do not exist, the material shall be got approved by the Engineer-in-charge before start of work.

1.95 CODE, REGULATIONS AND STANDARDS

The installation shall conform in all respects to Indian Standard Code of Practice for Electrical Wiring Installation I.S.732 1982. It shall also be in conformity with the current Indian Electricity Rules Safety

Codes and the Regulations and requirements of the Local Electrical Supply Authority. Wherever this specification calls for a higher standard of materials and/or workmanship then those required by any of the above regulations, this specification shall take precedence over the said regulations and standards. In general, the materials, equipments and workmanship not covered by the above shall conform to Indian Standards (latest), unless otherwise called for. Nothing in the enclosed specification shall be construed to relieve the Contractor of this responsibility.

1.96 DRAWINGS

The drawings, specifications and bill of quantities shall be considered as a part of this contract and any work or materials shown on the drawings and not called for in the specifications or vice versa, shall be executed as if specifically called for in both. The contract drawings indicated the extent and general arrangement of various equipment and their wiring, etc. and are essentially diagrammatic. The drawings broadly suggest the routes to be followed. The work shall be installed as indicated on the drawings. However, any minor change if found essential to coordinate the installation of this work with other trades shall be made without any additional cost to the Owners. The drawings and specifications are for the assistance and guidance of the Contractor only and the exact location, distances and levels, etc. will be governed by the site conditions.

The Contractor shall examine all Architectural, Structural, Plumbing and Sanitary, Air Conditioning and Electrical drawings before starting the work and prepare execution drawings containing all details mentioned under. These drawings will be approved by Engineer-in-charge. Any discrepancies which in his opinion appear on them have to be reported to the Engineer-in-charge and get them clarified. He shall not be entitled to any extras, for omissions or defects in electrical drawings or when they conflict with other work.

1.97 SUBMISSIONS

AS BUILT DRAWINGS / OPERATION AND MAINTENANCE MANUALS / INSPECTION AND TEST REPORT:

The Contractor shall submit three complete sets of drawings with updated details as per site conditions. Operation and maintenance manual with ITP properly documented shall be submitted in two sets for all equipments supplied and erected by the Contractor.

NOTE: Failing to comply with the above, will result in withholding the release of the retention money, and any other payments due to the Contractor, and issue of virtual completion certificate.

1.98 SITE ENGINEER

The Contractor shall employ a competent, licensed qualified full time electrical Engineer to direct the work of electrical installations in accordance with the drawings and specifications. The Engineer shall be available at all times on the site to receive instructions from the Engineer-in-Charge in the day to day activities throughout the duration of the contract. The Engineer shall correlate the progress of the work in conjunction with all the relevant requirements of the supply authority. The skilled workers employed for the work should have requisite qualifications and should possess competency certificate from the Electrical Inspectorate of Local Administration.

APPLICATION FOR POWER SUPPLY, FEES, PERMITS, TESTS AND INSPECTION / APPROVAL BY LOCAL AUTHORITIES:

The Contractor shall be responsible for filing and follow up of application for getting the drawings/scheme approved by the Electrical Inspector and finally the whole installation shall be got approved by the Electrical Inspector. The Contractor shall pay all fees and the same shall be reimbursed by the Owners at actuals on submission of receipts, on completion of this work, the Contractor shall

obtain and deliver to the Engineer-in-Charge certificate of final inspection and approval by the Local Electrical supply authority. The Engineer-in-Charge shall have full powers to require the materials or works to be tested by an independent agency at the Electrical Contractor s expenses in order to establish their soundness and adequacy.

1.99 GENERAL SCOPE

The Contractor shall furnish all tools, welding equipment testing equipment, test connections and kits, etc. required for complete installation, testing and commissioning of the items included in the contract work.

The rates quoted by Contractor shall include all necessary MS channels, angles, etc. required for erection of panels, distribution boards, etc. in floor / walls/ cable trenches as required.

The work shall be carried out strictly as per the instructions and execution drawings. In case of any doubt/misunderstanding as to correct interpretation of the drawings or instructions, necessary clarifications shall be obtained from the Engineer-in-charge. This Contractor shall be held responsible for any damage to the equipment consequent to not following the Manufacturer's instructions correctly. All necessary drawings, Manufacturer's equipment manuals shall be furnished to the owners and a copy to Architects.

All thefts of equipments/component parts, after take over by the Contractor, till the installation is handed over to the Owner, shall be make good by the Contractor.

The Contractor shall have a separate cleaning gang to clean all equipment under erection and as well as the work area at regular intervals to the satisfaction of the Engineer-in-charge. In case the cleaning is not to the Owner's satisfaction he will have the right to carry out the cleaning operations and any expenditure incurred by the Owner in this regard will be to the Contractor’s account.

In order to avoid hazards to personnel moving around the equipment such as switchgear, etc., which is kept, charged after installation before commissioning, such equipment shall be suitably cordoned off to prevent anyone accidentally going near it.

The Contractor shall carry out touch up painting on any equipment indicated by the Engineer-in-charge, if the finish paint on the equipment is soiled or marred during installation handling.

Equipment shall be installed in a professional manner so that it is novel, plumb, square and properly aligned and oriented. No equipment shall be permanently bolted down to foundation or structure until the alignment has been, checked and found acceptable by the Engineer-in-charge.

1.100 TOOLS, TACKLES AND OTHER MATERIALS

The Contractor shall also furnish all necessary consumables like anchor bolts and nuts, rawl plugs, hacksaw blades, taps, dies, drills, files, wire brushes, necessary pipe scaffolding, ladders, wooden and consumable material like oxygen, acetylene, greases, cleaning fluids, fasteners, gaskets, temporary supports, cotton waste and all other miscellaneous supplies of every kind required for carrying out the work under the contract.

The Contractor shall not dispose off transport or withdraw any tools, tackles, equipment and material provided by him for the contract without taking prior written approval from Engineer-in-charge. Engineer-in-charge at all times shall have right to refuse permission for disposal, transport or withdrawal of tools, tackles, equipment and material if in his opinion, the same will adversely affect the efficient and expeditious completion of the project.

1.101 TESTING AND COMMISSIONING

All checks and tests as per the Manufacturer's drawings / manuals relevant code of installation and commissioning for various types of equipments shall be carried out by the Contractor as part of installation work.

High voltage testing by voltage boosters, relay calibration by secondary injection and meter calibration have to be carried out at site by authorized agencies before commissioning.
The Owner may ask for such additional tests on site as in his opinion are necessary to determine that the works comply with the specifications, Manufacturer's guarantee / instructions or the applicable code of installation. The Contractor shall carry out such additional tests also.
The Owner's authorized representative shall be present during every test as called for by the Owner. The Contractor shall record all test values and furnish the required copies of the test data to the Owner. Electrical circuits and equipments shall be energized or used at nominal operating voltage only after such reports have been accepted as satisfactory by the Owner.

1.102 HANDING OVER AND TAKING OVER OF WORKS/EQUIPMENT/SYSTEMS

The Contractor shall hand over and the Owner shall take over the works / equipments / systems covered under this contract only after they have been completely installed, tested and commissioned in all respects by the Contractor to the entire satisfaction of the Engineer-in-charge and after the said operation. And all relevant test forms / certificates operation and maintenance manual's, as built drawings, etc. Incomplete/partly commissioned works / equipments / system will not be taken over by the Owner. In this regard, the decision of the Engineer-in-charge will be final and binding on the Contractor.

1.103 SAMPLES

The Contractor shall submit two sets of samples of accessories and apparatus proposed to used in the installation to the Engineer-in-charge along with execution for approval. Drawings of samples as required, shall be submitted by the Contractor and this specification shall not be departed from without the written instructions from the Engineer-in-charge. The verbal approval given by the Engineer-in-charge to any drawings or samples submitted by the Contractor shall in no way exonerate the Contractor from their liability to carry out the work in accordance with the forms of contract.

1.104 CHANGE IN QUANTITY

Purchaser reserves the right to amend the quantities to be supplied and erected as necessary and for any such amendments the unit rates offered by Contractor shall apply.

1.105 ACTUAL QUANTITIES

The Contractor shall verify the exact quantities of materials/equipments cables, etc., required after site measurements as per execution drawings by the engineer before procuring the same.

SPECIFICATION FOR LOW TENSION CABLES

1.106 SCOPE

This specification covers the technical requirements of supply, laying, testing and commissioning of Heavy duty medium voltage cables up to 1100 Volts for power, control and lighting application for efficient and trouble free operation.
The cable shall be properly packed for transportation, supply and delivery at site.

1.107 CODE AND STANDARDS

The materials covered by this specification shall unless otherwise stated as designed, constructed, manufactured and tested in accordance with latest revisions of the relevant Indian Standards.

IS 1554 (Part I) 1988	:	PVC insulated cables for working voltages up to and including 1000 V.
IS 5831 1984	:	PVC insulation & sheath of electric cables.
IS 8130 1984	:	Conductors for insulated electrical cables.

IS 3961 (Part II) 1977 : Recommended current ratings for PVC insulated and PVC sheathed heavy duty cables.

1.108 RATING

The cable shall be rated for a voltage rating of 1100 Volts.

1.109 SELECTION OF CABLES:

Cables should be selected considering the conditions of maximum connected load, ambient temperature, grouping factor, allowance for voltage drops. However it is the responsibility of the Contractor to recheck the sizes before cables are procured. He should submit the cable derating, voltage drop and length calculation to Engineer-in-charge for approval before procuring cables.

1.110 INSULATION:

The conductor is insulated with suitably compounded PVC applied to the conductor by the extrusion.

The PVC compound used for insulation shall have reduced flame propagation property. This shall also have reduced emission of hydrogen chloride gas fumes etc. when severely overheated during fires.

1.111 CORE IDENTIFICATION:

The cores of the cables shall be provided with the colour scheme of PVC insulation as per IS for any easy identification.

1.112 ARMOURING:

The armoring of multicore cable consists of either GI round steel wires or GI flat strips and in case of single core cable armouring shall be of non magnetic material such as hard drawn aluminium or aluminium alloy wires or strips.

1.113 OUTER SHEATH:

The PVC compound used for outer sheath shall be resistant to termites, fungus and rodent attacks and shall also have reduced flame propagation property as specified above.

1.114 IDENTIFICATION:

The manufacturer's name, voltage grade of cable, year of manufacture, nominal cross sectional area of conductor shall be embossed on the outer sheath of the cables throughout the length of the cable at regular intervals.

1.115 PACKING, MARKING AND TRANSPORT:

The cables shall be supplied in strong, non returnable wooden drums of heavy construction.

Each cable drum is marked with particulars of cable size, voltage class, length, direction of rolling, position of outer gross weight, ISI certification marking etc.

STORING, LAYING, JOINTING AND TERMINATIONS:

1.116 STORING:

All the cables shall be supplied in drums, on receipt of cables at site, the cables shall be inspected and stored in drums with flanges of the cable drum in vertical position.

Engineer-in-charge will inspect the cables before storing. Contractor shall take out samples from the drums as per their instructions and send them to the manufacturers to conduct the approval tests. After the receipt of the test analysis, the cable will be accepted by the Engineer-in-charge.

1.117 LAYING:

Cables shall be laid as per the specification given below:

Cables in Outdoor Trenches:

Cables shall be laid in outdoor trenches wherever called for. The depth of the trenches shall not be less than 75 cms. from the Formed Ground Level (FGL) which has to be ascertained from the Engineer-in-charge. The width of the trenches shall not be less than 45 cms. A spacing of not less than the cable

diameter shall be allowed between the cables. The trenches shall be cut square with vertical sidewalls and with uniform depth. Suitable shoring and propping may be done to avoid caving in of trench walls. The floor of the trench shall be rammed level. Cable unreeling from drums shall be done only with the help of cable drum rolling supports. The cables shall be laid in trenches over the rollers placed inside the trench. The cable drum shall be rolled in the direction of the arrow for rolling. Wherever cables are bent, the minimum bending radius shall not be less than 12 times the diameter of the cable. 15 cms thick layer of sand cushioning to be provided free of stones and pebbles. Cable shall be taken lifted and placed over this and cushion. The cable shall then be covered with a 15 cms thick sand cushion, where cable is laid in rocky situation. Extra thick cushioning of sand as may be required/decided by the Engineer-in-charge shall be done without extra charge. Over this, a course of cable protection tiles or brick shall be provided to cover the cables by 5 cms on either side. Unless otherwise specified, the cable shall be protected by concrete tiles/stone slabs of minimum 25 mm thick placed on top of the trench breadthwise for the full length of the cable. Trench shall be back filled with earth and consolidated. Cables shall be laid in hume pipes at all road crossings and in GI pipes / PVC pipes at the wall entries. Approved cable markers made of concrete blocks indicating the voltage grade and the direction of run of the cables shall be installed at regular intervals of 25 Mtrs. The depth of concrete blocks shall be atleast 300 mm below ground and 50 mm above ground.

Cables in Indoor Trenches:

Cables shall be laid in indoor trenches wherever specified. Suitable painted MS base plate clamps, saddles, GI nuts/bolts or alternatively UV resistant tie wraps shall be used for securing the cables in position at an interval not more than 450 mm. Spacing between the cables shall not be less than 15 mm center to center. Wherever specified, trenches shall be filled with fine sand and covered with steel chequered trench covers or RCC slabs.

All chases and passage if necessary for the laying of service cables at the entry or of premises shall have to be cut and made good to the satisfaction of the Engineer-in-charge.

All cables entries into the buildings / cable trenches / ducts, etc. shall be suitably sealed as required by the Engineer-in-charge without extra cost.

1.118 JOINTING AND END TERMINATIONS:

Cable jointing shall be done as per the recommendations of the cable manufacturer. Jointing shall be done by qualified cable jointer under strict supervision. Sample crimping of different size cables shall be subjected to contact resistance and heating tests in the presence of the Engineer-in-charge.

Each termination shall be carried out using Electroplated Brass double compression glands and copper cable sockets and approved jointing materials are to be used. Hydraulic crimping tool shall be used for making the end termination's. Cable gland shall be bonded to the earth by using suitable copper wire with earth tag's. The cable armoring is to be earthed properly so that the earth continuity is maintained. All outdoor terminations shall be provided with PVC shroud's to make them water vermin proof.

1.119 TESTING:

Cables shall be tested at factory as per the regulations of IS: 1554 Part I. The tests shall incorporate routine tests, type tests and acceptance tests. Copy of such test certificates shall be furnished to the Owner.

Cables shall be tested at site after installation and results shall be submitted to Engineer-in-charge.

Insulation resistance between conductors and neutral and conductors and earth.

SPECIFICATION FOR CABLE TRAYS

1.120 SCOPE :

1.121 TRAYS MADE OUT OF MS ANGLES, FLATS ETC.

This specification covers the design, supply, fabrication fixing, aligning, and painting of cable trays and other steel frame works at site as required.
The cable trays shall be designed and fabricated out of various sections such as M.S angles, flats, channels etc. and got approved by Engineer-in-charge.
Before fabrication the MS sections shall be properly straightened, aligned, cleaned properly to remove rust if any.
All materials used for fabrication of cable trays shall conform to IS 226 and fabrication shall be as per IS : 800.
After fabrication the cable trays, and accessories shall be free from sharp edges, corners, burrs and unevenness, and a coat of cold phosphating chemical shall be applied followed by a coat of red oxide primer.

The cable trays shall be welded to the mounting supports which in turn are either welded to plate inserts or grouted to structural members.
Plate inserts for cable tray mounting supports shall be supplied by the Electrical Contractor wherever the same are to be inserted in RCC by the Civil Contractor.
Cable trays shall either run in cable trenches or run overhead and supported from available structure.
Minimum clearance between the top most tray tier and structural member shall be 300 mm.
The type and size of tray to be used shall be as required.
Each continuous length of cable tray shall be earthed at minimum two places.
All hardware's such as passivated bolts, nuts, washers, and other consumable required for the fabrication and erection shall be included in the rate quoted by Contractor. However, if any grip / Anchor bolts or fasteners are required, the same shall be paid extra.
The cable trays, accessories, covers etc. shall be painted with two coats of red oxide primer followed by two finishing synthetic enamel paint of approved shade. Where any cuts or holes are made or welding is done on finished steel work, the same shall be sealed against oxidation by red oxide primer followed by finished paint.

1.122 TRAYS MADE OUT OF GI SHEET.

Cable trays shall be made of 2mm thick, perforated, galvanised sheet steel. Sizes shall be 300mm or 150mm wide as applicable and 75mm high.
Trays shall be supported at every 1500mm intervals when run under slung from slab / beam or run along wall / structure.
Supports shall comprise of M.S angles of sizes denoted in the relevant layout drawings. The support steel sections shall be applied one coat of red oxide primer and two coats of finish paint of approved color.
Cable trays shall be earthed at every 15-meter intervals or through an earthing conductor run along its route length, as shown in the layout drawings.
Trays shall be bolted to the support steel members. Supports shall be derived from building structure by anchor fasteners,

SPECIFICATION FOR EARTHING SYSTEM

1.123 SCOPE

This specification covers the requirements of supply, installation, testing and commissioning of earthing systems. The work shall be carried out in accordance with relevant layout drawings, typical drawings and installation notes etc. All metal conduits, cable sheathes, switchgear, distribution boards, light fixtures, fan and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes.

1.124 CODES AND STANDARDS

The earthing systems shall comply with all currently applicable standards, regulations and safety codes of the locality where the installation is to be carried out. Nothing in this specification shall be construed to relieve the Contractor of this responsibility.

The installation work shall conform to the latest applicable Electricity Rules, Relevant Indian Standards and Codes of Practices as follows:

IS 3043 Code of Practice for Earthing.

IS 732 Electrical Wiring Installation.

IS 3975 Galvanized round steel wire.

Indian Electricity Rules 32, 61, 67 and 68 of IER 1956.

1.125 EARTHING ELECTRODES

Earthing electrodes shall be designed as per the requirements of IS 3043. The resistance of earth electrodes shall be as low as possible, the maximum allowable value being one Ohm.

Earth electrodes shall be as far as possible embedded below permanent moisture level. Earth pits shall be further treated with salt and charcoal to improve the soil resistivity. In rocky areas where the required earth resistance cannot be attained using the standard earth electrode. Configuration then application of deep well earth pits should be examined.

1.126 PLATE ELECTRODE

Plate electrodes shall be made of copper plate of 3.15 mm thick and 600 x 600 mm size. The plate shall be buried vertically in ground at a depth of not less than 2.5 Mtrs. to the top of the plate, the plate being encased in powdered charcoal to a thickness of 15 Cms. allround. Salt and river sand shall not be used. Earth leads to the electrode shall be laid in a medium grade GI pipe and connected to the plate electrode with brass bolts, nuts and washers. The GI pipe of 19 mm dia. shall be placed vertically over the plate and terminated in a funnel of 5 Cms above the ground. The funnel shall be enclosed in masonry precast chamber. The chamber shall be provided with CI frame and CI cover. The earth station shall also be provided with a suitable permanent identification label / tag.

1.127 PIPE ELECTRODE

Pipe electrode shall comprise of 100 mm dia. class 'C' GI pipe with wall thickness 3.65 mm and not less than 3.0 mtrs long buried vertically in a pit of 350x350 mm size and filled with alternate layers of charcoal, salt and river sand and connected at the top to a medium grade GI pipe of 19 mm dia, 1 mtr long with a funnel at the other end, clamped to the pipe electrode with brass bolts, nuts and washers. GI pipe electrodes shall be cut tapered at the bottom and provided with holes of 12 mm dia. drilled not less than 75mm from each other upto 2 Mtrs, length from bottom. The top end of the pipe shall be threaded and provided with G.I cap. A hole shall be provided at 100 mm from the top end to receive a 13 mm bolt with double nuts and washers. The funnel and the earth lead connections shall be enclosed in a 450x450mm masonry chamber / inspection pit. The chamber shall be provided with C.I frame and C.I cover. A proper permanent identification tag / label / earth cable marker shall be provided for each electrode.

Safe Earthing: Also chemical earthing of Ashlok or equivalent is not acceptable

EARTHING SYSTEM

1.128 GENERAL

Each installation shall have one common earth grid connected to atleast two groups of earth electrodes. The earth grid shall extend throughout the installation in the form of a ring circuit with branch connections to the equipment and structures to be earthed.

1.129 EARTHING CABLES AND CONNECTIONS :

Earth systems shall be of solid copper / galvanized flats type, of cross-section specified on the relevant design earth layout drawing.

Connections between earth electrodes and main ring earth conductors shall be executed in accordance with Electrical Drawings and in such a way as to facilitate the inspection and testing the earth resistance of each individual earth electrode group without disconnection of the earth system main ring.
All uninsulated parts of earth conductors shall be suitably protected against direct contact with the soil to prevent electrolytic corrosion. This may be achieved by lap wrapping bared sections with green PVC adhesive tape.
All earthing termination's shall be made with compression type cable lugs. Interconnections shall be directly clamped with compression type branch connectors as detailed in Electrical Drawings.
Execution of earth cable branch connection by means of exothermic welding shall require the approval of The Company Site Representative, who will take into account the suitability of the welding equipment and the previous experience of the Contractor's personnel.
The resistance between each earth electrode configuration and the general mass of earth shall not exceed 5 ohms when isolated from the main earth grid.
Location of earth electrodes, earth conductors connections and earth cable routes shown on the installation earth layout drawing shall be considered as diagramatic only, and site inspection shall be necessary to determine earth connection onto equipment's locations and conductor routes prior to installation.

Within buildings, strips of high conductivity copper / GI, sized in accordance with the layout earthing design drawing, should be utilized.
Where copper tape or cable is fixed to building structure it shall be by means of purpose made saddles. Fixings shall be made using purpose made lugs and clamps.
Fixings requiring drilling of holes through stripes shall be used, considering the effective cross-section of the particular run is within relevant regulations.
Where tape or cable is run in the ground or fixed externally, and is liable to corrosion, it shall be wrapped with corrosion-resistant material. Alternatively, PVC wrapped tape or cable may be used.
Joints in copper tape shall be tinned before assembly, riveted with a minimum of two rivets, and sweated solid.
Where holes are drilled in the earth tape for connection to items of equipment, effective cross-sectional area of connections shall be not less than required to comply with the relevant Regulations.
Bolts, nuts and washers for any fixings of earth tape shall be of high-tensible grade.

1.130 ELECTRICAL EQUIPMENT

Metallic enclosures of all electrical equipment shall be earthed at two ends by connection to the common earth grid.
Cross-sectional area of the equipment earth connections shall be in accordance with the earth layout design drawing.

1.131 NON-ELECTRICAL EQUIPMENT

All metallic equipment used for storage, processing, transportation or pumping flammable liquids, vapours or gases, and their associated supporting structure or skid, shall be electrically bonded to the installation main earth ring.
Electrical bonding of associated metal work, in handrails, walkways, etc., is not necessary if it is demonstrated by testing that they are electrically continuous with the structure. However, the same shall be bonded to earth at one point.
Piping which is not in electrical contact with its associated tank or vessel, such as an open discharge line into a tank, shall be bonded to the tank.

In installations that do not contain electrical equipment, the resistance between each earth electrode configuration and the general mass of earth shall not exceed 5 ohms when isolated from the main earth grid.

1.132 BONDING

Metal sheaths and armour of all cables operating at low voltage, metal conduits, ducting, trunking, and protective conductors associated with such cables, which might otherwise come into contact with adjacent fixed metalwork, shall be effectively either segregated from, or bonded to, adjacent metal work. Metallic sheaths and / or non-magnetic armour of all single-core cables in the same circuit normally shall be bonded together at one end only of their run (solid bonding) unless specified otherwise.

All interior metal, water and gas piping shall be bonded together and made electrically continuous. Non-conductive coatings (such as paint, lacquer and enamel) on equipment to be earthed shall be removed from threads and other contact surfaces to ensure good electrical continuity.

SPECIFICATION FOR SUPPLY & INSTALLATION H.T CABLES

1.133 SCOPE

This specification covers the technical requirements of design, manufacture, test and supply of 3 core HT cable complete for efficient and trouble free operation.

The cables have to be procured directly from the manufacturers. Invoices for the cables shall be produced to Engineer-in-charge for conducting the receive inspection.

The laying, testing and commissioning of cable at site shall be done by Electrical Contractor.

The cables shall be properly packed for transportation, supply and delivery at site.

1.134 STANDARDS

The materials covered by this specification shall unless otherwise stated, as designed, constructed and tested in accordance with latest revisions of the relevant Indian Standards.

IS : 692 1973 Paper insulated sheathed cables.
IS : 8130 1976 Conductors for Insulated Electric Cables and Flexible Cords.
IS : 3975 1979 Mild Steel wires, strips and tapes for armouring of Cables.
IS : 3961 1967 Recommended current rating for cables.
IS : 1255 1967 Code of Practice for installation and maintenance of paper insulated power cables (upto and including 33 KV).
IS : 7098 1973 XLPE Cables.
Part II

1.135 RATING

The conductors shall be made from E1 critical grade high conductivity aluminium wires of Stranded type to form sector shaped conductor. The conductors shall conform to IS 8130 1976 (amended upto date).

1.136 CURRENT RATINGS

The continues current ratings of the cables shall be based on the following conditions:

a) Maximum conductor temperature	65 C	
b) Ambient Air temperature	-	50 C
c) Ground Temperature		30 C
d) Thermal resistivity of soil		150 C cm/w
e) Depth of laying	900 mm	

1.137 SHORT CIRCUIT RATING

The short circuit rating for the duration of short circuit as one second shall be as per IS 692 1973 (up-to-date) and based on the following :

a) Maximum conductor temperature 65 C under full load condition.

b) Maximum permissible temperature 160 C of conductor during short circuit.

1.138 TESTING AND INSPECTION

Tests shall be carried out at manufacturer's works under his care and expense.

The cables shall be subjected to 'Routine Tests' i.e conductor resistance at 20 C and A.C voltage test as per relevant IS.

Type test certificates and results as per IS 692 shall be furnished.

6 copies each of the above test certificates shall be submitted to the Owners.

1.139 PACKING, MARKING AND TRANSPORT

The cables shall be supplied on strong wooden drums of suitable size barrel diameter. The inner end of the cable shall protrude out from the drums flange and is fully protected against any mechanical damage and effectively sealed against increase of moisture with heat shrink end caps. The drum is overall lagged with wooden battens and steel straps.

Each cable drum is marked with particulars of cable size, voltage class, length, direction of rolling, position of outer end, gross weight ISI certification mark.

1.140 HIGH TENSION CABLES

HT cables shall be laid in trenches or ducts unless otherwise specified. Generally, laying, jointing and commissioning shall be as per regulations of local authorities.

CABLE INSTALLATION

1.141 Storing

On receipt of HT cables at site, cables shall be inspected to detect any damage. The ends of cable shall be in sealed condition. After inspection, cable shall be located in a proper place with battens of cable drums being replaced. The cable drums shall not be stored 'on flat' with flanges horizontal. Owners /Consultants / Architects will inspect the cables before storing. Contractor shall take out samples from the drums as per their instructions and send them to the manufacturers to conduct the approval tests. After the receipt of the test analysis, the cable will be accepted by the Owner.

1.142 Cables and Cable Entries

Particular attention is drawn to the Contractor's responsibilities in safeguarding cables installed in outdoor locations and unfinished buildings. Such equipment is particularly vulnerable to damage from water and dust penetration. The Contractor shall ensure that cables are adequately protected in this respect while installation work is proceeding. covers temporarily removed from trenches / entries for purpose of installation shall be reassembled on completion of the Work and replaced when such Work is suspended or otherwise left incomplete. Similarly, all entries shall at times be effectively sealed against ingress of water and dust, eg., Duct entries shall be sealed by the insertion of proprietary stopper plugs or approved means.

1.143 Handling of Cables

Storage & handling of cable before and during installation shall be executed with regard to Manufacturers recommendations. Cable drums shall be rotated only in the direction indicated on the drum, and open ends of cable shall be effectively sealed after cutting to prevent ingress of moisture, using heat shrink end caps.

1.144 Cable Pulling

Armoured cables shall be installed with the aid of specifically manufactured rollers, in order to prevent damage to outer sheaths. Cables up to 38 mm diameter shall be installed by hand. However, larger

cables, with the approval of the Company Site Representative, may be installed with the assistance of a winch. Any such winch shall be equipped with a suitable tensioning device and indicator, and operated by a competent operator.
Cable shall never be installed directly from a drum mounted on a moving vehicle.
Drum jacks, cable rollers and other equipment shall be of the correct type for the cable being installed.

1.145 Cable Bending

At all times utmost care shall be exercised to prevent excessive bending or twisting of cable during installation.
Changes in direction in cable trenches, racks or trays shall provide for a minimum cable bending radius of twelve times the overall cable diameter.

1.146 Cable Jointing

Cables shall be run in continuous unbroken lengths. Any requirement for cable jointing shall be executed only with the approval of the Company Site Representative.
All cable jointing shall be executed by fully trained tradesmen who have passed an approved course of instruction in such work for the operating voltage level concerned. Written confirmation in this respect shall be furnished to the Company Representative by the Contractor.

1.147 Protection from Moisture

Each cable system shall be installed either where it will not be exposed to rain, dripping water, steam, condensed water, etc., or be of a type designed to withstand such exposure.
In damp situations and wherever they are exposed to weather, all metal sheaths and armour of cables, metal conduit, ducts, ducting trunking clips and their fixings, shall be of corrosion-resistant material or finish, and shall not be placed in contact with other metal with which they are liable to generate electrolytic action.
For conductors insulated with impregnated paper, exposed conductor & insulation at termination's and cable joints shall be protected from ingress of moisture by being suitably sealed.

1.148 Cable Termination

All work on the termination of cables shall be executed by fully trained & competent tradesmen who have passed an approved course of instruction in such work for the operating voltage level concerned. Written confirmation in this respect shall be furnished to The Company Site Representative by the Contractor.
Within terminal boxes, an adequate length of cable tail shall be provided to enable each cable core to be connected to any terminal, in accordance with the approved method of termination for each equipment.
For multicore terminal / junction boxes, an adequate length of cable tail shall be left to allow for remaking and termination of each core, i.e. a 25mm diameter loop prior to entry of cable core into each terminal.

All connections at a cable termination shall be mechanically & electrically sound and shall be protected against mechanical damage or any vibration liable to occur. They shall not impose any appreciable mechanical strain on fixing of the connection and shall not cause any harmful mechanical damage to the cable conductor or equipment. Conductors of cables shall be terminated in a manner suitable for the terminal arrangement of the equipment concerned.
Prior to final connection, all cable shall be checked for continuity and insulation resistance and correct installation.
The appropriate check sheets shall be complete by the Contractor and accepted by The Company Site Representative, prior to final connection.

1.149 Glands, Seals and Shrouds

The entire body of a cable shall enter a gland, & the outer sheath of a cable shall not be removed before entering the weatherproof seal. Cable shall be on a straight axis from a point immediately before entering a gland.

Cable glands shall securely retain the cable without damage to the outer sheath or armour.

Glands shall be correctly sized and of a type suitable for installation in each respective type of enclosure.

All glands shall be correctly sized and of a type which will maintain the integrity of the equipment within into which they are to be installed. Such factors as use of insulated plastic enclosure and explosion proof type protection shall be taken into account when selecting glands.

All mechanical glands shall be of the hexagon double compression type, knurled type glands shall not be used.

Earth continuity of brass glands & termination's shall be achieved by rigid clamping of armour within each gland and intimate contact between threaded components of glands and equipment.

Brass glands terminating in unthreaded enclosures shall be provided with earth continuity by attachment of earth continuity bonds.

Terminations of mineral insulated cable shall be provided with sleeves having a temperature rating equal to that of the seals.

Cores of sheathed cables, from which the sheath has been removed, and non-sheathed cables at termination's of conduit, ducting or trunking, shall be enclosed according to the design specification.

1.150 Terminal Connecting Lugs

Cable tails of conductors of 10 Sqm and above shall be fitted with compression-type terminal connection lugs, using tools specially designed for use with such lugs.

At all terminal connections, cable conductors shall be fitted with correctly sized cable sockets of the crimped compression type. Soldered connections shall be employed only where their use is unavoidable. Solder used shall have a melting point of not less than 185 Deg.C, and cable lugs or thimbles shall be the correct type and size for each conductor. Packing of oversized lugs shall not be permitted.

Compression joints shall be made using proprietary sets of lugs and indent dies, correctly sized and shaped for each specified conductor concerned. Use of mixed lugs and dies of different manufacture or systems shall not be permitted.

1.151 Sealing of Cable Transits

Openings made or provided in or through building walls, floors, etc., shall be effectively sealed.

Cable entries into trenches (in switch rooms, etc) shall be effectively sealed after cables have been laid.

Unused cable entries and cable entries in equipment also shall be effectively sealed.

Openings through roofs and external walls shall be made weatherproof, including installation of flashing and / or rainhoods to prevent the entry of driving rain, seepage of water, dust, etc.

1.152 Single-Core Cables

Each set of single-core cables comprising a three-phase circuit shall be run close together in trefoil formation.

All cable gland mounting plates for single-core cables shall be inspected to ensure they are non-magnetic material.

When installed in ducts, each trefoil group shall be installed in a single duct.

1.153 Cable Supports

Every cable and conductor used as fixed wiring shall be supported in such a way that it is not exposed to undue mechanical strain and so that there is no appreciable mechanical strain on the termination's

of the conductor. Account shall be taken of the mechanical strain imposed by the supported mass of the cable or conductor.
Conduit, ducting and trunking shall be properly supported and of a type that is either suitable for any risk of mechanical damage which may be met in normal conditions of service, or adequately protected against such damage.
Installation shall take into account longitudinal expansion and contraction that may occur with variation of temperature under normal operating conditions.
UNDERGROUND CABLES
1.154 General Requirements
All excavation, cable protection, backfilling and surface restoration and installation of cable markers, protection tiles and warning tape shall be in accordance with the Electrical drawings.
Construction of cable trenches, their bedding and backfilling shall be executed in accordance with Electrical Drawings.
Where excavations are required near footings, foundations, concrete floors, etc. earthwork under and in the vicinity of these excavations shall not be disturbed and all backfill shall be well consolidated.
Installation shall be so arranged that all trenches are excavated and backfilled in a minimum period of time, care shall be taken to ensure that all cable's. For a particular route are made available at site, before trenches are excavated.
When planning the excavation sequence for cable trenches, the Contractor shall take care to not obstruct access.
Adequate safety precautions shall be observed at all excavations by the provision of safety barriers, warning notices, shoring, etc.
Cables installed under roads shall be in accordance with the Electrical Drawings. An additional number of pipes, 3 to 5, depending on space, shall be installed at normal cable laying depth to accommodate future cables.
Cables to be installed in underground ducts, conduits or pipes, shall be of a type that incorporates a sheath and/or armour, suitably resistant to any mechanical damage likely to be caused during drawing in.
Physical separation between HV, LV, telecoms and instrument cables laid within the same cable trench shall be in accordance with Electrical Drawings.
Underground cable routes shall avoid close proximity to pipe crossings and parallel pipe runs. Physical separation between cables and pipes shall be not less than 300 mm and cables should cross underneath pipes.
If a cable route is in close proximity to underground pipes carrying hot liquids or gases, or which are regularly steam cleaned, the pipe shall be insulated in order to limit its outside temperature to a maximum of 60 Deg.C. In these cases cables may be run above pipes.
Buried cables shall be identified with their full cable numbers, as detailed on the cable schedule, at both termination points. Cable number shall be embossed on a metallic strip and installed on cables using proprietary cable ties. Sample of which shall be approved before use.
Cable route and cable joint markers shall be installed visibly at ground surface level in accordance with the Electrical drawings.
When cable routing is not definitely indicated on a design layout drawing, the Contractor shall submit full details of his proposed routing to The Company Site Representative for approval. Routing details shall be shown clearly on the Contractor's working drawings.
1.155 Cable Installation

Installation of direct buried cables shall not be commenced until the entire route has been excavated and prepared ready to receive the cable.
If cable is left exposed above ground, it shall be coiled and suitably protected against damage. Alternatively, such cable may be left on the drum which shall be lowered from its jacks and firmly anchored.
Laying patterns, as indicated on the layout drawings, shall be adhered to.
Unavoidable crossings shall be made either in the cable cellar directly underneath the corresponding switchgear panel, or at the branching-off point of a particular cable from the main trench. Care shall be exercised to keep the whole installation tidy in these areas.
Ends of hard-floored cable trenches, ducts or pipes shall slope down into surrounding soil, to avoid cable damage following possible settling of soil.

ABOVE GROUND

1.156 General Requirements

Cable shall be laid on racks or trays in accordance with laying patterns indicated on layout drawings.
All cable outlets from a duct system, all joints in a duct system, and all joints between such a system and another type of ducting or conduit shall be formed so that joints are mechanically sound. During cable pulling cables shall not be damaged.
Spacing between cable racks, trays, or cable ladders, and structures, wall or columns, shall be atleast 50 mm.
Metal parts of cable racks and trays shall be bonded between each section, and connected to the common earth grid.
Cables shall be fixed to cable racks and trays by proprietary ties, straps and / or clamps where indicated on the layout drawings and as specified in the design specification. The cable ties, straps and clamps shall be capable of retaining the cables during short circuit stresses, and if nylon / plastic ties are used they shall be UV-resistant.
Where cables, conduits, ducts or trucking pass through fire-resistant structural elements such as walls and floors designated as fire barriers, openings made shall be sealed according to the appropriate degree of fire resistance. In addition, where cables, conduits or conductors are installed in channels, ducts, trunking, or shafts that pass through such elements, suitable internal fire-resistant barriers shall be provided to prevent spread of fire.
Enclosure for conductors and their joints / termination's which are subjected to dust conditions shall be protected to IP 54 (refer to IEC 79)
Cables shall not be installed on exterior wall faces of buildings, ceilings or support structures without the specific approval of The Company Site Representative. Spacing between cable and structure or similar shall be at least 10 mm.
For horizontal runs of cable on structures, cables shall be adequately cleaned such that no sags occur in cabling.
All cables shall be supported by saddles, cleats or other supports as indicated on the layout drawings such that no mechanical forces are imposed on cable glands.
Cable saddles shall be double-fixing. Half-section saddles shall not be used. Fixing of saddles by means of explosive tools shall not be permitted.
Cleats shall firmly clamp cable without distorting or damaging cable.
Cables sheathed with rubber, PVC or equal, may be supported by a catenary wire, either continuously bound to supported cable or attached at intervals. For cables supported by a catenary wire incorporated in accordance with minimum heights indicated on the layout drawings.

For spans without intermediate supports, terminal supports, terminal supports shall be arranged so that undue strain is not placed on conductors or insulation of cable. Adequate precautions shall be taken against any risk of chafing of cable sheath. Minimum specified height above ground and length of spans shall be in accordance with the layout drawings.

1.157 Testing :

Cables shall be tested at site as follows:

Before shifting of cables drums from the yard to the site, insulation resistance shall be carried out on the cable and readings recorded in the presence of the Site Representative.

On cable being laid prior to sand bedding an I.R. shall conducted and recorded in the presence of the Site Representative.

On the cable trench route being completed and compassion done an I.R shall be conducted and recorded in the presence to the Site Representative.

No backfilling of trenches shall be done till the trench / sand padding / cable's are inspected and tested.

Before end terminations are made an I.R shall be conducted to ensure the cable is in order.

On termination's being completed prior to connecting to the equipment. The following test shall be conducted.

An I.R. done on the cable / Termination.

Cable / term subject to a pressure test for 15 minutes. The voltage to be applied shall be as per manufacturer's recommendations and in co-ordination with Engineer-in-Charge /Consultants.

An I.R. Done on completion of the above Hi pot test and compared to Item (8.16.1).

All tests shall be done and recorded in the presence of the Site Representative of the Engineer-in-Charge.

1.158 TECHNICAL SPECIFICATION FOR 11KV INDOOR / OUTDOOR SWITCHGEAR PANEL

This shall be Metal Enclosed Outdoor /Indoor type units. The panel shall be manufactured and fully type tested according to IEC 60298 standards.

The design of the switchgear shall be exclusive and specific responsibility of supplier and shall comply with current good engineering practice, the relevant codes and recommendation, the project specific requirements.

The electrical switchgears and the relevant equipment shall be designed, manufactured and tested according to the latest version of:

IEC 60694 Common specifications for high-voltage switchgear and controlgear standards

IEC 60298 A.C. metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 72kV and the IEC Code herein referred

IEC 60129 Alternating current disconnectors (isolators) and earthing switches

IEC 60529 Classification of degrees of protection provided by enclosures

IEC 60265 High-voltage switches-Part 1: Switches for rated voltages above 1kV and less than 52 kV

IEC 60420 High-voltage alternating current switch-fuse combinations

IEC 60185 Current transformers

IEC 60186 Voltage transformers

IEC 60255 Electrical relays

The design of the switchgear shall be based on safety to personnel and equipment during operation and maintenance, reliability of service, ease of maintenance, mechanical protection of equipment, interchangeability of equipment and ready addition of future loads.

The switchgear and controlgear shall be suitable for continuous operation under the basic service conditions indicated below. Installation shall be in normal out door conditions in accordance with IEC 60694.

Design ambient temperature 50 deg
Relative humidity up to 95%
Altitude of installation up to 1000m, IEC 60120
The overall design of the switchgear shall be such that front access only is required. It shall be possible to erect the switchboard against a substation wall, with HV and LV cables being terminated and accessible from the front.
The units shall be constructed from 3 mm thick stainless steel sheets. The design of the units shall be such that no permanent or harmful distortion occurs either when being lifted by eyebolts or when moved into position by rollers.
The cubicle shall have a pressure relief device. In the rare case of an internal arc, the high pressure caused by the arc will release it, and the hot gases is allowed to be exhausted out at the bottom of the cubicle. A controlled direction of flow of the hot gas should be achieved.
The switchgear should have the minimum degree of protection (in accordance with IEC 60529)
- IP 67 for the tank with high voltage components
- IP 2X for the front covers of the mechanism
- IP 3X for the cable connection covers
- IP 54 for the outdoor

SPECIFICATION FOR ERECTION, TESTING & COMMISSIONING OF 11 kV SWITCHGEAR BREAKER PANELS

1.159 SCOPE

Unloading, Inspection, Storage, Installation, Testing & Commissioning of Switchgear shall be in accordance with (IS latest edition) and manufacturers instruction.

1.160 HANDLING:

Switchgears and all its accessories shall be handled carefully in its upright position as indicated in the packing case. Lifting lugs and jacking pads shall be used for lifting of the switchgear, while using jacking pads utmost care shall be taken in proper application of jacks. Where switchgear is dragged or pulled on sleepers or rollers, traction eyes provided at the bottom frame shall be used with suitable wire ropes and shackles.

1.161 STORAGE

Equipment shall be stored under shelter in a well-ventilated dry place and covered by suitable polythene or tarpaulin covers for protection against moisture. Where excess moisture / damp conditions prevail, and storage is for longer durations. Space heaters provided shall be energized temporarily.

1.162 General Requirements

Environment within the switch room shall be kept to acceptable limits to allow equipment storage and installation to take place without damage.
Under no circumstances shall any item of equipment be forced. Every fit will have been checked in the Manufacturer's works and if force is required the equipment shall be rechecked, realigned and the necessary corrective action taken until force is not required.
Only the correct size and type of tools shall be used in the erection of switchgear.
Should finish paint chip off or crinkle during transit/handling installation, the Contractor shall arrange for repainting the equipment at site at his own cost.

1.163 Foundations and Positions

Baseplates for switchgear shall be installed before final screeding of the switchroom floor. Panels shall be installed over a trench.
Switch room floor screeding shall be completed and levelled before switchgear is brought into the substation and installed.

Floor fixings shall be checked to ensure that they are level, in the correct position to match the fixings of the switchgear, and in accordance with dimensions given on the drawings. Correct clearances and also location of cables inlet / outlet shall be checked in relation to trenches holes through slabs, ducts, etc.

1.164 Installation

Before installation starts switch room floor shall be clean and tidy.

Installation of switchgear shall be executed in accordance with the Vendor's specifications approved by the Engineer-in-Charge.

Only nuts, bolts and washers supplied with switchgear shall be used for bolting switchgear, busbars, etc.

The center section shall be installed first (in its final position), such that when the complete switchboard is finally erected, correct clearances are obtained.

The center section shall be checked to ensure that it is vertical.

The center section shall be kept as flush to the floor as possible. It shall, if possible, be in direct contact with the fixing channel, so allowing any out-of-level flooring to be evenly spread over the whole length of the switchboard. Initially, fixing bolts shall be hand-tight only.

Before placing each section, checks shall be made for any items such as bushings, taps, wires, links, packing, etc., that need to be threaded or inserted, before placing of the adjacent section, ensuring that such items are not tightened.

Final placing of sections to either side of the center section shall be undertaken alternately, with leveling and shimming as necessary.

Serial numbers of each unit shall be checked against arrangement drawings to ensure that each section occupies its correct position.

Bolts shall be placed through each side panel and hand-tightened accurately, ensuring lining-up the switchboard until the whole switchboard is installed.

Each section shall be bolted, and tight, to the fixing channel.

Fixing bolts shall be used in every position that has been provided for them.

Busbar contact surfaces and tee-off connector surfaces shall be checked to ensure that they are clean on both sides.

After cleaning, faces shall be wiped with a clean rag to remove all dust, particular care shall be taken to keep metal dust from busbar insulation.

Starting at the center section and working outwards in each direction, floor fixing bolts shall be tightened on each unit in turn, taking up even pressure on each bolts.

As each panel is complete, checks shall be made to confirm that it is perfectly vertical. All units shall be complete in this manner. Between fixing of sections, busbars and insulators shall be checked to ensure that no strain is placed on them.

Following tightening of each section, alignment shall be checked to ensure that all with drawable units can be inserted and withdrawn. All doors shall be checked for proper operation.

Working from the center, each pair of side panels shall be tightened together. All buses and earth connection shall be tightened.

Working from the center section, busbars shall be tightened and insulators checked.

Positioning and tightening of busbars shall be such that no strain is placed on insulators, tee-off connectors, etc. and busbars are correctly aligned.

All extraneous material, objects, etc. shall be removed from the busbar chamber and busbar covers replaced.

1.165 Earthing and Bonding

Switchboard shall be earthed and bonded in accordance with the earthing layout design drawings, the Manufacturer's instructions.

1.166 Instruments and Relays

Any instruments or relays supplied loose with switchboards shall be fitted, and connected in accordance with the vendor's diagrams.

All relays shall be cleaned of dust, and shall have all packing and shipping stops removed. Compressed Air shall not be used to clean internal relay parts.

Before any loose items are fitted they shall be checked against the drawings to ensure that they are fitted in the correct position on the correct section.

1.167 Wiring

Switchboard will be completely internally wired in the Manufacturer's works, but all internal inter panel wiring shall be done at site, they shall be connected in accordance with the wiring diagrams.

When loose items of equipment have been fixed, they shall be connected in accordance with the wiring diagrams.

1.168 TESTS:

The following preliminary checks and pre-commissioning tests shall be carried out before commissioning the Switchgears in the presence of representative of the Engineer-in-Charge.

Preliminary Checks:

Check nameplate details according to specification.

Check for physical damage.

Check tightness of all bolts, clamps and connecting terminals.

Check earth connection.

Check cleanliness of insulators and bushings, arc chambers.

Check all moving parts are properly cleaned and lubricated.

Check space heaters provided.

Pre-commissioning Checks:

Check control wiring for correctness of connections, continuity and IR values.

Operation of Switches

Check on CTs / PTs Polarity / ratio.

High voltage tests on Control and Power Circuits.

TECHNICAL SPECIFICATION OF TRANSFORMERS

1.169 SCOPE:

Unloading, Inspection, storage, installation, testing and commissioning of transformers shall be in accordance with IS 1886 (Latest Edition), and manufacturer's instructions.

Whenever stated, transformers will be delivered without oil, filled with inert gas and without bushings and externally mounted accessories as applicable. The Contractor shall arrange for oil filtration before filling. If necessary, the oil filtration equipment shall be arranged by the Contractor.

Provide wedges / clamps to rigidly station all transformers on rails.

Connect up the transformers terminals.

Lay and terminate the Owner's cables / conduits between all the accessories mounted on the transformer, marshaling Kiosk, etc…

Care shall be taken during handling of insulation oil to prevent ingress of moisture or foreign matter. In the testing, circulating, filtering or otherwise handling of oil, rubber hoses shall not be used. Circulation of filtering of oil, the heating of oil by regulated short circuit current during drying runs and sampling

and testing of oil shall be in accordance with the manufacturer's instructions and specified Code of Practice.

1.170 HANDLING

Transformers and all its accessories shall be handled carefully in its upright position as indicated in the packing case. Lifting lugs and jacking pads shall be used for lifting of the transformer. While using jacking pads utmost care shall be taken in proper application of jacks. Where transformer is dragged or pulled on sleeper or rollers, traction eyes provided at the bottom frame shall be used with suitable wire ropes and shackles.

1.171 STORAGE

Transformer shall be stored under shelter in a place free from fire and explosion hazards. Care should be taken to see that moisture will not contaminate Oil inside the tank by checking all gaskets, bolts and nuts and accessories.

1.172 CABLING AND EARTHING

Cable shall be terminated at cable boxes only after IR value are measured and found to be in order. Neutral of the transformer shall be connected to two separate and distinct earth station through double run of earth tapes of suitable size. Where REF provided for Transformer Protection, C.T. Supplied loose shall be mounted in the transformer LV Box (Neutral) or a suitable weather proof box shall be mounted externally, as advised and the CT mounted in it. Either of the above shall be carried out as mentioned on the working drawings. The body of the transformer shall also be provided with effective earthing as per the drawings and specifications.

1.173 MOUNTING AND ERECTION

The transformer shall be lifted by lugs or shackles or by any other suitable means (such as dragging on rollers) and mounted on the concrete plinth prepared for the purpose. Care shall be taken to see that transformer is not tilted during lifting and erection of transformer. The roller shall be checked to prevent movement of the transformer after being positioned on the plinth. Adequate and necessary clearance from walls, other equipments, etc. shall be provided as indicated on the drawings.

All the accessories and parts such as conservator tank buchholz relay, breather, explosion vent, thermometer etc. should be mounted on the transformer. Tighten all bolts and nuts and check for any leakage. Leakage's if any shall be rectified.

Check the oil level and top it up if necessary with new oil. Dielectric strength of oil shall be tested as per IS/BS specifications, with an electric gap of 4 mm + or 0.02 mm polished electrodes of 12.5 mm dia using three samples of oil drawn from the oil drain valve of the transformer. The test voltage shall be raised from 5 KV to 50 KV in about 10 seconds. Atleast two samples of oil must withstand 40 KV voltage for one minute. Each drum of oil being used for topping up shall be tested before being used.

The insulation resistance of the winding shall be measured with 5 kV/1kV DC megger and results shall correspond to the factory test results.

If dielectric strength of oil is not as per the requirement, the drying of oil shall be done with the help of suitable streamline oil treatment plant. While drying of oil is being done, the transformer shall be provided with suitable lagging all round. The temperature of oil in the spray tank shall not exceed 80 C during the purification process. After treatment, the oil must conform to the conditions laid down in IS Specifications.

Phasing out test with 415 Volts applied to HV winding and voltage across LV winding being checked.

Measurement of neutral and body earth resistance with earth testing megger shall be carried out. The values shall not exceed 1 to 2 ohms as required.

Functioning of buchholz relay (for alarm & trip), thermometer, and oil level indicator shall be checked and adjusted, if necessary. The transformer shall be charged only after the above tests are conducted

and approvals of the local authorities are obtained. The earthing of neutral and body of the transformer shall be done as per I.E. regulations and requirements of local authorities.

The Contractor shall supply all the materials and labour for unloading, storing, erection and commissioning of transformers.

1.174 TESTS

The following preliminary checks and precommissioning tests shall be carried out before commissioning the transformers.

PRELIMINARY CHECKS

Compare nameplates details with the specifications.

Check for any physical damage, in particular of bushings/Oil Leaks.

Check tightness of all bolts, nuts, clamps, gasketting and connecting terminals.

Check cleanliness of bushings.

Check for oil leakage and oil level.

Breather condition, check whether breathing line is free, silica gel is reactivated; oil is available at the bottom.

Check for clearances, particularly in case of bus ducts.

Water tightness of terminal boxes and bus ducts.

Earthing of transformer tank and neutral bushing.

Check that the transformer is correctly installed with reference to its HV/LV Terminals.

PRECOMMISSIONING TESTS:

RATIO, POLARITY AND PHASE RELATIONSHIP:

Check ratio on all taps and between all the windings, and compare with the values indicated in the test report.

Check polarity and interface connection.

1.175 WINDING RESISTANCE :

Check winding resistance's at normal tap, and for other tap positions record the readings separately.

HV Winding :	
i) Phase 1U	ohm
ii) Phase 1V	ohm
iii) Phase 1W	ohm
LV Winding :	
i) Phase 2U	ohm
ii) Phase 2V	ohm
iii) Phase 2W	ohm

Ambient Temperature : Deg.C

1.176 INSULATION RESISTANCE:

Check insulation resistance between windings and between windings and earth.

i) Between HV windings and LV winding	meg ohms
ii) Between HV windings and earth	meg ohms
iii) Between LV winding and earth	meg ohms
Maximum voltage generated by megger	Volts
Maximum range of megger scale (before infinity)	megohms

1.177 MAGNETISING CURRENT AND IRON LOSS:

Check magnetizing current and iron loss and compare with the values indicated in the test report.

1.178 OIL:

Check dielectric strength of oil before filtration.

i) Main tank (top)	kV
ii) Main tank (bottom)	kV
iii) Conservator	kV
iv) Radiators	kV

1.179 Magnetic Oil Gauge :

Check for free movement of float mechanism of the oil level gauge.

Check proper functioning of low oil level alarm circuit.

1.180 Oil Temperature Indicator:

Check that the pointers are not locked.

Check alarm contacts and set at the required temperature.

Check trip contacts and set at the required temperature.

1.181 Winding Temperature Indicator:

Check that the pointers are not locked.

Check alarm contacts and set at the required temperature

Check trip contacts and set at the required temperature.

Check resistors in WT1 box, resistance valve as per test certificate, and proper connections.

1.182 Dehydrating Breather:

Check that the colour of the silica gel is blue

Check oil content in bottom sealing cup

1.183 Bushings Terminals:

Check whether line connections are properly done.

Check that cables used for cable termination's are of correct size and that all cable connections and joints are properly done.

Check air release from bushings.
Check that the bushing surface is clean and dry.

1.184 Marshaling Box.

Check for proper connections from various accessories to the marshaling box
Check control panels for proper connections

1.185 GENERAL CHECKS:

Check that the transformer is properly installed and there is no possibility of any movement during operation
Check whether earthing connections have been properly done.
Check whether all radiator valves and valves in the feed pipes between main tank and their respective conservators are open, while all drain, filter and sampling valves are closed.
Check whether oil is at the proper level in the:
Transformer tank
Conservator
Check that no air pockets are left in the tank.
Check that all thermometer pockets are filled with oil
Check heaters wherever provided in marshaling box, cubicles, etc.
I.R. Values
Rating and Voltage
Connection's made proper and tested

1.186 DATA SHEET FOR TRANSFORMERS

Sl. No.	Particulars	11 KV / 433 V
1.1	Ratings	200 KVA
1.2	Winding Materials	Copper.
2.0	Service	Outdoor.
3.0	Type of cooling	ONAN
4.0	Temp. rise above 50 Deg. Ambient	
4.1	In oil by thermometer	50 Deg. C.
4.2	In winding by resistance	55 Deg. C.
5.0	No. of phase & cycle	3 Phase 50 Hz.
6.0	Winding per phase	Two.
7.0	Fault level on HV System	350 MVA
8.0	Rated Voltage (Line to Line)	
8.1	H.V.	11000 Volts.
8.2	L.V.	433 Volts.
9.0	Basic Impulse Level	28 / 75 kV Peak.
10.0	Inter phase Connection	
10.1	H.V / L.V	Delta/Star.
11.0	Vector Group reference	Dyn 11.
12.0	Type of tap.	Off Circuit Load Tap changer.
13.0	Tap Changer %	+ 5.%, - 10%
14.0	Tap step voltage	2.5 %
15.0	System Grounding	Solidly grounded on LV side.
16.0	Terminal Arrangement:	

16.1	H.V.	Cable end box (outdoor) to receive 1R x 3C 95 Sq mm XLPE
16.2	L.V.	2 runs of 3.5c 120sqmm
17.0	Neutral Terminal:	
17.1	H.V.	Nil.
17.2	L.V.	Outside for earthing.
17.3	Neutral C.T. For REFR	Yes
18.0	External painting	Epoxy coated.
19.0	Accessories:	

Transformers of above ratings shall be supplied with the accessories as per schedule of each transformer but not necessarily limited to it.

19.1 Oil filling hole with plug/cover Tank/Conservator.
19.2 Conservator with sump and drain valve with plug/cover.
19.3 Oil level indicator with minimum and filling level markings.
19.4 Thermometer Pockets: 1 No.
19.5 Air release plug on tank cover.
19.6 Lifting lugs and jacking lugs.
19.7 Top filter value: 1 No.
19.8 Dehydrating breather with silica gel and oil seal and connecting pipes.
19.9 On load tap changer.
19.10 Rating and terminal marking plate in Stainless Steel.
19.11 2 Nos. earthing terminals with lugs.
19.12 Drain cum bottom filter valve.
19.13 Base channel with towing holes/lugs.
19.14 Double diaphragm explosion vent with sight glass.
19.15 Bi directional flat rollers.
19.16 150mm dial type oil temperature indicator with maximum reading pointer.
19.17 First filling of transformer oil.
19.18 Winding Temperature indicator. Inspection cover.
19.19 Air release hole with plug on radiators
19.20 Single gland cable box suitable for 1 No 3C 95 Sq mm XLPE, 11 kV cables with air insulated disconnecting chamber (HV Terminals)
19.21 LV box suitable for 2R x 3.5 C x 120 Sq mm XLPE/ cable..
19.22 Marshalling box to house OTI / WTI with double compression glands duly wired up from accessories to the box.

1.187 TECHNICAL PARTICULARS TO BE FURNISHED BY BIDDERS FOR TRANSFORMERS

Sl. No.	Description	200 KVA 11 kV / 433V
1.	Name of Manufacturer	:
2.	Rated kVA	:
3.	Type of Cooling	:
4.	Vector Group Reference	:
5.	No load voltage ratio on all tapes	:
6.	Power factor on existing current at 100% 100% voltage at 50 CPS.	:
7.	Iron losses at 50 Hz and 100% rated Voltage.	:
8.	Copper losses (at 75 Deg. C) at rated full load.	:
9.	Resistance voltage (kVA at 75 Deg. C in %)	:
10.	Reactance voltage (kVA at 75 Deg. C in %).	:
11.	Impedance voltage (kVA at 75 Deg. C In %)	:
12.	Zero phase sequence impedance	:
13.	Resistance of windings 75 Deg. C	:
	a) H.V. per phase	:
	b) L.V. per phase	:
14.	Regulation % at	
	a) Full load: Unity PF	:
	0.8 PF (Lag)	:
	b) 3/4 Load: Unity PF	:
	0.8 PF (Lag)	:
	c) 1/2 Load: Unity PF	:
	0.8 PF (Lag)	:
15.	WEIGHTS:	
	a. Weight of core & windings	:
	b. Tank with fittings	:
	c. Oil	:
	d. Total Weight	:
	e. Quantity of oil for complete filling:	
	1. For Transformer	:
	2. For OLTC Chamber	:
	f. Total dimension of Transformer	:
	L x B x H	:
16.	Whether transformer conforms to specification and data sheet, If not, list out the deviations	:
17.	Whether accessories tools and spares	:

as specified included. If not please specify deviations.

18. Whether all technical catalogs furnished. :

MAIN L.V. SWITCH GEAR

1.188 GENERAL

The main switchgear shall be factory built and housed within a totally enclosed sheet steel, cubicle type FORM 3B assembly and be dust and vermin proof and specially treated for anti-corrosion. The switchboard shall be arranged for front and rear access and bottom entry and in accordance with IS-375, IS-4247 and components shall be to the following Indian Standards

All necessary test certificates (routine/type) shall be provided by the supplier for approval

IS-5082	Bus bars and Bus bar connections
IS-375&2147	Electric power switchgear and associated apparatus
IS 2208	HRC fuses
IS –722	direct acting electrical indicating instruments
IS-732-1963	Electrical wiring installation (voltage not exceeding 650V)
IS 2032-1969	Graphical symbol used in Electro technology Part XI
IS 1646-1961	Fire safety of buildings (general)
IS 694-1964	PVC insulated cables
IS 1554-1964	PVC insulated cables (heavy duty)
IS-1087	6A tumbler switches
IS-2120	16A tumbles switches
IS-1293	3 pin plugs & sockets
IS-1753-1967	Aluminium conductors for insulated cables
IS 3961-1967	recommended current ratings for cables
IS-1255-1967	Installations & maintenance of paper insulated power cables
IS-3043-1966	Earthing
IS 1653-1964	Rigid steel conduits for electrical wiring
IS-2667-1964	Fittings
IS-3480-1966	Flexible steel conduits for wiring
IS-3887-1966	Accessories for rigid steel conduit insulated cables
IS-375	Switchgear, bus bars, connections, wiring, cable markings etc.,
IS –722	AC Electricity meters

IS-2147 Degree of protection provided by enclosure for LV Switch gear & control gear

I General requirements
II Measuring Current Transformer
III Protective Current Transformer

IS 4247 General requirement for switchgear & control gear for voltages not exceeding 1000 volt

IS-5082 Wrought aluminium & aluminium bars, rods, tubes & sections electrical purpose

IS-600	Code of practice for phosphate of iron & steel
IS-8623	Factory built assemblies of switchgear & control gear for

Voltage up to & including 1000 volts AC

IS-9224	Low voltage fuses
IS-10118	Code of practice for selection insulation & maintenance of Switch gear & control gear

IS-2516 (Part1&11)	Circuit breakers-requirement & test voltages not exceeding 1000V AC
IS-2208	HRC fuse links upto 650 volts

All main switches or (MCCBs) shall be located so that a minimum distance of 900mm exists from the finished floor level to the bottom of the switch or connecting straps, whichever is the less. The main switch or switches shall be marked as such and shall be identified from the other switchgear by grouping or colouring.

The switchboard shall consist of an incoming MCCB and outgoing MCCB with 4 pole bus-bars contained in separate compartments. The main incoming MCCB shall be mounted in one cubicle section.

The switchboard shall be designed for a fault level of 50 KA for one second. Circuit breakers, switchgear, isolators, contactors, busbars and cable connections shall be suitable for operating at the above level.

The switchboard & MCCBs should have been type tested for short time current rating and the type test report shall be furnished in the bid itself.

Voltmeter shall be provided on the front panel. This instrument shall have a selector switch arranged to read phase to phase and phase to neutral voltage, scale reading to be 0-500 Volts. An ammeter for each phase shall also be provided and an indicating light for each of the three incoming phases.

The rated current for circuit breakers and fused switches shall be marked on the board in English.

All switchboards and cubicles shall conform to IS 2147 where applicable and shall be of the same general style and finish throughout. The Contractor shall arrange for close collaboration with the manufacturers to this end.

The main switchgear cubicle shall consist of sheet metal panels built upon a substantial framework of rolled steel or folded sheet metal sections. All edges of panels shall be radiused, metal panels when fabricated shall be dead flat and true.

All necessary stiffeners and supports for the framework shall be provided and also where required on panels. Sheet metal for the built up of large panels shall be at least 2mm thick. For panels not exceeding 900 mm x900mm it shall be at least 1.6mm thick. All sheet metal shall be specially selected dead flat, zinc coated mild steel.

All hinges shall be concealed and provided with stops and where necessary shall be interlocked. Door handles where necessary shall be of the rotating type closing on the ramps and shall be of approved pattern, finished in black, hardwearing non-conductive material. Every door shall be provided with a dust excluding gasket of sponge rubber positively retained in a rebate.

After manufacture, all steelwork other than that manufactured from zinc coated sheet, shall be thoroughly cleaned off and zinc sprayed before any finish is applied.

The cubicle shall be divided internally by sheet metal webs so as to separate medium voltage equipment as far as possible from instrument and to obviate heating up of components. All instruments and equipment shall be securely mounted and all internal wiring runs shall be so positioned as to ensure complete accessibility for servicing purposes.

Conductors between the busbars and circuit breakers shall be high conductivity copper bar or rod, having a current rating of not less than that of the circuit breakers to which they are connected. The conductors shall be insulated with PVC (polyvinyl chloride) sheathing, coloured to ISI colour code for phase identification.

The switchboard shall include a copper earth bar and shall extend the full length of the switchgear and be rigidly supported at intervals of not more than 1m. The earth bar section shall be 25mm x6.25mm.

Provision shall be made at each end of the earth bars for external connections. The various component parts of enclosures forming switchgear shall be effectively connected to its earth bar. Cable glands shall also be effectively connected to the earth bar.

The case of instruments, relays and meters shall be connected to the earth bar by means of conductors of not less than 2.5 Sq mm sections.
Where equipment is separately mounted, each shall be provided with a 12mm diameter earthing terminal.
The star point of each group C.T secondary connections shall have a separate earthing link in an accessible portion. This position shall be at the relay panel except in the case of metering C.T's which shall be earthed at the switchgear.
All access doors shall be connected to the earth bar by means of conductors of not less than 4.0 Sq.mm section, connected to an earthing stud terminal fixed firmly to each door. Access door hinges shall not be relied upon for earth continuity.
All paint finishes shall be stove enameled, the appropriate number of undercoats shall be applied each being built up and flattened separately. The final coat shall be of approved colour with gloss finish and sufficient body shall be given to the paint films so that with the building up and flattening the final appearance of the finished unit is entirely free form blemishes or defects whatsoever.
The Contractor shall also submit drawings of the switchboards for approval by the Engineer before manufacture.
The Contractor s attention is specifically directed to the need for each of the items to be adequately packed and protected against damage in transit from the manufacturers works to the Site. Similarly on delivering to Site, each cubicle shall be properly off-loaded, stored and protected from damage until all work is completed.

1.189 M.V. CIRCUIT BREAKERS

M.V. circuit breakers shall have clear indication, on approved type labels, whether they are closed or open, together with their rating and short circuit breaking capacity and shall be arranged so that they are safe to operate and prevent injury to operators.
All circuit breakers must have provision for full manual operation, opening and closing, regardless of whether they are normally operated by another operated by another power source (eg electrical or pneumatic).
Overload protection shall be provided by thermal elements with variable setting and short circuit protection by rapid magnetic tripping. Moulded case circuit breakers shall comply with IS 2516 (Part I & II) and their rating calibrated at 50 Degrees Centigrade.
All terminals must be fully sized to accept the larger than normal cables to be fitted due to de-rating for volt drop or ambient temperature conditions.
Locking facilities shall be provided to lock breakers in their "on" or "off" position: where circuit breakers are used to control rotating machinery they shall be fitted with no-volt releases.

1.190 BUSBARS

Bus bars and bus bar connections shall be constructed in accordance with the requirements of IS 375.
Bus bars shall be rectangular section hard drawn high conductivity Aluminium, adequately rated and supported by SMC/DMC insulators spaced at suitable intervals, the complete assembly being capable of withstanding the maximum mechanical stresses to which it may be subjected under fault conditions.
Bus bars shall be enclosed in separate compartments of cubicle switchboards or in separate bus bar chambers and shall be so arranged that all conductors can be brought onto the bars without undue bending.
Rectangular section bus bar connections are to be made with double split cast brass clamps. Drilling of the bars will only be permitted if the cross sectional area is not reduced below the current rating of the bars. All bus bars shall be totally insulated in their phase colours.

Bus bar compartments shall not be used as switchboard wiring ways. Only the bars themselves, together with the connections to fuse switches, isolators, instrument and current transformer shall be permitted within the compartment.

1.191 FUSED SWITCHES AND ISOLATORS

All fused switches and isolators mounted in cubicle type switchgear or separately shall conform to the requirements of IS standards.

All contacts to be fully shrouded and to have a breaking capacity on manual operation as required by IS standards.

Isolators shall be fused switch units having solid copper links of adequate current rating in lieu of fuse links.

Fused switches and isolators mounted in cubicle type switchgear shall be enclosed in separate sheet metal compartments and mechanical interlocks shall be provided between the cubicle door and the switch operating mechanism, so arranged that the cubicle door may not be opened with the switch in the "ON" position. Similarly it shall not be possible to close the switch with the cubicle door open except that provision shall be made within the cubicle for authorized persons to defeat the mechanical interlock and close the switch with the door in the "OPEN" position for test purposes.

The "on" and "off" positions of all switches and isolators shall be clearly indicated by a mechanical flag indicator or similar device.

In all the T.P and N. fused switch units bolted neutral links shall be fitted. All S.P and N. isolators shall be double pole.

All switch gear shall be suitable for uninterrupted duty and contacts shall be silver plated.

Fused switches and isolators separately mounted shall be provided with dust-protecting enclosures of either cast iron or sheet metal construction (galvanized) not less than 3.5 sq mm. Mechanical interlocking between the enclosure door and the switch mechanism shall be provided.

1.192 MCCB PANEL BOARDS

The panel boards will be ASTA certified and manufactured to IP 54 as per IS: 2147. The board shall comprise the arrangements as shown on the drawings.

MCCBs shall be designed and tested to IS. The panel shall be suitable for wall/floor mounting and be complete with a lockable hinged door.

The board shall be constructed generally as detailed in Clause 4.4.8 for MCB distribution boards including circuit schedules as appropriate.

1.193 CONTACTORS

Contactors shall be of the air break type, they shall be of the uninterrupted rating and contacts shall either be silver contacts or de-rated to allow for this duty. The contactors shall be category AC3 and have a no-load operating cycle of 1 million operations.

All contactors shall be of the block type and contacts shall be of the self-cleaning type and easily renewable.

The design shall be such as to prevent welding in. All operating coils of contactors shall be able to operate on the control system voltage of the main low voltage switchgear.

Each contactor shall be so screened from adjacent units and current carrying parts that it is possible to carry out maintenance work in complete safety, while other equipment in the panel remains alive on load.

Means of isolation shall be provided to isolate all primary and secondary circuits to contactors, but means shall be provided to temporarily re-instate interlocks or other circuit interconnections with equipment which is required in service whilst the contactor is isolated.

1.194 CARTRIDGE FUSE LINKS

Cartridge fuse links shall comply with IS 2208 and shall be certified for category of duty 415 A.C.80 and a fusing factor as for class Q1 fuses.

Fuse carriers shall incorporate large viewing holes to ensure fuse indicators can be seen without removing the carrier.

Motors circuit fuses shall be sized to protect the circuit wiring and give adequate back-up protection to the starter overloads in accordance with the recommendations of the fuse manufacturers.

50% of each range of fuses shall be supplied for spares.

EB PANEL

1.195 GENERAL SPECIFICATION OF EQUIPMENT

The switch board shall be metal clad, totally enclosed, rigid, compartmentalized design, floor mounting, air insulated, extensible cubicle type for use on medium voltage power, 500 V 3 phase 4 wire 50 Hz AC System.

The equipment shall be designed for operation in high ambient temperature and high humidity tropical atmosphere conditions. Means shall be provided to facilitate inspections, cleaning and repairs when in service where continuity of operation is of prime importance.

1.196 STANDARDS

LV switchgear/control gear shall be as per IS 13947. Switchboard assemblies shall conform to the requirements of IS 8623-1993.

1.197 CONSTRUCTION

The construction should take care of the following points

Safety

Reliability

Maintainability

The panel shall be of metal enclosed, indoor/outdoor, floor/wall mounted free standing cubicle type, as specified in three distinct zones namely

Bus bar zone

Functional units zone

Cabling zone

The requisite vertical sections when coupled together shall form continuous dead front rear access switchboards, as required.

With dust, vermin and damp protection

Readily extendible as required by the addition of vertical sections after removal of the end covers with access to the feeders, bus bars, cable terminations, cable alley etc as required.

Each vertical sections shall comprise:

A front framed structure of rolled /folded CRCA sheet/MS angle section of minimum 2/3 mm thickness rigidly welded/bolted together. This structure shall house the components contributing to the major weight of the equipment such as circuit breaker cassettes, fuse switch units, main horizontal bus bars vertical risers and other front mounted accessories.

The structure shall be mounted on a rigid base frame of ISMC/folded CRCA sheet steel of minimum 6mm thickness and 75mm height. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during transit or during operation.

A cable chamber housing the cable end connections and power/control cable terminations. The design shall ensure generous availability of space for ease of installation and maintenance of cabling and adequate safety for working in one vertical/horizontal section without coming into accidental contact with live parts of the adjacent section.

A cover plate at the top of the vertical section, provided with a ventilating hood where necessary. Any aperture for ventilation shall be covered with a perforated sheet having less than 1mm diameter perforations to prevent entry of vermin.
Front and rear doors fitted with dust excluding neoprene gaskets with fasteners designed to ensure proper compression of the gaskets. When covers are provided in place of doors generous overlap shall be ensured between sheet steel surfaces with closely spaced fasteners to preclude the entry of bus.
The height of the panel shall not be more than 2300 mm unless otherwise specified. However operating height of switch/breaker should not exceed 1800 mm from the floor level. Total depth of the panel shall be adequate to cater for proper cabling space
Doors shall be of minimum 14G/2MM sheet steel and other door covers/partitions of 6g/1.6mm sheet steel. All sheet steel work forming the exterior of switchboards shall be smoothly finished leveled and free from flaws. The corner should be rounded.
The apparatus in the switchboard shall be so arranged as to facilitate ease of operation and maintenance and at same time to ensure the necessary degree of safety.
Apparatus forming part of the switchboards shall have the following minimum clearances

i.	Between phases	25mm
ii.	Between phases and neutral	25mm
iii.	Between phases and earth	25mm
iv.	Between neutral and earth	19mm

When, for any reason, the above clearances are not available, suitable insulation barrier shall be provided. Clearances shall be maintained during normal service conditions. Creepage clearance shall comply to those specified in relevant standards
All insulating material used in the construction of the equipment shall be on non-hygroscopic material treated to withstand the effects of high humidity, high temperature and tropical ambient service conditions.
Functional units such as circuit breakers, fuse switches MCCBs etc shall be arranged formation except that not more than two air circuit breakers shall be housed in a single vertical server.
Metallic/insulated barriers shall be provided within vertical sections and between adjacent section to reduce damage due to arcing fault and prevention of accidental contact with main busbars and vertical risers during operation, inspection or maintenance of functional and front mounted accessories.
Cable terminations of one functional unit, when working on those of adjacent unit/units
All covers providing access to live power equipment/circuits shall be provided with tool operated fasteners to prevent unauthorized access. One such tool shall be supplied along with each panel.
Provision shall be made for permanently earthing the frames and other metal parts of the switchgear by independent connections, all the doors shall be provided with braided flexible copper earth connection.
Doors with cutouts for instruments/relay shall be provided with stiffeners to avoid buckling.
Only CRCA steel sheets shall be used for fabricating the cubicle.
Thickness tolerance for sheets shall be as applicable in the relevant IS

1.198 METAL TREATMENT AND FINISH

Generally the treatment and finish of the metal surface shall be as per detailed specifications enumerated below:
Cold phosphating using eight tank process
Degreasing with alkaline solution followed by cold water rinsing
Derusting to remove rust scales followed by cold water rinsing
Phosphating followed by cold water rinsing

Passivation in de-oxalite solution
Drying in dust free conditions
Two coats for corrosion resistant solving primer with oven drying
Electro-static powder coating of approved colour

1.199 BUS BAR ZONE

This zone comprises of horizontal bus bar, vertical bus bars, heat shrunk PVC sleeves, SMC insulated supporting system
The bus bars chambers shall be suitable for 500 volts, 3 phase 4 wires, 50 Hz, the short circuit as specified in BOQ.
The bus bar system design should take care of the following points
Rated current, voltage & frequency
Withstand capability during short circuit condition
Protection against vermin, falling tools, hardware which tend to bridge and initiate among faults
Protection against dust and conducting deposits which accelerate tracking on supporting surface and consequently cause failure of the supporting system
Proper ventilation of heat dissipation
The orientation and spacing between busbars to withstand short circuit
Temperature rise and derating factor
Arcing faults
Insulation level
Proximity effect
The busbar shall be Al as specified in the BOQ.

The conductivity of the Busbars should be high and of electrolytic grade Cu. Of 99.9% IACS and Al. Of 55% IACS (International Annealed Copper standard) conforming to IS 5082-1981, Al grade 63401-WP.
The bus bar shall be provided with RYB N coloured heat shrink PVC sleeves along the entire length but the joints shall be shrouded.
When bus bars/links are connected in parallel some gap should be maintained between the bus of same potential to improve heat dissipation. The gap should be equal to the thickness of the bus or 10mm whichever is higher.
Stiffeners shall be provided between bus of same potential to avoid bending stress on conductor and number of such stiffeners shall depend on the partial force.
The total stress under short circuit condition should not exceed 0.1% proof stress of the bus bar material
The insulation material used for the supports should have the following desirable properties
High mechanical strength
High dielectric strength
High temperature withstand
Nonflammable properties
Non hygroscopic properties
High comparative tracking index
When making bus bars joint, the safe minimum bending radius shall be “t” for copper bus bars and 2t for Al bus bars, where “t” is the thickness of bus bar
The bus bars sections shall be joined either by overlapping or by providing fish plates and bolt or clamping the sections together. Bolting and clamping methods should provide joints that have subsidiary services.

The main requirement for any bus bar joint is that electrical efficiency should remain stable under all conditions of service. To achieve this, the following factors to be taken into account where the joints are made. They are

Proper contact pressure must be applied and maintained

The surface of the Aluminium must be cleaned before bolting up

Air and moisture must be excluded from the joint

The overlap should at least be equal to width of the busbar.

The busbars shall be suitably supported with DMC/SMC supports designed to provide a fault withstand capacity as specified.

High tensile bolts and springs washers shall be provided at all bus bar joints.

The bus bars shall have uniform cross section throughout and shall be capable of carrying the rated current at 500 V continuously. The bus bars shall be designed to withstand a temperature rise of 45 deg. C above the ambient. A current density of 0.8 Amps/sq.mm shall not be exceeded for Aluminium bus bars. The neutral bus bars shall have a continuous rating of at least 50% of the phase bus bars or as specified for non-near loads.

An earth bus of size not less than 40 x 6 mm aluminium shall run throughout the length of switchboard at top or bottom as required.

1.200 MOULDED CASE CIRCUIT BREAKER (MCCB):

The MCCB shall be 3P/4P AC and shall conform in all respects to IS 13947 – Part I & II. They shall incorporate quick make, quick break, independent manual type with 'trip free' feature. The handle position shall give a positive indication whether the breaker is in 'ON', 'OFF' or 'TRIP' connection.

The short circuit and the current rating of MCCB shall be as described under Annexures/BOQ.

MCCBs shall be provided with AC shunt trip/UV release as specified in the BOQ.

MCCBs shall be provided with rotary handle operating mechanism with door inter lock, door inter lock shall be defetable when required.

1.201 CURRENT TRANSFORMER (CT):

Current transformers shall comply with the requirements of IS 2705. They shall have atria's outputs and accuracy as specified/required.

1.202 INDICATING / INTEGRATING METERS:

All indicating instruments shall be of flush mounting type.

The instruments shall have clearly divided and indelibly marked scales and shall be provided with adjusting devices in the front.

1.203 CABLE TERMINATIONS:

Cable entries and terminals shall be provided in the switchboard to suit the number, type and size of aluminium conductor power cables and copper conductor control cable specified in the detailed specifications.

Provision shall be made for top or bottom entry of cables as required. Generous size of cabling chambers shall be provided with the position of cable gland and terminals such that cables can be easily and safely terminated.

Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit.

Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults.

Cable sockets shall be of tinned copper, crimping type.

1.204 CONTROL WIRING:

The panels control voltage or all indications and metering shall be derived by providing a control transformer of adequate capacity.

All control wiring shall be carried out the 1100V grade single core PVC cable having stranded copper conductors with minimum cross section of 1.5 sq.mm for potential circuits and 2.5 sq.mm for current circuits.

Wiring shall be neatly bunched, adequately supported and properly routed to allow or easy access and maintenance.

Wires shall be identified by a phase-numeric ferrules at each end. The ferrules shall be of ring type and of non-deteriorating material. They shall be firmly located on each wire so as to prevent free movement.

All control circuit miniature circuit breaker (MCB) shall be mounted so as to be easily accessible.

The panel shall be provided with space heaters & thermostats to humidify the moisture in the panel.

1.205 TERMINAL BLOCKS:

Terminal blocks shall be of 500 V grade, and mechanically robust.

Terminal blocks shall have a minimum current rating of 10 Amps and shall be shrouded. Provisions shall be made for label inscriptions.

1.206 NAME PLATE:

The panel as well as feeder compartments shall be provided with name plate of anodized aluminium or hylam switch plate with engraving. These shall be properly secured with fasteners/rivets. The panel/feeder descriptions shall be as indicated in the drawings.

1.207 TESTS:

Routine tests shall be conducted on each MV Panel and shall comprise.

Inspection of the Switch Boards including inspection of wiring and electrical operational tests where necessary.

Dielectric test.

Insulation resistance of the main circuit between each pole and the earth and that between the poles shall be measured.

Insulation resistance of all secondary wiring between phase and earth shall be measured. Insulation test shall be carried out both before and after high voltage test.

Checking of protective measures and electrical continuity of the protective circuits.

1.208 HIGH VOLTAGE TEST:

A high voltage test with 2.5 KV for one minute shall be applied between each pole and earth and between poles. Test certificate shall be submitted along with panel.

All instruments/meters used for testing should carry a calibration stamp not more than six months ol

STORING, ERECTION AND COMMISSIONING:

1.209 STORING:

The panels shall be stored in a well-ventilated dry place. Suitable polythene covers shall be provided for necessary protection against dirt and moisture.

1.210 ERECTION:

Switchboards shall be installed over trench/on wall or floor as required. Suitable grouting holes shall be provided in the flooring. Suitable MS base channel shall be supplied and embedded the flooring which the panel can directly be installed.

The switch boards shall be properly aligned and bolted to the base channel by at least four bolts & nuts shall be terminated on the bottom plate or top plate as the case may be, by using brass compression glands. The individual cables shall then be led through the panel to the required feeder compartments

for necessary terminations. The cables shall be clamped to the supporting arrangement. The switchboard earth bus shall be connected to the local earth grid.

The base channel used for erection of panels shall form part of the cost of the panel and shall not be measured or paid separately.

1.211 PRECOMMISSION TESTS:

The panels shall be commissioned only after successful completion of the following tests. The test shall be carried in the presence of Engineer-in-Charge/Consultants representative and copy of the test reports submitted before commissioning.

1. All main and auxiliary bus bar connections shall be checked and tightened.
2. All wiring terminations and bus bar joints shall be checked and tightened.
3. Wiring shall be checked to ensure that it is according to the drawing.
4. All wiring shall be tested for insulation resistance by a 500 volt Meggar.
5. Phase rotation tests shall be conducted.
6. Suitable injection tests shall be applied to all the measuring instruments to establish the correctness and accuracy of calibration and work order, as agreed mutually.
7. All relays and protective devices shall be tested for correctness of settings and operation by introducing a current general or and an ammeter in the circuit or by producing calibration test certificate as required by the Engineer-in-Charge/Inspectorate.

Rating of fuse, MCB's shall be checked

NOTE: THE TRANSFORMER AND HT EQIUPMENT SHOULD HAVE THE APPROVAL FROM KSEB & KSEI

1.212 DISTRIBUTION BOARDS AND WIRING ACCESSORIES:

DISTRIBUTION BOARDS GENERAL:

All distribution boards shall be of the sizes and types specified and shall be fitted with miniature circuit breakers. Where distribution boards are specified to be complete with an isolator and/or restricted current circuit breaker, they shall be integral with the distribution board enclosure. Isolators shall be double pole for SP & N distribution boards and four poles for TP and N distribution boards.

The enclosures shall comprise a case and door(s) of sheet metal. The type of construction shall be damp and dust protected, classification IP 52. Surface mounting shall be residence pattern fitted with cylinder lock. Doors shall be provided with quick release hinges.

Sheet steel shall be Electro-zinc coated to a minimum thickness of 0.009 mm and chromate washed.

All door furniture (e.g. locks, handles, fasteners, etc.,) shall be chromium plated.

Paint finishes, for all steel for use indoors shall have two coats of rust proof primer then filled as necessary and flattened to a smooth finish, then two under coats and the final finish being two coats of epoxy resin paint, the final coat drying to a hard semi-gloss surface.

Colours of all internal surfaces for both indoor and outdoor use of sheet steel fabrications shall be white semi-gloss.

All bright-machined parts shall have a protective treatment applied by the manufacturer before dispatch and this treatment is to be kept intact up to the time of handover unless it has to be removed for installation. If the surface is then exposed after installation a further protective coating shall be applied in accordance with the manufacturer's requirements.

Bus bars shall be rigidly mounted in the same position on all poles relative to their banks of MCB's and fully shrouded to enable spare ways to be wired whilst the board is live. Bus bars shall be copper.

All incoming terminals shall be fully shrouded and of the pressure clamp or socket type.

Renewable label sin the form of cards in a transparent envelope shall be provided within the enclosure for recording the following information for each circuit

Circuit Designation.
Cable Size
Circuit Rating.

The sequence of identification shall be stated on the label card. The make and type of fuse that discriminates and/or protects the miniature circuit breakers shall be indicated. If installation of fuses other than the manufacturer stated, would not discriminate or protect the miniature circuit breakers then a label to this effect shall be installed in the distribution board.

External labels shall be fitted in accordance with name plates and labels and shall be acrylic transparent plastic plates with engraved black letters.

Neutral and earth terminals shall be provided one for each outgoing phase way ie., three neutral and earth terminals for each TP way in positions respective to their phase terminals.

All miniature circuit breakers shall be rated to withstand the fault currents of the circuits they protect without causing any interference in any other protective device associated with the distribution system. At the same time, the design of the circuit breaker shall be such that it will protect the circuit for which it is intended and not cause or allow other protective devices to operate when fault conditions apply.

MCB's as fitted in distribution boards shall be of the thermal magnetic type. They shall comply with IS 8828-1993 or latest version of duty Category M 10 having short circuit capacity of 10 KA on single pole types and for triple pole types. The dolly shall be 'up' for 'on'. Where a M.C.B. is used for back-up protection for a motor starter overload, the rating shall be in accordance with the manufacturer's recommendations. MCBs shall be calibrated by the manufacturer for 50 deg C.

Residual current devices (RCD/ELCB/RCCB) shall be provided where shown on the distribution diagram. R.C.D's shall be of the moulded case type, fault rated to suit the installation with an integral current operated earth leakage trip set for instantaneous operation on an earth fault of the rating stated. Where earth leakage circuit breakers are indicated on the contract drawings, they shall be residual current operated conforming to IS with continuous current ratings and tripping current rating as noted on the drawings or D.B. schedules.

The Contractor shall supply, install, connect and commission all distribution boards and other equipment as indicated on the contract drawings. The final position shall be verified on site after consulting the detailed drawings of the equipment being installed.

Each MCB distribution board shall be suitable for operation at the fault level of the system at its point of installation and should have been type tested. However, the minimum fault current withstand ability shall be 10 KA for 1 second.

All final distribution boards shall be provided with integral isolators and ELCB's on the incoming supply as detailed on distribution board schedules.

1.213 IDENTIFICATION OF SWITCH GEAR:

All items of switch gear, whether separately mounted or forming part of a composite unit, shall be provided with means of identification adequately describing the function of the unit or circuit controlled and service phase(s) in English.

Where 415 volts or above is present the Contractor shall affix labels of DANGER board 10 mm high red lettering in English.

1.214 LIGHTING SWITCHES:

Switches for AC circuits shall be of AC pattern, grid switches and rated at minimum 10 amps. Each switch shall be able to withstand the rated capacity for both inductive and fluorescent loads.

Terminals shall be brass and switch contact silver with a contact gap of 3 mm.

All switches shall be fitted in rust proof boxes and multiple switches shall be ganged under a common cover plate.

The cover plate of the switches in different areas shall be as follows;
White plastic – all the areas
Generally all switches for interior use shall be a flush type except where otherwise specified.
Each switch assembly shall consist of an adjustable grid, switch interior and cover plate. The adjustable grid shall be supplied with a flying earth lead for bonding to the wall box.

1.215 SOCKET OUTLETS:

Generally all socket outlets shall be of the 6 or 16 amp switched type and normally flush mounted unless otherwise stated.
6/16 amp sockets outlets shall be a grid plate assembly unless otherwise stated.
Each socket shall consist of an adjustable grid complete with socket interiors and a cover plate. The switch to each socket shall be double insulated. Terminals shall be brass and switch contacts silver with a contact gap of 3 mm.
When plate type socket outlets are specified they shall be a one piece assembly but in all other respects meet the general socket outlet specification.
Other current ratings up to 100 amps may be specified for industrial socket outlets.
These outlets shall be manufactured from impact resistant materials and designed with an IP rating suitable for the location in which they are to be installed. Outlets shall be surface or flush mounted, un-switched or interlock switched, single twin or multiple outlet as described elsewhere.
This type of outlet shall be colour coded to suit its voltage and frequency.
A plug top shall be supplied for each socket outlet unless otherwise specified.

1.216 CONDUITS:

Exposed conduits shall be galvanized all welded mild steel heavy gauge Class B to IS 1653-1964 and jointed with solid screwed couplings and fittings with metric threads of ISO form for electrical installations.
Embedded/concealed conduits, fittings and components shall be heavy duty PVC to IS 2667-1964.
The size of conduit systems shall be determined by the number, type size and current rating of the cables that are to be accommodated without damage being caused to the cables or the conduit system.
Where PVC insulated single core cables are to be accommodated the size of conduit shall be determined in accordance with the 15th Edition of the IEE Regulations for Electrical Installations.
Where other types of cables are to be accommodated the size of conduit shall be determined from information obtained from the manufacturer of the cable.
The maximum length of any conduit run, either straight or incorporating bends, shall not exceed 10 meters between draw-in boxes.
The minimum size of conduits shall be 20 mm diameter circular. Boxes shall be used with conduit up to 25 mm diameter. Adaptable boxes shall be used with 32 mm diameter conduits.
The size and route of all conduit systems shall be approved before installation commences.

1.217 INSTALLATION OF CONDUIT – GENERAL:

Conduit systems shall be run on the surface on saddles or concealed within the structure and be neatly arranged.
The joining of two lengths of conduit shall be accomplished by means of a coupler. The lengths of conduit to be joined shall be screwed tight into the coupler to a depth equal to half the length of the coupler.
All bends and sets shall be formed in the conduit itself, factory made bends shall not be installed without approval.
Standard junction and adaptable boxes shall be provided at all junctions and at sharp changes of direction. Such boxes shall be sized and located to ensure ease of wiring and re-wiring.

Care should be taken to ensure that no water enters the conduit during building construction. Before any wiring is installed the conduits shall be verified to be clean and dry.

Surface conduits shall be fixed by means of single unit distance type saddles, spaced as indicated in the following table and 230 mm both sides of bends and sets.

Size of Conduit	Maximum Spacing distance Straight runs
All PVC	600 mm
20 mm	900 mm
25 mm	1200 mm
32 mm	2000 mm

All boxes shall be fixed by screws to the structure and be supported independently of the conduits.

Where conduits cross expansion joints they shall be provided with couplings of an approved design and earthing terminals shall be provided in a conduit box at each side of the coupler connected together by means of a PVC insulated single core cable of the appropriate size and colour code.

Conduit systems shall be arranged so that they are suitable for wiring using the loop-in system.

1.218 CONDUIT AS THE CIRCUIT PROTECTIVE CONDUCTOR:

The conduit systems shall form the whole or part of a circuit protective conductor for lighting. The conduit system shall be electrically continuous and of the lowest resistance possible, the conduit system shall satisfactorily carry the current it will conduct under earth fault conditions and that is shall so remain for the life of the installation.

1.219 CIRCUIT PROTECTIVE CONDUCTOR:

An adequately sized circuit protective conductor sheathed with material equivalent to the circuit conductor and properly colour coded shall be drawn into conduit systems with the circuit conductors for the general purpose power circuits indicated.

The circuit protective conductor shall terminate only at distribution boards and at boxes equipped with accessories. A separate circuit protective conductor shall be provided for each circuit and shall commence with its circuit conductors at the distribution board.

The circuit protective conductor shall be electrically continuous and terminations shall have the lowest resistance possible and this conductor will satisfactorily carry the current it will conduct under earth fault conditions without detriment to the circuit conductors or the installations.

1.220 LIGHTING INSTALLATION:

The Contractor shall supply, install and connect the complete lighting installation as specified and shown on the drawings.

From the final distribution boards the Contractor shall install final circuit wiring to the lighting points as above on the drawings.

Generally wiring shall be carried out using PVC cables in galvanised steel trunking and conduit.

The conduit systems shall be wired on the loop-in system to allow for re-wiring at a later date.

Final connections to each OR grouped luminaire shall be made by 6A switch.

Where conduits are installed above the suspended ceiling, they shall be fixed to the structural ceiling in the same manner as for a surface installation and terminate above the luminaire in a bess box as described above. Conduit drops to switches shall be installed beneath the plaster finish. Where false ceilings are installed the Contractor shall be responsible for supporting the luminaries from the primary ceiling grid. Luminaires will not require separate support from the structural slab above.

The conduit system shall be concealed beneath the surface of the plastered walls and partitions and above the suspended ceilings and cast in slabs where necessary in all areas except plant rooms where a surface conduit system shall be employed.

1.221 LUMINAIRES:

All luminaires except where otherwise specified shall be provided by the Contractor who shall include for taking delivery, fixing and connecting them.

The Contractor shall be responsible for drawing up a complete schedule of luminaires required so that they may be ordered correctly. All luminaires shall be complete with lamps, fluorescent luminaires shall be fitted with Electronic ballast and shall be fitted with a stand fused terminal block per tube way rigidly fixed and earthed to the metal spine in accordance with the requirements of BS 4533. The control gear within fluorescent fittings shall be polyester resin filled type and noiseless in operation and be capable of giving trouble-free operation. The luminaires within plant rooms, external and non-air-conditioned areas shall be capable of giving trouble-free operation with ambient temperatures of 50 deg C (122 F). The internal wiring shall be of silicone rubber flexible cables of appropriate size neatly clipped in position.

Flexible cable for final connection of all luminaires shall be of the glass fibre insulated silicone vanished and glass fibre braided type or butyl insulated and sheathed white circular type.

All metal parts of luminaries shall be effectively earthed.

The Contractor shall not place order for any luminaires without the prior approval of the Engineer-in-Charge.

Luminaires employing tungsten filament type lamps shall be fitted with heat resisting type lamp holders. Lamp holders incorporated in weatherproof fittings shall be of porcelain or brass.

The Contractor shall allow for supplying all lamps and fluorescent tubes as indicated on the drawings and in the schedule of luminaires.

1.222 GENERAL POWER INSTALLATION:

The Contractor shall supply, install test and commission the small power installation as shown on the drawings.

From the final distribution boards final circuit wiring shall be installed to the power points as indicated on the drawings.

The wiring generally shall be carried out in PVC insulated multistrand flexible single core copper cables and shall be installed generally as a flush or surface installation to match the lighting installation previously specified.

For a concealed installation the whole of the conduit system shall be installed beneath the surface of the rendered and plastered walls and above the suspended ceiling.

An earth continuity conductor shall be provided throughout the entire length of the insulated conduit system and special terminals shall be provided at all outlets, junction boxes and distribution boards for terminating these conductors. The conductors shall be sized in accordance with IEE Regulations.

Socket outlets for the general services unless otherwise specified shall be 16 amp capacity rectangular pin type with integral switch.

Surface mounted sockets shall be mounted in galvanized malleable cast iron boxes. Flush mounted switch socket outlets shall be supplied sherardized in sheet metal boxes.

All outlets shall be switched and where mounted flush shall be provided with overlapping front plates. Where a surface installation is used, the switch plates shall be the same size as the conduit box in which they are mounted.

Cover plates shall match the lighting switches previously supplied.

All flexible cables for power circuits etc., shall be PVC insulated and PVC sheathed of 1100 volt grade for single phase and 3-phase connection. Where cables are connected to equipment with excessive heat loss, they shall be of the heat resisting type.

1.223 CABLE INSTALLATION:

Cables serving luminaires must loop into and out of except where otherwise stated.

The cables shall follow the route shown on the drawings and unless otherwise detailed shall be laid through conduit as indicated in this specification.

Wiring between the cut-out, lantern and control switch if not specified shall be 2.5 sq.mm PVC insulated and sheathed cable.

For the standard configuration of the trench refer to the electrical distribution specification.

The underground cable for street lighting shall comply with the electrical distribution specification, NEW standard specification and Municipality Street lighting specifications.

PREAMBLE TO BILL OF QUANTITIES

All items of work mentioned in the Bill of Quantities shall be read and executed strictly in accordance with the description of the item in the Bill of Quantities, equipment schedule/ Data sheet, drawing and standard specifications read in conjunction with the appropriate IS and conditions of contract.

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, hardware, operations, tools, equipment, consumables, civil works wherever involved and incidentals required in preparations for in the full and entire execution and completion of the work called for the item and as per specifications and drawings completely.

Wastage on materials and labour.

All taxes, duties, octroi, including works contract tax, sales tax, transit insurance, packing and forwarding charges, loading, transportation, unloading handling, hoisting, to all levels. setting and fixing in position , disposal of debris and all other labour necessary in accordance with contracts documents, good practice and recognized principles.

Liabilities, obligations and risks arising out of conditions of contract.

Liaison service charges.

All requirements of system whether such of them are mentioned in the item or not the specifications and drawings are to be read as complimentary to and part of the schedule or quantities and any work called for in one shall be taken as required for all.

In the event of conflict between the bill of quantities and other documents, the most stringent shall apply and interpretations of the Engineer-in-Charge shall be final and binding.

The installation of price of switchboards, metering panels, DB's or any other items shall include supply and fixing of supporting steel structures / MS channels grouting of the same, civil works etc. as required.

No change in unit rate shall be allowed for any change in quantity or for any other reason whatsoever.

Supply of materials shall mean supply of materials at site. The rate for supply shall include all taxes, octroi, insurance, packing and forwarding charges, transportation, unloading at site.

The successful Contractor s shall submit the Schematic diagrams, fabrication drawings with details of equipment wiring diagrams etc. to Engineer-in-Charge for approval prior to supply / commencement of such works. The approval of these drawings will be general and will not absolve to Contractor of the responsibility of the correctness of these drawings. At least four copies of the approved drawings supplied to Engineer-in-Charge for their distribution to various agencies at site at no cost to owner.

The tenderers must see the site conditions such as type of soil, locations etc. and take all factors into consideration while quoting the rates as no extra cost will be allowed on any ground arising out or relating to the site conditions.

Any error in description in quantity or omission of items from the contact shall not vitiate this contract but shall be corrected and deemed to be a variation required by the Engineer-in-Charge.

The Liason service charges shall include the following:

Follow up expenses with the Electricity Board from the drawing approval up to servicing the installation and getting the safety certificate.
Preparation of detailed drawings required by the Electrical Inspector.
Obtaining Approval of drawings and Installation.
Renewal of any temporary power supply connection during construction.
All incidental charges/expenses associated with the above work.
Provision of labour in assisting Electricity Board for installing DP Structure and accessories.
Official deposits paid to the above agencies will be reimbursed separately at actuals by the Engineer-in-Charge.
All testing and calibration charges for the meters shall be included in the installation price of the Meter Board.
The tender shall take into account the expenses of pre-commissioning tests to be conducted as per specification of the complete installation by licensed agencies.

1.224 NETWORK ENCLOSURE

1.1 WALL MOUNT NETWORK RACK 8U, 12U, 24U etc
1.1.1 19" Mounting profile, Depth:600mm x Width:800mm x Height: as per requirement given in BOQ
1.1.2 Basic Structure: Frame Of sturdy frame section construction, consisting of folded rolled Steel hollow frame section punched.
1.1.3 Front Glass (toughened) Door: Sheet steel with 4 mm thick toughened safety glass with three point locking mechanism for the front door.
1.1.4 Surface Finish: Nano Coated, powder coated with textured polyester RAL 7035 to 80 to 120 microns.
1.1.5 Front Glass with Gasket
1.1.6 Side Louvered panel, with Gasket
1.1.7 Top and bottom cover, with cable entry provision at bottom cover.
1.1.8 Three units of Power Distribution Panel (PDP) with 15A / 5A three pin socket 5 Nos. in each PDP along with three meters of cable with Plug.
1.1.9 Two nos. of blowers mounting below the top cover of the rack with finger guards. For air circulation.
1.1.10 Plinth frame of height 150 mm with cable entry hole and mounting provision to be assembled below the rack instead of caster wheels.
1.1.11 Earthing str (Cu) with Earthing kit,
1.1.12 Cable tray at both sides of the rack rear side for routing of the cable.
1.1.13 All Products should be certified according to ISO 9001, 14001, 18001 and UL, VDE Listed
1.2 42U FLOOR STANDING NETWORK RACK
1.2.1 19" Mounting profile, Depth:1000mm x Width:800mm x Height: as per requirement given in BOQ
1.2.2 Basic Structure: Frame Of sturdy frame section construction, consisting of folded rolled Steel hollow frame section punched.
1.2.3 Front Glass (toughened) Door: Sheet steel with 4 mm thick toughened safety glass with three point locking mechanism for the front door.
1.2.4 Surface Finish: Nano Coated and powder coated with textured polyester RAL 7035 to 80 to 120 microns.
1.2.5 Front Glass with Gasket
1.2.6 Side Louvered panel with PU Gasket

1.2.7 Top and bottom cover, with cable entry provision at bottom cover.
1.2.8 Three units of Power Distribution Panel (PDP) with 15A / 5A three pin socket 5 Nos. in each PDP along with three meters of cable with Plug.
1.2.9 Two nos. of blowers mounting below the top cover of the rack with finger guards. For air circulation.
1.2.10 Plinth frame with cable entry hole and mounting provision to be assembled below the rack instead of caster wheels.
1.2.11 Earthling str (Cu) with Earthling kit,
1.2.12 Cable tray at both sides of the rack rear side for routing of the cable.
1.2.13 All Products should be certified according to ISO 9001, 14001, 18001 and UL, VDE Listed
2. 50/125 μm OM2 TYPE MULTI MODE INDOOR OPTICAL FIBER CABLE
2.1 The cable shall consists of number of 900 μm tight buffered optical fibres reinforced with aramid yarns and sheathed in a flame retardant Low Smoke Zero Halogen compound.
2.2 Graded Index 50/125 μm fiber tested and certified to satisfy Gigabit Ethernet applications. Should support link lengths greater than 1000 metres at both 850nm and 1300nm in local area network applications (LAN) and transmission rates of up to 10Gbit/s over a distance of 150 metres at 850nm.
2.3 The cable should be designed for internal use primarily in structured wiring systems in backbones. Should consist of a “dry” water blocking system to prevent the flow of water along the cable in the event of sheath breech.

1.225 OPTICAL PERFORMANCE

2.4.1 Max. Attenuation: At 850 nm: 2.5 dB/km and at 1300 nm: 0.7 dB/km
2.4.2 Min. Bandwidth : At 850 nm: 2000 MHz/km and at 1300 nm: 500 MHz/km
2.5 CONSTRUCTION
2.5.1 Fiber Identification: Colour Coded
2.5.2 Fiber Insulation: Coloured Nylon
2.5.3 Reinforcing: Aramid Yarns
2.5.4 Sheath: LSZH Black
2.6 DIMENSION & MASS
2.6.1 Diameter (Nominal): 6 Core : 5.6mm
2.6.2 Mass (Nominal) : 6 Core 38 kg/km
2.7 STANDARDS
2.7.1 ISO/IEC 11801:2002 - 2nd Edition, Type OM3; AS/ACIF S008; AS/NZS 3080:2003

1.226 FIBER OPTIC DRAWER / LIU

3.1 1 RU, 19” Rack Mountable,12” Depth
3.2 Should accommodate 6 Adapter Plates with max 48LC Connects
3.3 Should accept 3-Pack(6Fiber),6-Pack(12 Fiber) & 12-Pack(24 Fiber)
3.4 Should have 6 no of splice trays
3.5 Should have removable sliding tray which releases from front or rear of enclosure to facilitate field terminations and splicing.
3.6 Lock & Key for the door
3.7 Cable entrance port on the top, bottom, and sides to allow cable entry to the box from any direction
3.8 Constructed of 18 gauge steel, powder-coated black
3.9 Must be independently tested and verified by ETL and UL.

1.227 LC ADAPTER PLATES

4.1 Incorporates Duplex LC adapters
4.2 OM-3 Single mode performance
4.3 RoHS compliant
4.4 Should provide 3-Pack(6Fiber),6-Pack(12 Fiber) & 12-Pack(24 Fiber)
4.5 For use within the Fiber optic LIU fiber Management Systems
4.6 Shuttered feature to protect from harmful light emissions
4.7 Tools: snap-in rivet
4.8 Plate Material: Black Electroplate or Thermoplastic
4.9 Must be independently tested and verified by ETL and UL.

1.228 LOCKABLE OM-2 MULTIMODE FIBER PATCH CORD (LC-LC)

5.1 Duplex, Multimode OM-3, 1 Mtrs Cord length
5.2 Connecter : LC –LC
5.3 Should be provided with Secure Keyed LC Fiber System to prevent from unauthorized and inadvertent changes.
5.4 Once connected to a port, the locking system should prevent removal by hand, and could only be removed with extraction tool.
5.5 Only the operators with an authorized extraction tool can open a port.
5.6 Should be provided with provided Dust Caps to protect connect upon removal from a port,
5.7 LC Lockable port protection plugs should be available in 8 different colors for easy segregation and better identification of different fiber circuits.
5.8 The keyed patch cords & port protection plugs, extraction tools, should works with any industry compliant LC duplex or quad adapter
5.9 Must be independently tested and verified by ETL and UL.
5.10 Commercial Standards: ISO/IC 11801, ANSI/TIA/EIA 568.B.3-2000, ANSI/TIA/ EIA-492, TELECORDIA GR-409, ICEA-596
5.11 Mechanical Characteristics
5.11.1 O.D: 2.0mm +/- 0.1mm x 4.1+/- 0.2mm
5.11.2 Buffer Diameter: 900Um
5.11.3 Primary Coating : 245um
5.11.4 Strength Member: Aramid Yarn
5.11.5 Jacket Material: LS0H IEC 61034-1 & 2,IEC-60332-1, IEC-60754-1 & 2
5.11.6 Minimum Bend Radius: Install: 3.0cm. Long-term: 2.0cm
5.11.7 Operating Temperature: -40° C to +85° C
5.11.8 Mode Field Dia 9.0um ± 0.4um @1310nm
5.11.9 Must be independently tested and verified by ETL and UL.

1.229 MULTI-MODE LC PIGTAIL

6.1 STANDARDS COMPLIANCE :Compliant with TIA/EIA-568-C.3
6.2 PHYSICAL SPECIFICATIONS: LC simplex connector with 1-meter length fiber pigtail
6.3 Dimensions: Built on .9 mm tight buffered cable.
6.4 Cable Type: OM-2Multi -Mode & 3Mtr Cord length
6.5 LSZH rated white fiber optic cable
6.6 Must be independently tested and verified by ETL and UL.

1.230 CAT 6 UTP CABLE

7.1 Type : Unshielded Twisted Pair, Category 6,
7.2 Conductors :23 AWG solid bare copper, Dia: 0.574
7.3 Insulation: Polyethylene

7.4 Twisting Lay Length (mm): 30underneath
7.5 Cabling Lay Length (±10mm): 140
7.6 Filler: PE
7.7 Jacket: LSZH
7.8 Cable construction must have a cross web for best cross talk performance
7.9 Approvals UL Listed, ETL verified to TIA / EIA Cat 6
7.10 Rated Temperature : -20 to 75 ° C
7.11 Frequency tested up to : Minimum 250 MHz
7.12 Packing : Box of 305 meters
7.13 1-100MHz Input Impedance (Ohms): 100+/-15
7.14 100-250MHz Input Impedance (Ohms):100 Ohms +/-22
7.15 1-250 MHz delay skews (ns/100m) :45
7.16 Reference Standards: Subject 444, EIA/TIA-568 B.2.1, ISO/IEC 11801 IEC61156-5, CM Rated
7.17 Must be independently tested and verified by ETL and UL.

1.231 CAT 6 RJ45 JACKS (INFORMATION OUTLET)

8.1 110 TYPE IDC Connector
8.2 Plastic Housing: Polycarbonate, UL94V-0 rated or Equivalent
8.3 Operating Life: Minimum 750 insertion cycles
8.4 Contact Material: Copper Alloy
8.5 Contact Plating: 50 μ" Gold/100 μ" Nickel
8.6 Contact Force: 100g minimum
8.7 Plug Retention Force: 15 lb.
8.8 Plastic Housing: Polycarbonate, UL94V-0 rated or Equivalent
8.9 Operating Life: Minimum 200 re-terminations
8.10 Contact Material: Copper Alloy
8.11 IDC Contact Plating: Tin/Lead Plate
8.12 Contact Force: 100g minimum
8.13 Wire Accommodation: 22-24 AWG solid
8.14 Interface Resistance: 20 milliohms
8.15 Initial Contact Resistance: 2.5 milliohms
8.16 Insulation Resistance: >100 Mega ohms
8.17 Dimensions (mm): 23.5(H) x 17.9(W) x 30.53(D)
8.18 110 Type IDC termination
8.19 Dual color-coding for 568 A/B wiring configuration
8.20 Dual layer wiring label must be used to simplify punch down and reduces re-work.
8.21 Should be terminated using industry standard punch down tools
8.22 Should be RJ-11 & RJ-12 compatible
8.23 Gas tight connection at the IDC to prevent corrosion.
8.24 Must have retention force technology (RFT) to protect tines from damage
8.25 Commercial Standards: TIA/EIA-568-B.2-1 Component Compliant,
8.26 FCC Subpart F 68.5 Compliant,
8.27 IEC-603-7 Compliant
8.28 ISO 11801 Class E Compliant
8.29 ETL Verified for Category 6 Component Compliance
8.30 Must be independently tested and verified by ETL and UL.

1.232 FACEPLATE

9.1 Unloaded face plates should be designed to accept the RJ45 Cat5E & Cat 6 Connector.
9.2 The unloaded face plates should be available in 1, 2 and 4 port variants, in five colors, to co-ordinate with any decor and any installation size.
9.3 The face plate kit should contain screws and screw-hole covers that provide individual installation labeling, as well as snap-in icon
9.4 Labels, that are color co-ordinate with the face plate.
9.5 Plastic: The Jacks should be UL listed and come complete with Integral shutter for protection against dust ingress.
9.6 Should be designed with Protected labeling facility Icon Port Identification labeling
9.7 Screws provided with 1, 2 & 4 Port versions
9.8 Must be independently tested and verified by ETL and UL.

1.233 1& 2 METER CAT 6 UTP PATCH CORDS

10.1 Conductor size: 24 AWG stranded bare copper
10.2 Max O.D.: 5.6mm (.22")
10.3 3Mtre Cord length
10.4 Jacket: LSZH
10.5 Temperature range: -20° C to +60° C
10.6 Operating life: Minimum 750 insertion cycles
10.7 Contact material: Copper alloy
10.8 Contact plating: 50 μ" Gold/100 μ"Nickel
10.9 Plug dimensions & tolerances compliant with FCC Part 68 & IEC60603-7
10.10 Electrical Characteristics:
10.10.1 Max voltage: 150 VAC (max)
10.10.2 Max current: 1.5A @ 25°
10.11 Operating temperature: -40° C to 85° C
10.12 Unshielded 4 pair stranded cable ETL Verified.
10.13 Should be of Slim Boot Design Suitable for high density active equment with limited space between individual RJ45 jacks
10.14 Should be Available in 5 colors
10.15 Suitable for EIA 568A/B applications
10.16 Patch cords must be independently tested and verified by ETL and UL.

1.234 2 METER CAT 6 UTP LOCKABLE PATCH CORDS

11.1 The Secure RJ System should consist of slim line patch cords with installed secure housing made of transparent polycarbonate UL 94V-2 material on both ends.
11.2 Port blockers shall utilize the same polycarbonate UL94V-2 material.
11.3 Connectors and port blockers should only be removed with an extraction tool, preventing unauthorized or accidental moves, adds, or changes.
11.4 Should be available in eight housing color options for color coding of copper network ports, with matching color extraction tool required for secured port access.
11.5 Housings should be transparent to allow visible access to Link/Status LEDs on networking equipment.
11.6 Patch cord should be compatible with high density active network equipment and patch panels
11.7 Patch cords should be available in CAT 6 and requirements defined in the TIA-568-C.2 standard.
11.8 Compatible with industry standard RJ-45 ports in electronic equipment, patch panels, and jacks
11.9 The locking mechanism cannot be released without matching-color extraction tool
11.10 Compatible with high-density network equipment and 1RU 48-port patch panels

11.11 Available in eight colors to reserve, identify, segregate, protect, and secure network ports
11.12 Transparent polymer housing allows color coding while maintaining Link/Status LEDs visibility on active equipment Single system is compatible with all flush and most recessed RJ-45 ports
11.13 Port blocker prevents unauthorized network connection via ports not currently in use
11.14 Made in USA options available
11.15 Common color coded extraction tool used for secure RJ cords and port blockers
11.16 Conductor size: 24 AWG stranded bare copper
11.17 Max O.D.: 5.6mm (.22")
11.18 3Mtre Cord length
11.19 Jacket: LSZH
11.20 Temperature range: -20° C to +60° C
11.21 Operating life: Minimum 750 insertion cycles
11.22 Contact material: Copper alloy
11.23 Contact plating: 50μ" Gold/100μ"Nickel
11.24 Plug dimensions & tolerances compliant with FCC Part 68 & IEC60603-7
11.25 Electrical Characteristics:
11.25.1 Max voltage: 150 VAC (max)
11.25.2 Max current: 1.5A @ 25°
11.26 Operating temperature: -40° C to 85° C
11.27 Suitable for EIA 568A/B applications and must be independently tested and verified by ETL and UL.

1.235 24 PORT MANAGED L-2 ETHERNET SWITCH

12.1 24 Port: Should have min 22 Ports 10/100/1000BaseT/TX + 2 Ports Combo 1000BaseSX (SFP) port loaded
12.2 PERFORMANCE:
12.2.1 24 Port: Switching capacity 48Gbps ; Throughput 35.7Mpps
12.2.2 14,880pps for 10Mbps Ethernet
12.2.3 148,800pps for 100Mbps Ethernet
12.2.4 1,488,000pps for 1000Mbps Ethernet
12.3 MAC addresses 8K
12.4 VLAN ID's available 4K
12.5 Max VLANs 200 tagged + 56 port-based
12.6 Multicast Up to 32 static multicast groups
12.7 Packet buffer 2MB ,DRAM 16MB,Flash 4MB,Switch memory 2MB embedded
12.8 Interface Connections: 10/100/1000T RJ-45 & SFP 100TX, 100FX, 1000T,1000SX or 1000LX
12.9 Standards and Compliance
12.9.1 IEEE 802.3 CSMA/CD;IEEE 802.3i 10T; IEEE 802.3u 100TX; IEEE 802.3z 1000SX/LX
12.9.2 IEEE 802.3z/ab 1000T; IEEE 802.3x Flow control ;IEEE 802.1p Prioritization (four queues)
12.9.3 IEEE 802.1x Authentication; IEEE 802.1d Bridging ; IEEE 802.3ad Link aggregation
12.9.4 IEEE 802.1Q Tagged VLAN; IEEE 802.1d/w Spanning-Tree; Rapid Spanning-Tree
12.10 ENVIRONMENTAL SPECIFICATIONS
12.10.1 Operating temp. 0° C to 45° C (32° F to 113° F); Non-operating temp. -20° C to 70° C (-4° F to 158° F)
12.10.2 Operating humidity 5% to 90% non-condensing; Storage humidity 5% to 95% non-condensing
12.10.3 Vibration IEC 68-2-36; Shock IEC 68-2-29; Drop IEC 68-2-32
12.11 SHOULD SUPPORT THE FOLLOWING

12.11.1 Quality of Service Classification
12.11.2 IEEE 802.1p tagging
12.11.3 Port-based priority; Four priority queues per port
12.11.4 Multicast Support (v4); IGMP snooping (v1/v2)
12.11.5 Static multicast group
12.11.6 IEEE 802.1x Port-based and MAC-based
12.11.7 Network Access Control
12.11.8 Local authentication server (MD5 only)
12.11.9 Remote authentication through RADIUS
12.11.10 Dynamic VLAN assignment
12.11.11 RADIUS client for IEEE 802.1x
12.11.12 DHCP client
12.11.13 Statistics charts in Web
12.11.14 IEEE 802.3x flow control or *HOL blocking
12.11.15 Prevention (*when flow control is off)
12.11.16 Port mirroring
12.11.17 Destination MAC filtering
12.11.18 Ingress/egress rate limiting
12.11.19 Broadcast storming control Switch fabric - non-blocking, full wirespeed
12.11.20 With Enhanced Stacking

1.236 24 PORT SFP MANAGED LAYER-3 SWITCH

13.1 24 Port of 100/1000BaseX, should be loaded with 24 Port of 1000BaseSX (SFP) Multimode fiber optic module
13.2 PERFORMANCE
13.2.1 Switching Capacity 48Gbps & Forwarding Rate 36Mpps
13.2.2 Up to 256K v4 routes & Up to 16K MAC addresses
13.2.3 Up to 80K BGP routes & 4K VLANs
13.2.4 Packet buffer memory:64MB & 160MB 16MB Flash Memory
13.2.5 SHOULD SUPPORT FOLLOWING
13.2.5.1BGP-4; RFC 1771 Border Gateway Protocol 4; RFC 1966 BGP Router Reflection; RFC 1997 BGP Communities Attribute; RFC 1998 Multi-home Routing; RFC 2385 Protection of BGP Sessions via the TCP MD5
13.2.5.2Signature Option
13.2.5.3RFC 2439 BGP Route Flap Damping; RFC 2858 Multrotocol Extensions for BGP-4; RFC 2918 Route Refresh Capability for BGP-4; RFC 3065 Autonomous System Confederations for BGP; RFC 3392 Capabilities Advertisement with BGP-4
13.3 Should be Non-blocking Layer 2 and 3 v4 switching and routing at wire-speed
13.4 Should supports VLAN double tagging & Private VLANs, providing security and port isolation of multiple customers using the same VLAN
13.5 802.1x support for network security
13.6 Full environmental monitoring, with alerts to network manager in case of failure
13.7 Extensive wire-speed traffic classification
13.8 Comprehensive wire speed QoS features
13.9 ADVANCED PROTOCOLS
13.9.1 OSPF, BGP-4, R and Rv2, DVMRP, PIM-SM, PIM-DM

13.9.2 STP, RSTP, MSTP (802.1s)
13.9.3 DHCP Snooping
13.9.4 DHCP Option 82
13.9.5 Port trunking (802.3ad LACP) & Port mirroring
13.10 Asynchronous management port
13.11 SSH for secure management, SNMPv3 & • GUI
13.12 EPSR & VRRP

1.237 UNIFIED TREAT MANAGEMENT (UTM)/FIREWALL

14.1 Should support ASIC based appliance where firewall & VPN and AV scanning are accelerated by ASIC.
14.2 Should not be a hard disk based solution & even if hard disk fails the security functionalities should not stop functioning
14.3 The firewall should provide minimum of 1 Gbps Firewall throughput, VPN throughput of more than 0.5 Gbps with minimum 30 SSL VPN users
14.4 The Firewall Should support at least 2,00,000 concurrent sessions and at least 5,000 new sessions per second.
14.5 Firewall should have features to block applications by name
14.6 Should provide full UTM functionalities like Gateway AV, S, Web category filtering, Antispam & Application control
14.7 Should provide minimum of 4 10/100/1000 interfaces or more.
14.8 The firewall should be able to support high availability and dynamic load balancing for data going through the firewall (active-active)
14.9 The Firewall should support Rv1,Rv2, OSPF .
14.10 Should provide RPS for the Appliance
14.11 The Firewall should support automatic ISP failover as well as ISP load sharing and load balancing for outbound traffic. Should have separate interfaces for terminating dual ISP Ethernet connectivity.

1.238 WIRELESS LANN ACCES POINT

15.1 ANTENNA SPECIFICATIONS
15.1.1 802.11n 3 x 3 MIMO
15.1.2 3 Transmit and 3 Receive chains
15.1.3 Each Radio Three (3) dual-band omni-directional
15.1.4 Internal antennas for diversity for each
15.1.5 802.11n/g/b/a radio
15.1.6 Two (2) dual-band omni-directional
15.1.7 Internal antennas for diversity for each 802.11g/b/a radio
15.2 REGULATION & APPORVALS
15.2.1 Safety: UL 60950-1, EN 60950-1, IEC 60950-1, ANATEL Resolution 238
15.2.2 EMC: FCC Part 15 class B, EN 301 489, VCCI Technical Requirements, V-3/2001.04
15.2.3 ANATEL Resolution 442
15.2.4 Radio (including modular approval) :FCC Part 15 C and FCC Part 15 E,EN 300 328, EN 301 893
15.3 POE: Power PoE (IEEE 802.3af) Power Supply (optional): 48VDC
15.4 WLAN STANDARDS
15.4.1 IEEE 802.11n, 2.4GHz and 5GHz
15.4.2 IEEE 802.11g, 2.4GHz(pure mode, mixed mode)
15.4.3 IEEE 802.11b, 2.4GHz(short/long preamble support)

15.4.4 IEEE 802.11a, 5GHz
15.5 SPECTRUM
15.5.1 Number of simultaneous channels: Up to three simultaneous 802.11n/b/g/a channels
15.5.2 Operating Frequencies:2.412 – 2.472 GHz, 5.15–5.35 / 5.47-5.825 GHz
15.6 MAXIMUM NUMBER OF OVELAPPING CHANNELS
Varies by local regulation
15.6.1 @ 2.4 GHz : b/g 3 x 20MHz channels & 3 x 20MHz channels or 1 x 40MHz and 1 x 20MHz channels
15.6.2 @ 5Ghz: a 13 x 20MHz channels & 13 x 20MHz channels or 9 x 40MHz channels
15.7 SUPPORTED RATES
15.7.1 802.11a 6, 9, 12, 18, 24, 36, 48, and 54 Mbps
15.7.2 802.11g 6, 9, 12, 18, 24, 36, 48, and 54 Mbps
15.7.3 802.11b 1, 2, 5.5, and 11 Mbps
15.7.4 802.11n 20MHz: 6.5, 7.2, 13, 14.4, 19.5, 21.7, 26,28.9, 39, 43.3, 52, 57.8, 58.5, 65, 72.2, 78, 86.7, 104, 115.6, 117, 130, 144.4
15.7.5 40Mhz: 13.5, 15, 27, 30, 40.5, 45, 54, 60,81, 90, 108, 120, 121.5, 130, 135, 157.5, 162, 180, 216, 240, 243, 270, 300
15.8 TRANSMITTER POWER
15.8.1 802.11n 20dBm (2.4GHz and 5GHz)
15.8.2 802.11g/b 20dBm
15.8.3 802.11a 20dBm
15.9 ROGUE AP DETECTION
15.10 Infrastructure Dedicated radio per AP
15.11 Functionality Automated, continuous monitoring, ensures very fast detection of rogue AP(finds a rogue AP in 2 minutes average)
15.12 Additional Features Configurable “white list” of allowed BSSIDs

1.239 WIRELESS CONTROLLER

16.1 STANDARDS COMPLIANCE:
16.1.1 WLAN IEEE 802.11a/b/g/n*
16.1.2 IEEE 802.11i
16.1.3 IEEE 802.11d
16.1.4 Ethernet IEEE 802.3x, full/half duplex
16.1.5 IEEE 802.1q, VLAN tagging
16.1.6 IEEE 802.3af Power over Ethernet
16.2 WIRELESS PERFORMANCE
16.2.1 CHANNELS: Control up to four simultaneous WLAN Channel Blankets, regardless of band CAPACITY : Configurable rate for each channel
16.2.1.1802.11b: 1 to 11 Mbps
16.2.1.2802.11g: 1 to 54 Mbps
16.2.1.3802.11a: 6 to 54 Mbps
16.2.2 TRUEREUSE: Increase aggregate bandwidth of a Wi-Fi channel by enabling denser re-use than cell planning, without co-channel interference
16.2.3 RAOMING : Intra-switch - 0 mSec; Inter-switch < 50 mSec
16.3 SSID & VLAN
16.3.1 SSID Up to 8 ESSIDs per (radio) channel blanket
16.3.2 VLANs 4096 Ethernet VLANs
16.3.3 SSID to VLAN mapping

16.4 MANAGEMENT
16.4.1 User Interface: Secure Web-based GUI
16.4.2 Command Line Interface (CLI)
16.4.3 SNMP Version 2c
16.4.4 Redundancy Master-to-backup auto fallback
16.4.5 Captive Portal Customizable web client captive portal
16.4.6 Upgrades Firmware upgrade through Web/CLI
16.5 SECURITY
16.5.1 Encryption : 802.11i hardware-based encryption for: WEP-64 and WEP-128 WPA-TKIP / AES (CCMP) WPA2-TKIP / AES (CCMP)
16.5.2 Authentication : RADIUS (802.1x),Captive portal authentication, WPA Pre-Shared Key (PSK), WPA2 EAP, TLS, TTLS, LEAP, PEAP, MD5
16.5.3 Security policy :MAC Address-based ACL Per ESSID/BSSID security configuration Built-in wireless intrusion detection (IDS), Captive portal walled garden, Per-user dynamic VLAN assignment
16.5.4 Rogue AP: Built-in, dedicated dual-band scanning using one channel blanket.
16.6 INTERFACES WLAN Ports (to APs) Twenty-four (24) Fast Ethernet ports with IEEE 802.3af PoE LAN Ports (Uplink to Wired LAN), two RJ45 10/100 Ethernet ports (only port one is in use).
16.7 REGULATION/APPROVALS
Safety UL 60950-1, EN 60950-1, IEC 60950-1, ANATEL Resolution 238, EMC FCC Part 15 Class B EN 300386, VCCI Technical Requirements, V-3/2001.04, ANATEL Resolution 442

1.240 Biometric Reader CUM Controller

1.1 Shall support 30000 numbers of transactions
1.2 Shall be able to support 500 templates
1.3 The optical fingerprint sensor shall be without film
1.4 Enrollment time shall be less than 2 seconds
1.5 False acceptance rate shall be less than 0.0001%
1.6 False rejection rate shall be less than 0.01%
1.7 Shall have mono LCD screen
1.8 Shall have on board RS485, RS232 & TCP/IP comm port
1.9 Shall have builtin web server
1.10 Shall support finger print / password / combined type registration mode
1.11 Shall support Wiegand output
1.12 Shall support access management software

1.241. Network Controller

2.1 Shall Stores complete access control and configuration database for up to 32 Reader Interfaces (up to 64 doors).
2.2 The access control system shall interface with combinations of devices with a maximum of:
2.2.1 32 Door/Reader interfaces (up to 64 doors/readers) or
2.2.2 32 input monitor interfaces 9 (up to 512 monitor points) or
2.2.3 32 output control interfaces (up to 384 control relays)
2.3 Shall include HTTP API, Windows® DLL API, and direct communication API.
2.4 Shall allow local connection of a laptop computer for diagnostics and configuration.
2.5 Shall connect to the host and other devices on a TCP/IP network.
2.6 Shall receive and process real time commands from the host software application.
2.7 Shall control and communicate with all connected devices
2.8 Shall buffers offline transactions and uploads to the host when communication is restored

2.9 Shall allow fallback communications via dialup or RF modem if TCP/IP network communication is lost.
2.10 Shall have UL 294 and UL 1076 recognized component.
2.11 Shall mount to any wall surface.
2.12 Shall have communication LED's to indicate the status
2.13 Shall support RJ-45 connector for Ethernet TCP/IP, Four RS-485 connections to interfaces, supervised analog inputs for general purpose applications, non-latching output relays for local alarm annunciation, DC Power input, Tamper input, AC Power Fail input & Battery Fail input
2.14 Shall have 32-bit RISC CPU, 100 MHz
2.15 Shall have 8mb on board memory with 32mb expansion possible

1.242 Reader Interface

3.1 Shall connect to the network controller via RS-485.
3.2 Shall receive and process real time commands from the network controller.
3.3 Shall report all activity to the network controller
3.4 Shall proces off-line access control decisions based on facility code.
3.5 Shall have UL 294 and UL 1076 recognized component.
3.6 Shall mount to any wall surface.
3.7 Shall have communication LED's to indicate the status
3.8 Shall support 2 readers, 2 door monitor switches, 2 request to exit switches, AC fail monitor, battery fail monitor and enclosure tamper monitoring

1.243 Reader Interface

4.1 Web-based System-Administrator's Login to:
4.1.1 Add and manage multiple companies
4.1.2 Add and manage multiple branches of a company
4.1.3 Add administrator to a branch
4.2 Add and manage multiple companies from a single server and shared access control infrastructure. Complete confidentiality of each company's data from other company's administrator.
4.3 Web-based Branch-Administrator's Login to administer all tasks pertaining to an employees and generation of reports
4.4 Add and manage users with 18 standard and 16 custom fields
4.5 Define and manage titles/designations of a specific branch
4.6 Define and manage departments of a specific branch
4.7 Add employee photograph
4.8 Assign access card to an employee
4.9 Define card start and expiry date
4.10 Assign up to 8 access groups to an employee, out of which upto 4 other branch access groups can be defined
4.11 Assign current and future time attendance rules to an employee
4.12 Define privilege level of an employee, one or more than one of the following privileges can be assigned:
4.12.1 Administrator
4.12.2 Report Viewer
4.12.3 Personal Report
4.12.4 iSpot
4.12.5 Group User
4.12.6 Security Administrator

4.12.7 Security Viewer
4.12.8 None
4.13 Assign User Group to an employee. The feature empowers the project coordinators, floor-managers or project managers to manage access & time attendance rules and view reports of a specific user-group. Thus the feature lowers the burden on branch-HR manager
4.14 Define and manage user groups
4.15 Special web-based report-viewer's login for generating organizational time attendance and access reports
4.16 Special web-based individual employee's login to view personal time attendance reports
4.17 Special web-based Project Manager(PM)'s login to view personalized team attendance reports and assign access and time attendance rules to his/her team
4.18 iSpot view to spot an employee's current location. This feature empowers the system user such as a receptionist to enquire the presence and position of an employee in business premises, within seconds.
4.19 Import user information from excel format
4.20 Export user information to excel format
4.21 Advanced search form to search users on fixed and mixed search criteria such as: name, department title, access group, time attendance rule,
4.22 Define and manage Time Codes
4.23 Define and manage Time Zones
4.24 Define and manage Holidays (yearly repeatable and yearly non-repeatable)
4.25 Define and manage Holiday Groups
4.26 Define and manage Door/Reader Groups
4.27 Define and manage Access Groups
4.28 Define and manage Shifts:
4.28.1 Day Start Time
4.28.2 Shift Start Time
4.28.3 Shift End Time
4.28.4 Late coming half day
4.28.5 Early going half day
4.28.6 Minimum full day hours
4.28.7 Minimum half day hours
4.28.8 Non-working hours
4.29 Define and manage Weekly shifts
4.30 Generate following reports:
4.30.1 Daily Report
4.30.2 Individual report
4.30.3 Individual detailed report
4.30.4 Daily Summary
4.30.5 Individual Summary
4.30.6 Reader Access report
4.30.7 Employee Access report
4.31 Export report in various standard formats such word, excel, pdf etc.
4.32 Support for all smart card technologies such as iClass-any format, HIDprox, Mifare, Desire etc

4.33 System can be configured to support various card technologies simultaneously. This feature enables users to easily migrate from one card technology to another or different users to possess different smart cards.
4.34 Database supported: Microsoft SQL server
4.35 Configure and manage multiple controllers
4.36 Configure and manage multiple interfaces to each controller
4.37 Configure readers as In, Out, Login, Logout or Login-Logout
4.38 Define and manage door alarms such as door forced, door held, reader tamper, AC fail and battery fail alarms
4.39 Configure anti-pass back on a reader
4.40 Define and manage digital inputs and outputs from emergency doors, fire alarms, CCTV cameras or any other sensors or actuation devices
4.41 Define and manage digital outputs based on reader events such as Card read, Card accepted (Access granted) or Card Denied (Access Denied). This feature can help configure CCTV system to perform a certain task when user shows card on the reader.
4.42 Monitor and control doors and alarm status
4.43 Monitor and control input-output status in the real time
4.44 Manage door locks and alarms through commands such as Lock, Unlock, Permanent Lock, and Close Alarm
4.45 Support for special access control hardware such as turnstiles and boom barriers
4.46 Support for biometric and smart card based readers
4.47 Support for special access control hardware such as Turnstiles, boom-barriers etc
4.48 Seamless integration with existing ERP, HR and legacy systems through specialized database views
4.49 Distributed and segmented database architecture to manage multiple remote branches
4.50 Database administration module:
4.50.1 to take periodic database backups
4.50.2 to restore database
4.50.3 to delete undesired log tables
4.50.4 database replication
4.50.5 database creation

1.244 Cable & Conduit

SL.NO	CONNECTION	CABLE	MAX
4.4	Controller to Reader	22 AWG 8 Core Shielded	150 Mtr
4.2	Controller to Egress Button	18 AWG 4 Core Shielded	150 Mtr
4.3	Controller to Lock	18 AWG 4 Core Shielded	150 Mtr
4.4	Controller to Controller	24 AWG 4 / 8 Core Shielded	1200
4.5	Controller to LAN	CAT5/CAT 6	100 r

1.245 Power Cable

4.6.1 Size / No. of cores: 3 x 1.5 sq. mm / 3 x 4 sq. mm
4.6.2 Conductor: Copper
4.6.3 Core Insulation: PVC Insulation (as per IS 1554/Part-1/1988)

4.6.4 FRLS TYPE
4.6.5 Shall comply IS code

1.246 Break Glass Unit

4.7.1 The BGU shall be Semi-flush or surface mounting
4.7.2 Shall be green in color
4.7.3 Shall be labelled as “Break Glass to Release Door”
4.7.4 BGU shall be resettable type
4.7.5 IP rating shall be minimum 24
4.7.6 Shall provide output to the access controller for monitoring the BGU status and disarm the door if the contact is closed

1.247 Electromagnetic Lock

4.8.1 Shall be used with both Single & Double Swing Doors
4.8.2 Shall be Dual Voltage Selectable (12 VDC or 24 VDC)
4.8.3 Shall consume low current
4.8.4 Holding force shall be reliable
4.8.5 Door position sensor output shall be available
4.8.6 Anti-Tamper Jam Nuts shall be available
4.8.7 Casing shall be anodized aluminum type
4.8.8 Shall have LED indicator for indicating EM lock status
4.8.9 Shall be protected from surge & spike
4.8.10 Shall be suitable for use with Glass, wood & metal door
4.8.11 Shall be of 600 & 1200lb holding force type whichever is applicable

Strategically placed video surveillance cameras shall enhance security by providing continuous monitoring of all parts of the premises.

A. All equipment and materials used shall be standard components that are regularly manufactured and used in the system.

B. All systems and components shall have been thoroughly tested and proven in actual use.

1.248 APPLICABLE STANDARDS

Original Equipment Manufacturer Standard

1) APPROVALS

All the cameras should be

A. CE Compliant
B. UL Listed and
C. EN

1.249. Fixed dome IR Cameras Specification:-

1.1 The high performance 960H 1/3-inch Double Scan (DS) CCD sensor shall provide a resolution of 720TVL

1.2 The camera shall support WDR function, which ensures the best image performance under difficult (high contrast) lighting conditions.

1.3 Shall have water resistant IP66 rated housing
1.4 Shall have vandal resistant IK8 rated housing
1.5 The camera is easy to install and can be adjusted around 3 axes
1.6 The camera shall have integrated 18 IR LED’s for providing 20meters of night vision
1.7 The cameras shall be available with 2.8 to 10.5 mm varifocal lens
1.8 Shall support built-in motion detection
1.9 Shall be of UL / EN standard

1.250. IR Bullet Camera:-

2.1 The high performance 960H 1/3-inch Double Scan (DS) CCD sensor shall provide a resolution of 720TVL

2.2 The camera shall support WDR function, which ensures the best image performance under difficult (high contrast) lighting conditions.

2.3 Shall have water resistant IP66 rated housing

2.4 Shall have vandal resistant IK8 rated housing

2.5 The cameras shall be available with 2.8 to 12 mm varifocal lens

2.6 The true day/night feature automatically switches from color to monochrome using a mechanical IR filter depending on the available light

2.7 The integrated infrared LED's shall provide up to 30 m (100 ft) of night vision

2.8 Shall support built-in motion detection

2.9 Shall be of UL / EN standard

1.251 Digital Video Recorder.

3.1 Shall support 16 Channel 4CIF real-time digital recording

3.2 Shall have flexible high-resolution HDMI and VGA monitor outputs

3.3 Shall support hybrid camera viewing and recording

3.4 Shall support remote viewing, playback, control, and configuration

3.5 Mobile Device support for viewing shall be available

3.6 The recorder is also available with a built-in DVD writer

3.7 Shall supports up to 2 SATA hard drives, max. 2TB each internally

3.8 Shall have 4 Relay outputs, configurable NO/NC

3.9 Shall support Pelco P and D (over RS-485) Bosch OSRD (over RS-485 or RS-232 with the optional LTC 8786 Series Biphase Converter)

3.10 Display Modes: Monitor A Full, quad, multi-screen (live and playback), full sequence, alarm call-up (live) and Monitor B Full, quad, multi-screen, full sequence, alarm call-up

3.11 Recording Modes: Normal partition Continuous recording (with or without overwriting) Event partition Input and motion recording (with or without overwriting)

3.12 Shall be of UL / EN standard

1.252 Keyboard.

4.1 The keyboards shall be full function, multipurpose keyboards.

4.2 Shall be used for system control and programming.

4.3 Shall include an integral variable speed pan/tilt/zoom (PTZ) joystick and a splash resistant design.

4.4 Shall be desktop & rack mounting type

4.5 Shall comply with CE regulations, UL, CSA & EN Standards

1.253. Monitor

5.1 The display size shall be 21"

5.2 The monitor shall be LED type

5.3 Shall support HDMI, DVI & VGA connectors

5.4 Power source shall be 100 to 240V~

1.254 Co-axial cable

6.1 Centre Conductor Dia. Shall be 0.8mm for RG59e, 1.02mm for RG6 and 1.63mm for RG11 cables

6.2 Insulation Dia shall be 3.55 mm for RG59e, 4.57 mm for RG6 and 7.11mm for RG11 cables

6.3 Outer Conductor 1st shield shall be ALUMINUM Foil Tape With Overlap and 2nd shield shall be aluminum alloy braiding,

6.4 Nom Dia 6.2mm for RG59e, 7.25mm for RG6 & 10.3mm for RG11

6.5 Normal impedance shall be 75ohms for all 3 types of cables

6.6 The cable shall be manufactures in accordance IS codes

1.255 PVC Conduit

7.1 The PVC Conduit shall be FRLS type

7.2 The thickness of PVC conduit shall be 2mm

7.3 The size of conduit shall be 3/4" or 1"

7.4 Standard of Construction: ISI Standards

1.256 Fire detection & alarm system

Basis of Design

• An Intelligent Fire Alarm System (IFAS) shall be provided to effect total control over the life safety services required in the facility. The IFAS shall be of the digital, distributed processing, real time, and multitasking, multi-user and multi-location type. IFAS shall be integrated to Building Automation System and **Security System.**

• The Fire Alarm system shall consists of an Operator Station with latest windows operating system based, graphical user interface software running on it. The operator workstation & Fire Alarm main panels shall be located in the Fire Control Room / BMS room. Repeater panel shall be located in the Security area.

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

1. HVAC System
2. Public Address System
3. Lifts

Standards & approvals

The system shall meet the following design Standards.

1. IS:2189 & Local Fire Code
2. EN standards
3. UL standards

Fire alarm control panel (FACP)

- The distributed Intelligent Fire Alarm Control Panel (FACP) shall function as fully stand-alone panel. FACP shall have its own microprocessor, software and memory and should be listed under UL / EN. Each loop shall be capable of handling 254 elements per loop.
- The fire panel is available with two different housings:
  - Housing for mounting directly on the wall
  - Frame installation housings which are fitted to the mounting frame and can be swiveled.
- The System shall support Interconnection of up to 32 Panel Controllers, Remote Keypads, and OPC servers
- Shall have TFT touch screen
- Control panels with more than 512 detectors / call points must be connected redundantly, that means redundant controller shall be provided
- The memory data for panel configuration and operation shall reside in non-volatile memory (EEPROM). Removal of the board shall not cause loss of memory.
- FACPs shall supervise detection circuits and shall generate an alarm in case of abnormal condition.

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- resolution LCD touch-screen with automatically activated
- The repeater panel shall mimic all display information from the host FACP and the other FACP's on
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- The repeater panel shall have status LED's for Power, Alarm, Trouble, Supervisory, and Alarm
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- less than 3 ½ ft (1.1 m) and not more than 4 ½ ft (1.37 m) above floor level unless otherwise
-
-
-

3 The size of conduit shall be 3/4" or 1"
4 Shall comply IS code

2. Supplementary Information Regarding Works to be procured

2.1 The Contractor shall execute the whole work in the most substantial and workman like manner in strict accordance with the specifications, approved design, drawings, particular specifications, special conditions, additional conditions and instructions of the Engineer-in-Charge.

2.2 Before tendering, the Contractor shall inspect the site of work and structures and shall fully acquaint himself about the conditions prevailing at site, availability of water, availability of materials, availability of land and suitable location for construction of go-downs, stores and camp, transport facilities, constraints of space for establishing design mix plants ,weather condition at site, the extent of leads and lifts involved in execution of work etc., which may affect or influence the tenders. It shall be deemed that the Contractor has satisfied himself as to the nature and location of the work, transport facilities, availability of land for setting up of camp, etc. The department will bear no responsibility for lack of such knowledge and the consequences thereof. To be read along with GCC 7.2 of ITB.

2.3 The Contractor shall at his own expense and risk arrange land for accommodation of labour, setting up of office with minimum requirement (as per drawing attached), storage of materials, erection of temporary workshops, including land required for carrying out of all jobs connected with the completion of the work. However, the departmental land to the extent available may be allowed to be used for these purposes free of rent without accepting any responsibility for the delay, if any, on this account. The Contractor shall have to abide by the regulations of the authorities concerned and the directions of the Engineer-in-Charge for use of land available at the site of work. If it becomes necessary during construction to remove or shift the stored materials, shed, workshop, access roads, etc, to facilitate execution of the work included in this agreement or any other work by any other agency, the Contractor shall remove or shift these facilities as directed by the Engineer-in-Charge and no claim whatsoever shall be entertained on this account.

2.4 The Contractor shall carry out true and proper setting out of the work in co-ordination with the Engineer-in-Charge or his authorized representatives and shall be responsible for the correctness of the positions, levels, dimensions and alignments of all parts of the structure. If at any time during the progress of the work any error appears or arises in the position, level, dimensions or alignment of any part of the work, the Contractor on being asked to do so by the Engineer-in-Charge, shall rectify such error to the entire satisfaction of Engineer-in-charge. The checking by the Engineer-in-Charge or his authorized representatives shall not relieve the Contractor of his responsibility for the correctness of any setting out of any line or level. The Contractor shall carefully protect and preserve all bench marks, pegs and pillars provided for setting out of works.

All setting out activities concerning establishment of bench marks, theodolite stations, center line pillars, etc. including all material, tools, plants, equipment, theodolite and all other instruments, labour, etc. required for performing all the functions necessary and ancillary thereto at the commencement of the work, during the progress of the work and till the completion of the work shall be carried out by the Contractor and nothing extra shall be paid on this account.

2.5 The work shall be carried out in the manner complying in all respects with the requirement of relevant rules and regulations of the local bodies under the jurisdiction of which the work is to be executed and nothing extra shall be paid on this account.

2.6 For completing the work in time, the Contractor may have to work in two or more shifts and no claims whatsoever shall be entertained on this account, notwithstanding the fact that the Contractor

will have to pay to the laborers and other staff engaged directly or indirectly on the work according to the provisions of the labour regulations and the agreement entered upon and/or extra amount for any other reasons.

2.7 The Contractor shall make his own arrangements for water and for obtaining electric connections if required and make necessary payments directly to the State / Central Govt. departments concerned. Contractor shall get the water tested from laboratory approved by the Engineer-in-charge at regular interval as per the CPWD Specifications 2009. All expenses towards collection of samples, packing, transportation etc. shall be borne by the Contractor.

2.8 The drawings for the work issued by the Engineer-in-Charge during execution of work shall at all times be properly correlated before executing any work and no claim whatsoever shall be entertained for discrepancies in the drawings.

2.9 The works to be governed by this contract shall cover delivery and transportation up to destination, safe custody at site, insurance, erection, testing and commissioning of the entire works. The works to be undertaken by the Contractor shall inter-alia include the following:

(i) Pre-commissioning tests as per relevant standard specifications, code of practice, Acts and Rules wherever required.

(ii) Warranty obligation for the equipment's and / or fittings/fixtures supplied by the Contractor. Contractor shall provide all the shop drawings or layout drawings for all the coordinated services before starting any work or placing any order of any of the services etc. These shop drawings /layout drawings shall be got approved from Engineer-in-charge before implementation and this shall be binding on the Contractor. The Contractor shall submit material submittals along with material sample for approval of Engineer-in-charge prior to delivery of material at site.

2.10 The Contractor shall maintain in good condition all work executed till the completion of entire work entrusted to the Contractor under this contract.

2.11 No payment shall be made to the Contractor for damage caused by rain, whatsoever during the execution of works and any damage to the work on this account shall have to be made good by the Contractor at his own cost.

2.12 Unless otherwise provided in the Bill of quantities, the rates tendered by the Contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building and nothing extra shall be payable to him on this account.

2.13 No claim whatsoever for idle labour, additional establishments, costs of hire and labour charges for tools and plants, scaffolding etc, would be entertained under any circumstances.

2.14 The Contractor (s) shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night. In case of any accident of labours/ contractual staffs the entire responsibility will rest on the part of the Contractor and any compensation under such circumstances, if becomes payable, shall be entirely borne by the Contractor.

2.15 Contractor shall within two weeks of award of work, submit to the Engineer-in-Charge for his approval, list of measures for maintaining safety of manpower deployed for construction and avoidance of accidents.

i) IS 3696 Part I Safety Code for scaffolds and ladders.
ii) IS 3696 Part II Safety Code for scaffolds and ladders Part II ladders.
iii) IS 764 Safety Code for excavation work.
iv) IS 4138 Safety Code for working in compressed air.
v) IS 7293 Safety Code for working with construction machinery.
vi) IS 7969 Safety Code for storage and handling of building materials.
vii) IS 4130 Safety code for demolition of buildings.

2.16 For the safety of all labour directly or indirectly employed in the work the Contractor s shall, in addition to the provision of CPWD safety code and directions of the Engineer-in-Charge, make all arrangements to provide facility as per the provision of Indian Standard Specifications (Codes) listed below and nothing extra shall be paid on this account.
The Contractor shall employ at site an experienced staff having qualification in safety (HSE) at all times to oversee the safety requirements and adherence of the same

2.17 Scaffolding: Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the Contractor. It shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. It shall be designed to take all incidental loads and the designs shall be submitted to the Engineer-in-Charge and got approved. It should cater to the safety features for workmen. It shall be ensured that no damage is caused to any structure due to the scaffolding. Nothing extra shall be payable on this account.

2.18 Royalty if any payable and all other incidental expenditure shall have to be paid by the Contractor on all the boulders, metal shingle, earth, sand bajri, etc. collected by him for the execution of the work, direct to the concerned Revenue Authority of the State or Central Govt. and the amount paid shall not be reimbursed in any form whatsoever.

2.19 On account of security considerations, 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. Nothing extra shall be paid on this account.

2.20 Stacking of materials and excavated earth 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.

2.21 Unless otherwise specified in the Bill of Quantities the rates for all items of work shall be considered as inclusive of working in or under water and/or liquid mud and/or foul conditions including pumping or bailing out liquid mud or water accumulated in excavations during the progress of the work from springs, tidal or river seepage, rain, broken water mains or drains and seepage from subsoil aquifer.

2.22 Some restrictions may be imposed by the State Government on quarrying of sand, stones etc, from certain areas. For timely completion of work the Contractor shall have to bring such materials from other quarries located elsewhere.

2.23 The Contractor shall give ten years guarantee in the prescribed proforma for water proofing items specified in the Bill of quantities. In addition to this 10% of the quoted cost of items shall be retained either in cash /fixed deposit or in the form of bank guarantee, which shall be released after the expiry of ten years from the date of completion if no defects are found in water proofing or the defects are made good. This amount shall be adjusted against the expenses incurred on making good the defects if the Contractor commits breach of guarantee.

2.24 The Contractor shall arrange to keep the premises neat and clean. The rubbish/malba and unserviceable materials shall be removed on day to day basis. In case of non-compliance a penalty of Rs. 5,000/- per day will be levied on the Contractor.

2.25 All the hidden items such as water supply lines, drainage pipes, conduits, sewers etc. are to be properly tested as per the design conditions before covering and their measurements in computerized measurement book duly test checked shall be deposited with Engineer in charge or his authorized representative, prior to hiding these items.

2.26 Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to local bye-laws rules and specification of municipal / corporation, If CPWD Specifications are

not available for the same. The Contractor should engage licensed plumbers for the work and get the materials (fixtures/fittings) tested by the Municipal Body/Corporation authorities wherever required at his own cost.

2.27 Miscellaneous Requirements:

a) Display Board showing detail of work, weekly progress achieved with respect to targets, reason of shortfall, status of manpower, wages being paid for different categories of workers.

b) Entrance and area surrounding to be kept clean.

c) Display layout plan key plan, Building drawings including plans, elevations and sections.

d) Display of up to date Bar chart, CPM and PERT Chart etc.

e) Keep details of quantities executed, balance quantities, deviations, possible Extra item, substituted Item etc.

f) Keep one sets of plastic / cloth mounted building drawings.

g) Sets of Helmets and safety shoes for exclusive use for officers/dignitaries visiting at site.

3. Personnel Requirements

Using Form PER-1 and PER-2 in Section 4 (Bidding Forms), the Bidder must demonstrate it has personnel that meet the following minimum requirements:

No.	Position	Total Work Experience [years]	Experience In Similar Work [years]
1	Project Manager – 1 no. Graduate in Civil Engineering	10	7
2	Site Engineer (Civil) – 1no. Graduate/ Diploma in Civil Engineering	7	5
3	Site Engineer (Electrical) – 1no. Graduate/ Diploma in Electrical Engineering	7	5
4	Safety Engineer (HSE) – 1no. Diploma with Certificate in HSE	3	3
5	Site Supervisors – 3nos. Diploma/ITI in Civil (2nos.) and Electrical (1no.)	3	3
6	Other staff (admin/Store keeper) – 2nos.	5	3

4. Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate it has the key equipment listed below:

No.	Equipment Type and Characteristics	Minimum Number Required
1	Concrete mixer with hopper & Weigh batching arrangement	1 no.
2	Earth Moving Equipment JCB/Excavator	1 no.(as required)
3	Road Roller of required Capacity (8-12 MT)	1 no.
4	Needle/Surface vibrators	3 nos. each
5	Shuttering material/ Steel/Wooden scaffolding	As required
6	DG set	1 no.
7	Pumps/Motors	3 nos.
8	Water storage tanks- 5000ltr /1000ltr capacity	3 nos. each
9	Welding equipment	1 no.
10	Hoist	1 no.

Secretary

Cochin Co Operative Hospitals Society Ltd No: E 288

5. Environment Management Plan

5.1 List of Equipment for Field Testing Laboratory and Field Testing Instruments

1. Balances
   (i) 7 Kg to 10 kg capacity, semi-self indicating type- Accuracy 10 gm
   (ii) 500 gm capacities, semi-self indicating type- Accuracy 1 gm
   (iii) Plan balance- 5kg capacity- Accuracy 10 gms
2. Ovens- electronically operated, thermostatically controlled upto 110oC to 10C.
3. Sieves as per IS 460-1962.
   (i) IS sieves - 450mm internal dia, of sizes 100mm, 80mm, 63mm, 50mm, 40mm, 25mm, 12.5mm, 10mm, 6.3mm and 4.75mm complete with lid and pan.
   (ii) IS sieves - 200mm internal dia(brass frame), consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 212 microns, 90 microns, 75 microns with lid and pan.
4. Sieve shaker capable of 200mm and 300 mm dia sieves, manually operated with timing switch assembly.
5. Equipment for slump test-slump cone, steel plate, tamping rod, steel scale, scoop.
6. Dial gauges, 25mm travel- 0.01mm/division least count-2 nos.
7. 100 tonnes compression testing machine, electrical cum manually operated.
8. Graduated measuring cylinders 200 ml capacity – 3 Nos.
9. Enamel trays (for efflorescence test of bricks)
   (i) 300 mm x 250 mm x 40 mm – 2 Nos.
   (ii) Circular plates of 250mm dia 4 Nos.
10. Steel tapes-3m
11. Vernier calipers
12. Micrometer screw 25mm gauge.
13. A good quality plumb bob.
14. Spirit level, minimum 30cms long with 3 bubbles for horizontal vertical.
15. Wire gauge (circular type) disc.
16. Foot rule
17. Long Nylon thread
18. Rebound hammer for testing concrete.
19. Dynamic penetrometer.
20. Magnifying glass.
21. Screw driver 30cms long
22. Bell pin hammer, 100 gms
23. Plastic bags for taking samples.
24. Moisture meter for timber.
25. Earth resistance test.
26. Megger
27. Total station – 1No.

5.2 QUALITY ASSURANCE PLAN

CONTENTS

1: INTRODUCTION

1.1 This QA Plan document contains the brief code specifications and frequency of tests to be carried out for each item of work as per IS standards. A model QA Plan has been drawn up. The QA plan is not exhaustive and will be broadened to include all mandatory tests for all materials as processes that are involved in execution of this work. The contractor is therefore bound to carry out all such test that will be require for the execution of work irrespective of whether the same is included in the QA plan or not.

1.2 The detailed specifications for each item of work are given in the Contract document, and the Contractor is requested to go through all of them and execute the work as per directions given therein.

1.3 The QA plan and specifications have been prepared with the latest CPWD standards and wherever any relevant information is absent, the specifications and code provisions shall prevail.

1.4 The Engineer-in-charge has the authority to interpret or clarify the QA Plan and insist on a more stringent course, if so desired or to place any such standard as he may deem necessary for the work.

1.5 Any Indian Standard / International Standard / manual referred in this QA Plan shall mean the latest revision / edition with all additions and amendments issued thereto.

1.6 This QA Plan is to be read in conjunction with the detailed specifications, Additional specifications, Quality Assurance and other conditions in Section 6 (Employer's Requirements) of the Contract document.

1.7 This QA Plan is complementary to the Contract Conditions and is not to be read independently.

2: CARRIAGE OF MATERIALS

2.1 GENERAL

The carriage and stacking of materials shall be done as directed by the Engineer. All tools and plants required for the work will be considered as covered by the cost of the work and shall be arranged by the Contractor. The carriage of materials includes loading within a lead of 50 metres, unloading and stacking within a lead of 50 metres.

2.2 RESPONSIBILITY FOR LOSS OR DAMAGE

Loading, carriage, unloading and stacking shall be done carefully to avoid loss or damage to the materials. Mode of carriage depending upon the feasibility and economy, the Engineer shall determine the mode of carriage viz. whether by mechanical or animal transport or manual labour.

2.3 LEAD

2.3.1 All distances shall be measured over the shortest practical route and not necessarily the route actually taken.

2.4 STACKING

Material shall be stacked as directed by the Engineer in such a manner as to ensure the preservation of their quality and fitness for the work. Different types of materials shall be stacked separately and in such a way that counting and measurements can be done without disturbing the stacks.

2.5 MEASUREMENTS

Length, breadth and height of stacks shall be measured correct to a cm. The quantity shall be worked out in cubic metre correct to two places of decimal. The volume of stacks, shall be reduced by

percentages as shown against each for looseness in stacking to arrive at the net quantity for payment. No reduction shall be made in respect of articles or materials for which mode of payment is by length or weight or number.

a) Earth
b) In loose stacks such as cart loads, lorry loads, etc. - 20%
c) In fills consolidated by light mechanical machinery -10%
d) In fills consolidated by heavy mechanical machinery but not under OMC (Optimum Moisture Content) - 5%.
e) In fills consolidated by heavy mechanical machinery at OMC - Nil.
f) Consolidated fills in confined situation such as under floors, etc. - Nil.

2.5.1 Manure or sludge - 8%.

2.5.2 Murrum, building rubbish Lime and sand -Nil.

2.5.3 Stone metal, 40 mm nominal size and above -7.5%.

2.5.4 Coarse aggregate / stone metal below 40 mm nominal size - Nil.

2.5.5 Soling Stone/Boulder 100 mm and above -15%.

2.5.6 Excavated rocks - 50%.

2.6 RATE

2.6.1 The rate for carriage of materials is inclusive of all the operations described above.

3: EARTH WORK

3.1 ANTIQUITIES AND USEFUL MATERIALS

3.1.1 Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of antique or monetary value shall be delivered to the Engineer-in Charge and shall be the property of the Government. Necessary security and/ or watching arrangements shall be provided by the Contractor until the antiquities are taken over by the Government, if it is necessary in the opinion of the Engineer

3.1.2 Any material obtained from the excavation which in the opinion of the Engineer is useful, shall be stacked separately in regular stacks as directed by the Engineer and shall be the property of the Employer.

3.2 PROTECTIONS

3.2.1 Excavation where directed by the Engineer shall be securely fenced and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red lights during the night to avoid accidents. While working in roads having traffic, additional caution boards shall be displayed and maintained at 50 metres away from the ends of working reach or as directed by the Engineer and to compliance with traffic regulations.

3.2.2 The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes & chambers, communication cables, power supply cables etc. met with in the course of excavation shall be properly supported and adequately protected, so that these services remain functional.

3.2.3 Excavation shall not be carried out below the foundation level of the adjacent buildings until underpinning, shoring etc. is done as per the directions of the Engineer.

3.3 EARTH WORK AND PIPE BEDDING

a) Trench widths shall be as per the following Tables 3.1 to 2.3

TABLE 3.1: Pipes laid under the roads wider than 3.0 m

Sl. No.	Outside dia of pipe (mm)	Width of Trench (mm)	Depth of trench (mm)	Remarks
1	50	500	1200	Provide 150 mm thick sand bedding where soils are poor or rock is met with. Increase the depth of trench by 150mm in such cases
2	63	500	1250	
3	75	500	1250	
4	90	500	1250	
5	110	550	1300	
6	125	550	1300	
7	140	550	1300	
8	160	600	1350	
9	180	600	1350	
10	200	600	1350	
11	225	650	1400	
12	250	650	1400	
13	280	700	1450	
14	315	750	1500	
15	355	750	1550	
16	400	800	1550	

TABLE 3.2: Pipes laid under the roads less than 3.0 m wide/foot paths and valves provided

Sl. No.	Dia of pipe (mm)	Width of Trench (mm)	Depth of trench (mm)	Remarks
1	50	500	900	Provide 150mm thick sand bedding where soils are poor or rock is met with. Increase the depth of trench by 150mm in such cases
2	63	500	950	
3	75	500	950	
4	90	500	950	
5	110	550	1000	
6	125	550	1000	
7	140	550	1000	
8	160	600	1050	
9	180	600	1050	
10	200	600	1050	
11	225	650	1100	
12	250	650	1100	
13	280	700	1150	
14	315	750	1200	
15	355	800	1250	
16	400	800	1250	

TABLE 3.3: Pipes laid under roads less than 3.0 wide /foot paths and no valves provided

Sl. No.	Dia of pipe (mm)	Width of Trench (mm)	Depth of trench (mm)	Remarks
1	50	500	800	Provide 150mm thick sand bedding where soils are poor or rock is met with. Increase the depth of trench by 150mm in such cases
2	63	500	800	
3	75	500	850	
4	90	500	850	
5	110	550	900	
6	125	550	900	
7	140	550	900	
8	160	600	950	
9	180	600	950	
10	200	600	950	
11	225	650	1000	
12	250	600	1000	
13	280	700	1050	
14	315	750	1100	
15	355	800	1150	
16	400	800	1150	

The trench spoil material should be placed where it will not interfere with stringing and jointing of the pipes

3.3.1 Chemical Treatment

"CHLOROPYRIFOS EMULSIFIABLE CONCENTRATE – 1%" shall be used for anti-termite treatment.

The anti-termite treatment shall be applied to the soil beneath the building and around the foundation. Further, the treatment shall be applied on the sides of foundation and basement and to the top surface of the filled earth within the plinth walls.

Treatment to soil is provided in accordance with IS 6313 (part II) and on sides of structures as per IS 6313 (Part III). The chemical shall be applied by spraying using hand operated pressure pumps.

4: PLAIN CEMENT CONCRETE WORK

CONCRETE WORK		
LIST OF BUREAU OF INDIAN STANDARD CODES		
1	IS 383	Specification for coarse and fine aggregate from Natural Source for Concrete
2	IS 456	Code of practice for plain and reinforced concrete
3	IS 516	Method of test for strength of concrete
4	IS 1199	Method of sampling and analysis of concrete
5	IS 1200 (Part II)	Method of measurement of building and civil engineering work (Concrete work)
6	IS 1322	Specification for bitumen fleet for water proofing and damp Proofing
7	IS 1791	Specification for batch type concrete mixers
8	IS 2386	Method of test for aggregate for concrete work
	Part I	Particle size and shape
	Part II	Estimation of deleterious materials and organic impurities

	Part III	Specific gravity, density, voids absorption and bulking
	Part IV	Mechanical properties
9	IS 2645	Specification for integral cement water proofing components
10	IS 4656	Specification for form vibrators for concrete
11	IS 7861	Code of practice for extreme weather concreting (Part I) recommended practice for hot weather concreting
12	IS 7861 (Part II)	For cold weather concreting
13	IS 9103	For admixtures for concrete
14	IS 10262	Recommended guidelines for concrete mix designs

TABLE 4.1 Graded Stone Aggregate or Gravel

IS Sieve Designation	Percentage passing (by weight) for nominal size			
	40mm	20mm	16mm	12.5mm
75mm	100	-	-	-
37.5mm	95 to 100	100	-	-
19mm	30 to 70	95 to 100	100	-
16mm	-	-	95 to 100	100
11.2mm	-	-	-	90 to 100
9.5mm	10 to 35	25 to 55	30 to 70	40 to 85
4.75mm	0 to 5	0 to 10	0 to 10	0 to 10

Table 4.2: Grades of Concrete

Group	Grade Designation	Specified Characteristic Compressive Strength of 150 mm Cube at 28 Days in N/mm²
Ordinary Concrete	M10	10
	M15	15
	M20	20
Standard Concrete	M25	25
	M30	30
	M35	35
	M40	40
	M45	45
	M50	50
	M55	55
High Strength Concrete	M60	60
	M65	65
	M70	70
	M75	75
	M80	80

NOTES

1. In the designation of concrete mix the letter M refers to the mix and the suffixed number to the specified compressive strength of 150mm size cube at 28 days, expressed in N/mm2.

2. For concrete of compressive strength greater than M55, design parameters given in the standard may not be applicable and the values may be obtained from specialized literatures and experimental results.

Table 4.3: Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20mm Nominal Maximum Size

Sl. No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water Cement Ratio	Minimum Grade of Concrete
i)	Mild	220	0.6	-	300	0.55	M20
ii)	Moderate	240	0.6	M15	300	0.5	M25
iii)	Severe	250	0.5	M20	320	0.45	M30
iv)	Very Severe	260	0.45	M20	340	0.45	M35
v)	Extreme	280	0.4	M25	360	0.4	M40

NOTES

1. Cement content prescribed in this table is irrespective of the grades of cement. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.
2. Minimum grade for plain concrete under mild exposure condition is not specified.
3. The above minimum cement content and maximum water cement ratio apply only to 20mm nominal maximum size aggregate. For other sizes of aggregates, these should be changed as per Table 6 of IS 456:2000.
   The minimum grade of concrete for plain and reinforced concrete shall be as per Table 4.2

4.1. The concrete mix proportion chosen should be such that the concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available. Suggested ranges of workability of concrete measured in accordance with IS 1199 are given below:

Placing Conditions	Degree of Workability	Slump (mm)
Blinding concrete;	Very low	See 3.2.2.2
Shallow sections;		
Pavement s using pavers		
Mass concrete;	Low	25-75
Lightly reinforced sections in slabs, beams, walls, columns;		
Floors;		
Hand placed pavements;		
Canal lining;		
Strip footings		
Heavily reinforced sections in slabs;	Medium	50-100
Beams, walls, columns;		
Slip form work;	Medium	75-100
Pumped concrete		
Trench fill;	High	100-150
In-situ piling		
Tremie concrete	Very high	See 3.2.2.3.

NOTE

For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used (see also 3.2.9)

Table 4.4: Slump of Concrete for Various Types of construction

SLUMP (in mm) FOR VARIOUS TYPES OF CONSTRUCTION		
	Maximum (mm)	**Minimum (mm)**
Reinforced foundation walls and footings	75	25
Plain footings and substructure walls	75	25
Slabs, Beams, and reinforced walls	100	25
Building columns	100	25
Pavements	50	25
Heavy mass construction	50	25

Table 4.5: Proportions for Nominal Mix Concrete

Grade of Concrete	**Total Quantity of Dry Aggregates by Mass per 50Kg of Cement. To be taken as the Sum of the Individual Masses of Fine and Coarse Aggregates, Kg, Max**	**Proportion of Fine Aggregate to Coarse Aggregate (by Mass)**	**Quantity of Water per 50kg of Cement, Max**
M5	800	Generally 1:2 but subject to an upper limit of 1:1.5 and a lower limit of 1:2.5	60
M7.5	625		45
M10	480		34
M15	330		32
M20	250		30

4.1.1 All out effort shall be taken by the contractor to avoid any deflection. However, the maximum allowable deflection shall be as given below.

Location	**Permissible Deflection**
Between adjacent framing members	+ 2 mm
Between adjacent ties on a frame	+ 1 mm
Over the full depth of a vertical face	± 3 mm
Over a 3 metre length horizontally	± 3 mm

4.1.2 The formwork shall be made generally with the following upward cambers

Members	**Desirable Camber**
Cantilever slabs	- 3 mm for every 1.5 metre of span
Slabs of span not greater than 3 metres	- 3 mm for every 3.0 metre of span
Cantilever beams	- 6 mm for every 1.5 metre of span
Beams of span not greater than 6 metres	- 6 mm for every 3.0 metre of span

4.1.3 Striking or removal of Formwork

Unless specified in the drawing or directed by the Engineer, the following shall be the minimum intervals of time that should be allowed between finishing the concrete work and striking the form.

Vertical sides of concrete beams, walls and unloaded columns 1 day

Soffits of Slabs (props left in) 7 days

Props to slabs 14 days
Soffits of beams (props left in) 14 days
Props to beams 21 days

However the contractor shall delay the removal of shuttering as long as necessary in order to avoid damages to the work.

Removal of shuttering of soffits prior to the props is permissible only if the design of the shuttering allows such a sequence of operations without the props being in no way disturbed. If the shuttering and props are not independent, both must be left in place until propping is not required.

Material	Clause	Test	Field/Laboratory	Test Procedure	Min. Qty of Material for Carrying out test	Frequency of Testing
Stone aggregate	3.1.2.1	a) Percentage of soft or deleterious material	General visual Inspection / Laboratory Test where required by the Engineer	I.S 2386 Part II.	One test for each source or as directed by the Engineer	One Test for each source or as directed by the Engineer
	3.1.2.2	Particle size distribution	Field /Lab	IS. 383	10cum	Every 40cum or part thereof
	3.1.2.4	a) Estimation of organic impurities	Field /Lab	I.S 2386 Part II	10cum	- do-
		b) Surface moisture	Field /Lab	I.S 2386	10cum	- do-
		c) Determination of 10% fine value	Field /Lab	I.S 2386	10cum	-do -
		d) Specified gravity	Field /Lab	I.S 2386	10cum	- do-
		e) Bulk density	Field /Lab	I.S 2386	10cum	- do-
		f) Aggregate crushing strength	Field /Lab	I.S 2386	10cum	- do-
		g) Aggregate impact value	Field /Lab	I.S 2386	10cum	- do-
Concrete	3.2.2	Slump test	Field	I.S 1199 and I.S 9103	10cum	15 cum or part thereof
	3.2.9	Compaction	Field I.S. 1199		20cum	Every 20cum or part thereof

5: REINFORCED CEMENT CONCRETE

List of Relevant Bureau of Indian Standard Codes to be followed

1	IS 226	Structural Steel
2	IS 432 (Part I)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement – Part I mild steel and medium tensile steel bars.

3	IS 432 (Part II)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement – Part II Hard drawn steel wire
4	IS 456	Code of Practices for Plain and Reinforced concrete
5	IS 516	Method of test for strength of concrete
6	IS 1566	Specification for hard-drawn steel wire fabric for Concrete Requirement
7	IS 1599	Method for bend test
8	IS 1608	Method for tensile testing of steel products
9	IS 1786	Specification for high strength deformed steel and wires for concrete reinforcement
10	IS 2502	Code of practice for bending and fixing of bars for concrete reinforcement
11	IS 2751	Recommended practice for welding of mild steel plain and deformed bars for reinforced construction
12	IS 4925	Batch Plants Specification for concrete batching and mixing plant
13	IS 6523	Specification for pre-cast reinforced concrete door, window frames

TABLE 5.1: Physical Requirements for Steel Reinforcement

Sl. No.	Type and nominal size of bar	Ultimate tensile stress N/mm² minimum	Yield stress N/mm² minimum	Elongation per cent minimum
1.	**Mild steel grade I**			
	For bars up to and including20mm.	410	250	23
	For bars over 20mm up to and including 50mm	410	240	23
2.	**Mild steel grade II**			
	For bars up to and including 20mm.	370	225	23
	For bars over 20mm, up to and including 50mm	370	215	23
3.	**Medium tensile steel**			
	For bars up to & including 16mm	540	350	20
	For bars over 16mm, up to and including 32mm	540	340	20
	For bars over 32mm, up to and including 50mm	510	330	20

Elongation Percent on gauge length 5.65 × square not of ‘so’ where 'so' is the cross sectional area of the test piece.

Note

1. Grade (II) Mild steel bars are not recommended for the use in structures located in earthquake zone subjected to severe damage and for structures subjected to dynamic loading (other than wind loading) such as railway and highway bridges.
2. Welding of reinforcement bars covered in this specification shall be done in accordance with the requirements of IS: 2751.

Nominal mass / weight: The tolerance on mass/weight for round and square bars shall be percentage given in Table 4.2 of the mass/ weight calculated on the basis of density 0.785 kg/cm3 or 0.00785 kg/mm3.

TABLE 5.2: Tolerance on Nominal Mass

Nominal size in mm	Tolerance on the nominal mass percent		
	Batch	**Individual sample +**	**Individual sample for coil (-x-)**
a) up to and including 10	±7	±8	±8
b) Over 10, up to and including 16	+5	-6	+6
c) over 16	±3	-4	±4

+ for individual sample plus tolerance is not specified

(x) for coil batch tolerance is not applicable

Tolerance shall be determined in accordance with method given in IS 1786.

Tests - Following type of lab test shall be carried out

1. Tensile Tests

This shall be done as per IS 1608

2. Bend Test

This shall be done as per IS 1599

3. Test on deformed bars

This shall be done as per IS 1786

Should any one of the test pieces first selected fail to pass any of the tests specified above, two further samples shall be selected for testing with respect to each failure. Should the test pieces form both these additional samples pass, the materials represented by the test samples shall be deemed to comply with the requirement of the particular test. Should the test piece from either of these additional samples fail, the material represented by the test samples shall be considered as not having complied with standard.

High strength deformed bars & wires shall conform to IS: 1786. The physical properties for all sizes of steel bars are mentioned below in Table 5.3.

TABLE 5.3: Physical Properties of Reinforcing bars

Sl. No.	**Property**	**Grade**		
		Fe 415	**Fe 500**	**Fe 550**
1.	0.2% proof Stress/yield stress, min. N/mm^2	415	500	550
2.	Elongation, percent min on gauge length 5.65**Ö**A, Where A is the Cross Sectional Area of the test piece	14.5	12	8
3.	Tensile strength	10% more than actual 0.2% proof stress but not less than 465 N/mm^2	8% more than actual 0.2% proof stress but not less than 545 N/mm^2	6% more than actual 0.2% proof stress but not less than 585 N/mm^2

TABLE 5.4: Cross Sectional Area and Mass of Steel Bar

Nominal Size mm	Cross Sectional Area Sq. mm	Mass per metre Run Kg
6	28.3	0.222
7	38.5	0.302
8	50.3	0.395
10	78.6	0.617
12	113.1	0.888
16	201.2	1.58
18	254.6	2.00
20	314.3	2.47
22	380.3	2.98
25	491.1	3.85
28	616.0	4.83
32	804.6	6.31
36	1018.3	7.99
40	1257.2	9.85
45	1591.1	12.50
50	1964.3	15.42

***Note**: These are as per clause 5.2 of IS 1786*

TABLE 5.5:

Compressive Strength of Mixes.

Concrete Mix (Nominal Mix on Volume basis)	Compressive Strength in (Kg/sq cm)	
	7 days'	28 days'
1:1:2	210	315
1:1½:3	175	265
1:2:4	140	210

The compressive strength on work tests for different mixes shall be as given in Table 5.6 below:

Table 5.6

Concrete Mix (Nominal Mix on Volume basis)	**Compressive Strength in (kg/sq.cm)**	
	7 days'	28 days'
1:1:2	210	315
1:1½:3	175	265
1:2:4	140	210

TABLE 5.7: List of Mandatory Tests

Material	Clause	Test	Field/ Laboratory	Min. Qty of Material for Carrying out test.	Frequency of Testing	
Reinforced Cement Concrete (Nominal Mix)	4.3.2	a) Slump Test	Field / Lab	i) 5cum in case of column	i) Every 5cum or part thereof	
				ii) 20cum for slabs, beams and connected columns	ii) Every 20cum or part thereof	
				iii) 20cum for other RC.C. Work for. All other small items and where RC.C. done in a day is less than 5cum, test may be carried out as required by Engineer.	iii) Every 20cum or part thereof	
	4.4.3.2	b) Cube Test	Lab	i) 5cum in case of column	i) Every 5cum or part thereof	
				ii) 20cum for slabs, beams and connected columns	ii) Every 20cum or part thereof	
				iii) 20cum for other RC.C. Work for all other small items and where RC.C done in a day is less than 5cum test may be carried out as required by Engineer.	iii) Every 20cum or part thereof	
Steel for Reinforced Cement Concrete	4.1.2	A) Physical Test			a) For consignment below100 tones i)Under 10mmdia, one sample for each 25 tons or part thereof ii) 10mm to 16mm dia one sample for each 35 tonnes or part thereof iii) over 16mm dia one sample for each 45 tons or part thereof	b) for consignment over 100 Tons
		a) Tensile strength	Lab I Field IS. 1608			i) Under 10mm dia, one sample for each 40 tons or part thereof
		b) Retest	Lab I Field IS. 1786			
		c) Rebound Test	Lab I Field IS. 1786			
		d) Nominal Mass	Lab I Field IS. 1786			ii) 10mm to 16mm dia, one sample for each 45 tons or part thereof
		e) Bend Test	Lab I Field IS. 1599			
		f)Elongation Test	Lab I Field IS. 1786			iii) over 16mm dia, one sample for each 50 tons or part thereof

6: BRICK WORK

List of Relevant Bureau of Indian Standard Codes to be followed

Sl. No.	IS. No.	Subject
1.	IS 1077	Common burnt clay building bricks.(5th Revision)
2.	IS 1200 (Part 3)	Method of measurements of building and civil engineering works: Part 3 Brick work. (3rd Revision) Reaffirmed 1992.
3.	IS 2212	Code of practice for brick work. (1st Revision)
4.	IS 3102	Classification of burnt clay solid bricks. (1st Revision) (Superseded by Common burnt clay building bricks) (5th Revision)
5.	IS 3495- (Part 1-4)	Method of test for clay building bricks. (Part 1 to 4 in one volume) (3rd Revision)
6.	IS 5454	Methods of sampling of clay building bricks.

TABLE 6.1: Dimensions of Bricks

Type of Bricks/Tiles	Nominal Size, mm	Actual Size, mm
Modular Bricks	200 × 100 × 100mm	190 × 90 × 90mm
Modular Tile Bricks	200 × 100 × 40mm	190 × 90 × 40mm
Non-modular tile bricks	229 × 114 × 44mm	225 × 111 × 44mm
Non-modular bricks	229 × 114 × 70mm	225 × 111 × 70mm

Classification: Bricks/Brick tiles shall be classified on the basis of their minimum compressive strength as given below:

TABLE 6.2: Classification of Bricks

Class Designation	Average compressive strength			
	Not less than		Less than	
	N/mm^2	(kgf/cm^2)	N/mm^2	(kgf/cm^2)
10(100)	10	(100)	12.5	125
7.5(7.5)	7.5	(75)	10	100
5(50)	5	(50)	7.5	75
3.5(35)	3.5	(35)	5.0	50

The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour and emit clear ringing sound when struck.

TABLE 6.3: Scale of sampling and permissible number of defectives for visual and dimensional characteristics

No. of bricks in the lot	For characteristics specified for individual bricks		For dimensional characteristics for group of 20bricks — No. of bricks to be selected
	No. of bricks to be selected	Permissible no. of defective in the sample	
2001—10000	20	1	40
10001—35000	32	2	60
35001—50000	50	3	80

Note: *In case the lot contains 2000 or less bricks the sampling shall be as per decision of the Engineer.*

TABLE 6.4: Scale of sampling for physical characteristics

Lot size	Sample size for compressive strength, water absorption and efflorescence	Permissible No. of defectives for efflorescence
2001—10000	5	0
10001—35000	10	0
35001—50000	15	1

Note: *In case the lot contains 2000 or less bricks, the sampling shall be as per decision of Engineer.*

TABLE 6.5: List of Mandatory Tests

Material	Clause	Test	Field/ laboratory Test	Minimum Qty. of material for carrying out test
Bricks	5.1.3	Testing of Bricks/ Brick Tiles for dimensions compressive strength, water absorption and efflorescence	Laboratory	As per Table 6.3 and 6.4

7: STONE WORK

List of Relevant Bureau of Indian Standard codes to be followed

S. No.	IS. No.	Subject
1.	IS: 737	Wrought aluminium and aluminium alloy, steel and strip for general engineering purpose.
2.	IS: 1121 (Part1)	Methods of test for determinations of properties and strengths of natural building stones (Part 1-compressive strength).
3.	IS: 1122	Methods of test for determination of specific gravity of natural building stones.
4.	IS: 1123	Methods of identification of natural building stones.
5.	IS: 1124	Methods of test for determination of water absorption, apparent specific gravity and porosity of natural building stones.
6.	IS: 1125	Methods of test for determination of weathering of natural building stones.
7.	IS: 1126	Methods of test for determination of durability of natural building stones.
8.	IS: 1128	Lime stones (slab & tiles).
9.	IS: 1129	Recommendations for dressing of natural building stones.
10.	IS: 1200 (Part 4)	Methods of measurements of building and Civil engineering works: Part 4: Stonemasonry.
11.	IS: 1597 (Part 1)	Code of practice for construction of rubble stone masonry: Part 1: Rubble Stone masonry.
12.	IS: 1597(Part 2)	Code of practice for construction of ashlar stone masonry : Part 2 : Ashlar masonry
13.	IS: 1805	Glossary of terms relating to stones, quarrying and dressing.

14.	IS: 2185-(Part 1)	Concrete masonry units: Part 1: Hollow and solid concrete blocks.
15.	IS: 2572	Code of Practice for construction of hollow concrete block masonry.
16.	IS: 3620	Laterite stone block for masonry.
17.	IS: 3622	Sand stone (slab & tiles)
18.	IS: 4101-(Part 1)	Code of practice for external facings and veneers: Part 1 Stone facing.
19.	IS: 4101-(Part 2)	Code of practice for external facings and veneers: Part 2: Cement concrete facing.

8: WATER SUPPLY

List of Relevant Bureau of Indian Standard codes to be followed.

1	IS. 8329	Centrifugally cast ductile iron pressure pipes for water, gas and sewage.
2	IS. 9523	Ductile iron fittings for pressure pipes for water, gas and sewage.
3	IS 11906	Recommendations for cement mortar lining cast iron, mild steel and ductile iron pipes and fittings for transportation of water.
4	IS 12288	Code of practice for laying of ductile iron pipes.
5	IS 1592	Asbestos cement pressure pipes.
6	IS 6530	Code of practice for laying of Asbestos cement pressure pipes.
7	IS 5531	Cast iron specials for asbestos cement pressure pipes for water, gas and sewage.
8	IS 4984	High Density Polyethylene (HDPE) pipes for potable water supply, sewage and industrial effluent
9	IS 4985	uPVC pipes for potable water supply.
10	IS 7634	Code of practice for plastic pipe work for potable water supply. Part. 2 - Laying and jointing of polyethylene pipes Part. 3 – Laying and jointing PVC pipes.
11	IS 7834	Injection moulded PVC fittings with solvent cement joints for water supply.
12	IS 8008	Injection moulded HDPE fittings for potable water supplies.
13	IS 8360	Fabricated HDPE fittings for potable water supplies.
14	IS 10124	Fabricated PVC fittings for potable water supplies.
15	IS 12235	Methods of test for unplasticised PVC pipes for potable water supplies.
16	IS 2373	Water meter (bulk type)
17	IS 780	Sluice valves for water works purposes (50 to 300 mm size)
18	IS 2906	Sluice valves for water works purposes (350 to 1200mm size)

TABLE 8.1: Test and working pressure of spigot and socket ended spun pipes

Class of Pipe	Test Pressure at works, kg/sq.cm		Test Pressure at site, kg/sq.cm		Maximum working Pressure inclusive of surge pressure, kg/sq.cm	
	Upto 600mm	Above 600mm	Upto 600mm	Above 600mm	Upto 600mm	Above 600mm
LA	35	15	16	15	10	10
A	35	20	20	20	12.5	12.5
B	35	25	25	25	16.0	15.0

TABLE 8.2: Test and working pressure of Flanged spun pipes

Class of Pipe	Test Pressure at works, kg/sq.cm		Test Pressure at site, kg/sq.cm		Maximum working Pressure inclusive of surge pressure, kg/sq.cm	
	Upto 300mm	350 to 600mm	Upto 300mm	350 to 600mm	Upto 300mm	350 to 600mm
B	25	16	25	20	16	16

TABLE 8.3: Class of pipes and colour of marking

Class of pipe	Class 1 (2 kg/cm^2)	Class 2 (2.5 kg/cm^2)	Class 3 (4 kg/cm^2)	Class 4 (6 kg/cm^2)	Class 5 (10 kg/cm^2)
Colour	Orange	Red	Blue	Green	Yellow

8.1 LIST OF MANDATORY TESTS

Following are the mandatory tests to be conducted at appropriate stages of the work

TABLE 8.4

Item	Test	Field / Laboratory test	Sample size
Pipes	Type tests and Acceptance tests	Laboratory Tests	As per relevant IS
Jointing materials	Acceptance tests	Laboratory Tests	- do -
Pipe lines	Pressure tests	Field Tests	- do -
Valves	Acceptance tests	Laboratory Tests	- do -
Water meters	Acceptance tests	Laboratory Tests	- do -

9: SEWERAGE

List of Relevant BUREAU OF INDIAN STANDARD codes to be followed		
S. No.	**IS. No.**	**Subject**
1	IS: 458	Concrete Pipes
2	IS: 783	Code of practice for laying of Concrete Pipes
3	IS: 784	Prestressed Concrete Pipes
4	IS: 3597	Methods of Tests for Concrete Pipes
5	IS: 1592	Asbestos Cement pressure pipes
6	IS: 5531	Cast Iron specials for Asbestos Cement pressure pipes for water, gas and sewage
7	IS: 6530	Code of practice for laying Asbestos Cement pressure pipes
8	IS: 8794	Cast Iron detachable joints for use with Asbestos Cement pressure pipes (light duty)
9	IS: 9627	Asbestos Cement pressure pipes (light duty)
10	IS: 12987	Cast Iron detachable joints for use with Asbestos Cement pressure pipes (heavy duty)
11	IS: 651	Salt glazed Stoneware pipes and fittings
12	IS: 4127	Code of practice for laying glazed Stoneware pipes
13	IS: 3006	Chemical resistant glazed Stoneware pipes and fittings
14	IS: 4984	High Density Poly-Ethylene pipes for potable water supply, sewage and industrial effluents
15	IS: 8008	Specification for injection moulded HDPE fittings for potable water
16	IS: 8360	Fabricated HDPE fittings for potable water supplies
17	IS: 8329	Centrifugally cast (spun) Ductile Iron pressure pipes for water, gas and sewage.
18	IS: 9523	Ductile Iron fittings for pressure pipes for water, gas and sewage.
19	IS: 12288	Code of practice for use and laying of Ductile Iron pipes

10: SURFACE DRAINAGE

List of Bureau of Indian Standard Codes to be followed		
Sl. No.	**IS No.**	**Subject**
1	IS: 458	Concrete pipes
2	IS:783	Code of practice form laying concrete pipes.
3	IS:1726	Specification for cast iron manhole covers and frames.
4	IS:7740	Code of practice for road gullies

10.1 GENERAL

Storm or Surface water drainage shall be done according to the provisions of this Section of the General Specifications.

10.1.1 Existing services plans furnished, if any will be for information purposes only and do not necessarily indicate exact locations, depths, offsets, etc. Small items of service are not normally indicated on the Drawings. The Contractor shall uncover and verify the existence of all services. Temporary protection during the construction shall not be measured and paid for but shall be considered as a subsidiary obligation under the Contract and no separate measurement or payment will be made unless separate Items are provided.

10.1.2 This work shall include for working in close proximity to existing service utilities, the provision of temporary supports to services, any special protective measures required by the Service Authorities and/or the Engineer, dewatering, excavation in any materials, backfilling, levelling and compaction of excavations. It also includes for supply and placing of bedding and surround materials (except concrete for pipelines which shall be measured separately or as otherwise stated in the Bill Item description), disposal of debris to tip and disposal of unsuitable material and/or surplus suitable material.

10.1.4 All rates shall include for finishing as per the requirements of the Specifications.

10.1.5 All Concrete Surround of storm water pipes shall be with grade 40/20 concrete.

10.2 GULLIES & CONNECTIONS

10.2.1 "Supply and Install Kerb Gully/ flush gully" shall include for supplying and installing with all necessary excavation and backfilling, gully grating, hinged cover and frame all of ductile iron and the gully pot of GRP complete with approved removable bucket, sand deflector, precast concrete make-up and concrete surround to the pot and spout.

10.2.2 The rate for "uPVC Gully Connection Pipe" shall include all necessary excavation and backfilling, cutting, jointing, bends, collars, adaptors, etc. The lengths of uPVC pipes shall be measured from the edge of the gully pot concrete surround to the edge of carrier drain or outside face of chamber as shown on the Drawings. Concrete surround to gully connection pipe shall be measured separately.

10.2.3 Where gully pipes are laid but no kerb entry gullies are to be installed, the rate shall include for provision and installation of end caps and approved concrete marker slabs suitably inscribed and installed as directed by the Engineer-in-charge. The Contractor shall obtain prior approval of the exact locations from the Engineer-in-charge

10.2.4 Supply and installation of saddle or tee connections of different diameters shall include but not limited to the additional excavation around the pipes, provision and installation of saddles or

tees/reducers, etc. on the carrier pipelines, couplings, pipe bedding and all incidentals necessary to complete the work. All connections to carrier pipes of diameter less than 500mm shall be by tee connections.

10.2.5 "Break Out existing Gully and Replace" shall include removal of existing frame & cover, gully pot and concrete surround, refurbishment of frame and cover or provision of new frame and cover, new complete gully pot concrete surround and reinstatement of kerbs, road and footpath etc. to original condition.

10.3 STORM WATER UPVC/GRP/RC CARRIER PIPELINES

10.3.1 Pipelines

Storm water drainage pipelines are made up of uPVC/GRP/RC carrier drains and gully pipes.

10.3.2 This work shall include all necessary excavation, dewatering, temporary supports, provision of pipes and fittings, installation, bedding and surround, backfilling, with suitable material from excavation or with approved imported suitable graded material to be compacted in layers of 15 cm to 95% MDD, warning tapes, water testing the pipelines and all incidentals necessary to complete the works.

10.3.3 Bedding and surround to GRP and uPVC pipes will vary depending on the cover depth of pipe and as indicated in the drawing.

10.3.4 The depth to invert is measured from formation level. Wherever a minimum clear cover of 1.00 metre below FRL or 0.60 metre below footpath is not available a concrete surround is given to the pipe and is measured under relevant item in the bill. Where a fill has to be constructed to provide the above mentioned minimum cover for the pipe, the Contractor shall, at no additional cost, construct the fill, prior to excavating the trench in order to lay the pipeline.

10.3.5 The work for pipelines shall include, in addition to the works mentioned above, for all cutting, jointing, bends, collars, tees, short pieces, adaptors etc., and connecting to receiving chambers etc.

10.4 BUILT UP DRAINS

10.4.1 Drains shall be built exact to line, levels and gradient. Drains shall be constructed in concrete, RCC, stone masonry or brick masonry as specified. Bottom and side walls shall be plastered in cement mortar 1:4 and finished smooth.

10.4.2 The drains shall be open or covered. Pre-cast R.C.C cover slab of appropriate thickness and steel shall be provided for cover drains. The pre-cast cover slabs shall be capable of withstanding loads under traffic wherever traffic is expected over the drains.

10.5 MEASUREMENT

10.5.1 The length of pipeline shall be measured along the centreline of the pipeline between inside faces of the structures, manholes, inspection and collection chambers and the like. The average depth to invert between terminal points shall be calculated as the arithmetic mean of the measurement of depth from the existing ground level or finished ground level or the formation level of the road if the road is constructed under this Contract, whichever is lowest, to invert level of the pipe taken at intervals of 10 metres along the pipeline, starting from their downstream end. For lengths of pipelines less than 10 metres long the measurement of depth shall be the average depth as specified above, measured at each end of the pipeline.

10.5.2 Where pipelines pass into structures and the material of the pipes in the structure walls is different from the pipe material external to the structure, then this short length of alternative pipe material shall not be measured as a separate item. Any additional costs associated with this short length of alternative pipe material shall be included in the items for structures.

Concrete, masonry, plastering etc. shall be measured in quantities.

10.6 RATE

10.6.1 The rate for pipe laying for cutting and reinstating existing roads shall include for saw cutting existing asphalt, excavation in the road, backfill, and reinstate road and all other incidental works, in order to lay pipes to any depth.

10.7 MANHOLES AND CHAMBERS:

10.7.1 The work shall include but not be limited to all necessary excavation, formwork, provision of concrete, reinforcement, GRP coated step irons, building pipes into the walls, removal of surplus materials, backfilling, reinstatement and all incidentals necessary to complete the manhole and chambers. The manhole's cover slab shall be RCC cover slab constructed integral with CI/DI manhole covers where the covers are smaller than the chamber dimensions. Manhole chambers in places of traffic shall be of heavy duty type. The chamber walls shall be of concrete, brick masonry or stone masonry as per specifications.

10.7.2 Inside of the chambers and benching shall be plastered and finished smooth to provide minimum obstruction to flow.

10.7.3 Any abortive excavation for manholes, catchpits or chambers due to the relocation of works instructed in writing by the Engineer-in-Charge shall be measured and paid under the item "Abortive Excavation".

11: BUILDING WORKS

11.1 MORTARS

List of Relevant Bureau of Indian Standard Codes to be followed

1)	IS: 196	Atmospheric condition of testing.
2)	IS: 269	Specification for 33grade ordinary Portland Cement.
3)	IS: 383	Specification for coarse and fine aggregate from natural source for Concrete.
4)	IS: 455	Specification for Portland slag cement.
5)	IS: 650	Specification for standard sand for testing of cement.
6)	IS: 1489	Specification for Portland Pozzolana Cement.
7)	IS: 1542	Specification for sand for plaster.
8)	IS: 1727	Methods of Test for Pozzolanic materials.
9)	IS: 2116	Specification for sand for masonry mortar.
10)	IS: 2250	Code of Practice for preparation and use of masonry Mortar.
11)	IS: 2386 (Part I)	Method of test for aggregate for concrete (Particle size and shape).
12)	IS: 2386 (Part II)	Method of test for aggregate for concrete-Estimation of deleterious materials and organic impurities.
13)	IS: 2386 (Part III)	Method of test for aggregate for concrete-Specific gravity, density, voids, absorption and bulking.
14)	IS: 3025	Method of sample and test for water.
15)	IS: 3406	Specification for masonry cement.

16)	IS: 4031(Part I) to (Part XIII)	Method of Physical test for hydraulic cement.
17)	IS: 4032	Method of chemical analysis of Hydraulic Cement.
18)	IS: 8041	Rapid hardening Portland cement.
19)	IS: 8043	Hydrophobic Portland cement.
20)	IS: 8112	Specification for 43 grade ordinary Portland cement.
21)	IS: 12269	Specification for 53 grade ordinary Portland cement.

TABLE 11.1: Compressive Strength Requirement for Cement

Sample	Strength in N/mm² not less than for		
Age at testing	Gr. 33	Gr. 43	Gr. 53
72 ± 1 hr	16	23	27
168 ± 2 hrs	22	33	37
672 ± 4 hrs	33	43	53

TABLE 11.2: Grading of sand for use in masonry mortar as per IS: 2116

IS Sieve Designation	Percentage passing by mass	Ref to method of test
4.75 mm	100	
2.36mm	90 to 100	
1.18mm	70 to 100	
600 micron	40 to 100	
300 micron	5 to 70	
150 micron	0 to 15	

TABLE 11.3: Grading of sand for use in Plaster as per IS: 1542

IS Sieve Designation	Percentage passing
10 mm	100
4.75 mm	95 to 100
2.36 mm	90 to 100
1.18 mm	85 to 100
600 micron	80 to 100
300 micron	20 to 65
150 micron	0-50

Note: *For crushed stone sands, the permissible limit on 150 micron IS Sieve is increased to 20%. This does not affect the 5% allowance IS-2386 (Part I).*

TABLE 11.4: Relation between Moisture Content and Bulking Percentage

Moisture content % age	Bulking % age (by volume)
2	15
3	20
4	25
5	30

TABLE 11.5: EQUIVALENT PLAIN AREAS OF UNEVEN SURFACE

S. No	Description of work	How measured	Multiplying coefficients
a	**WOOD WORK DOORS, WINDOWS ETC**		

1.	Panelled or framed and braced doors, windows etc.	Measured flat (not girthed including)	1.30 (for each side)
2.	Ledged and battened or ledged, battened and braced doors, windows etc.	Chowkhat or frame, Edges chocks, cleats, etc. shall be deemed to be included in the item.	
3.	Flush doors etc.	-do-	1.20 (for each side)
4.	Part panelled and part glazed or gauzed doors, window etc. (Excluding painting of wire gauze portion)	-do-	1.00 (for each side)
5.	Fully glazed or gauzed doors, windows etc. (Excluding painting of wire gauze portion)	-do-	0.80 (for each side)
6.	Fully venationed or louvered doors, windows etc.	-do-	1.80 (for each side)
7.	Trellis (or Jaffri) work one way or two way	Measured flat overall, no deduction shall be made for open spaces, supporting members shall not be measured separately	2 (for painting all over)
8.	Carved or enriched work	Measured flat	2 (for each side)
9.	Weather boarding	Measured flat (not girthed supporting frame work shall not be measured separately	1.20 (for each side)
10.	Wood shingle roofing	Measured flat (not girthed)	1.10 (for each side)
11.	Boarding with cover fillets and match boarding	Measured flat (not girthed)	1.05 (for each side)
12.	Tile and slate battening	Measured flat overall no deductions shall be made for open spaces	0.80 (for painting all over)
II.	**STEEL WORK DOORS, WINDOWS ETC.**		
13.	Plain sheeted steel doors or windows	Measured flat (not girthed) including frame edges etc.	1.10 (for each side)
14	Fully glazed or gauzed steel doors and windows (excluding painting of wire gauze portion)	-do-	0.50 (for each side)
15.	Partly panelled and partly glazed or gauzed doors and windows (excluding painting of wire gauze portion)	-do-	0.80 (for each side)
16.	Corrugated sheeted steel doors or windows	-do-	1.25 (for each side)
17.	Collapsible gates	Measured flat	1.50 (for painting all over)
18.	Rolling shutters of interlocked laths	Measured flat, (size of opening) all over; jamb guides, bottom rails and locking arrangement etc. shall be included in the item (top cover shall be measured separately)	1.10 (for each side)

III	GENERAL		
19.	Expanded metal, hard drawn steel wire fabric of approved quality, grill works and gratings in guard Bars, balustrades, railing partitions and MS Bars in windows frames.	Measured flat overall; no deduction shall be made for open spaces; supporting members shall not be measured separately	1 (for paint all over)
20.	Open palisade fencing and gates including standards, braces, rails stays etc in timber or steel	-do- (see note No. 12)	1 (for paint all over)
21.	Corrugated iron sheeting in roofs, side cladding etc.	-do- Measured flat (not girthed)	1.14 (for each side)
22.	AC corrugated sheeting in roofs, side cladding etc.	-do-	1.20 (for each side)
23.	AC semi corrugated sheeting in roofs, side cladding etc. or Nainital pattern using plain sheets	-do-	1.10 (for each side)
24.	Wire gauze shutters including painting of wire gauze	-do-	1.00 (for each side)

Explanatory notes

(1) Measurements for doors windows etc., shall be taken flat (and not girthed) over all including Chowkhats or frames, where provided. Where Chowkhats or frames are not provided, the shutter measurements shall be taken.

2) Where doors, windows etc., are of composite types other than those included in Table 12.21 the different portion shall be measured separately with their appropriate coefficients, the centre line of the common rail being taken as the dividing line between the two portions.

3) The coefficients for door and windows shall apply irrespective of the size of frames and shutter members.

4) In case steel frames are used the area of doors, windows shutters shall be measured flat excluding frames.

5) When the two faces of a door, window, etc. are to be treated with different specified finishes, measurable under separate items, the edges of frames and shutters shall be treated with the one or the other type of finish as ordered by the Engineer and measurement of this will be deemed to be included in the measurement of the face treated with that finish.

6) In the case where shutters are fixed on both faces of the frames, the measurement for the door frame and shutter on one face shall be taken in the manner already described, while the additional shutter on the other face will be measured for the shutter only excluding the frame.

7) Where shutters are provided with clearance at top or/and bottom each exceeding 15 cm height, such openings shall be deducted from the overall measurements and relevant coefficient shall be applied to obtain the area payable.

8) Collapsible gates shall be measured for width from outside to outside of gate in its expanded position for height from bottom to top of channel verticals. No separate measurements shall be taken for the top and bottom guide rails rollers, fittings etc.

9) Coefficients for sliding doors shall be the same as for normal types of doors in the table. Measurements shall be taken outside to outside of shutters, and no separate measurements shall be taken for the painting guide rails, rollers, fittings etc.

10) Measurements of painting as above shall be deemed to include painting all iron fittings in the same or different shade for which no extra will be paid.

11) The measurements of guard bars, expanded metal, hard drawn steel wire fabric of approved quality, grill work and gratings, when fixed in frame work, painting of which is once measured else where shall be taken exclusive of the frames. In other cases the measurements shall be taken inclusive of the frames.

(12) For painting open palisade fencing and gates etc., the height shall be measured from the bottom of the lowest rail, if the palisades do not go below it, (or from the lower end of the palisades, if they project below the lowest rail), upto the top of rails or palisades whichever are higher, but not up to the top of standards when the latter are higher than the top mils or the palisades.

Width of moulded work of all other kinds, as in hand rails, cornices, architraves shall be measured by girth.

For trusses, compound girders, stanchions, lattice girders, and similar work, actual areas will be measured in sq. metre and no extra shall be paid for painting on bolt heads, nuts, washers etc. even when they are picked out in a different tint to the adjacent work.

Painting of rain water, soil, waste, vent and water pipes etc. shall be measured in running metres of the particular diameter of the pipe concerned. Painting of specials such as bends, heads, branches, junctions, shoes, etc. shall be included in the length and no separate measurements shall be taken for these or for painting brackets, clamps etc.

Measurements of wall surfaces and wood and other work not referred to already shall recorded as per actual.

Flag staffs, steel chimneys, aerial masts, spires and other such objects requiring special scaffolding shall be measured separately.

Precautions: All furniture, fixtures, glazing, floors etc. shall be protected by covering and stains, smears, splashings, if any shall be removed and any damages done shall be made good by the contractor at his cost.

Rate: Rates shall include cost of all labour and materials involved in all the operations described above and in the particular specifications given under the several items.

Primer for plaster/wood work/Iron & Steel/Aluminium surfaces shall be as specified below:

TABLE 11.6

S.No	Surfaces	Primer to be used
1.	Wood work (hard and soft wood)	Pink conforming to IS: 3536
2.	Resinour wood and plywood	Aluminium primer conforming to IS: 3585
3.	(A) Aluminium and light alloys (B) Iron, Steel and Galvanized steel	Zinc chromate primer confirming to IS: 104 Red Oxide Zinc chromate Primer conforming to IS: 2074

4.	Cement/Conc./RCC/brick work. Plastered surfaces, asbestos surfaces to receive Oil bound distemper or paint finish	Cement primer conforming to IS : 109

The primer shall be ready mixed primer of approved brand and manufacture.

Where primer for wood work is specified to be mixed at site, it shall be prepared from a mixture of red lead, white lead and double boiled linseed oil in the ratio of 0.7 kg: 0.7 kg: 1 litre.

Where primer for steel work is specified to be mixed at site, it shall be prepared from a mixture of red lead, raw linseed oil and turpentine in the ratio of 2.8 kg 1 litre: 1 litre.

12: MECHANICAL WORKS

12.1 LIST OF STANDARDS

Titles of various standards referred to in the specifications are indicated below. This list does not necessarily cover all the standards referred to the following:

Standard No.	Title
IS:814-1991	Specification for arc welding of carbon manganese steels
IS 9137 - 1978	Specification for acceptance tests for centrifugal, mixed flow and axial pumps - Part 1 – Class 'C' Tests
IEC-189 (Part 1 & 2)	Low frequency cables and wires with PVC insulation and PVC sheath
IS: 5	Colours for ready mixed paints and enamels
IS: 210	Grey Iron Castings
IS: 318	Leaded Tin Bronze Ingots and Castings
IS: 325	Three Phase Induction Motors
IS: 807	Code of Practice for design, manufacture, erection and testing (structural portion) of cranes and hoists
IS: 1239	Mild Steel tubes, tubular and other wrought steel fittings
IS: 1536	Centrifugally cast (Spun) iron pressure pipe for water, gas and sewage
IS: 1537	Vertically cast iron pressure pipes for water, gas and sewage
IS: 1538	Specification for cast iron fittings for pressure pipes for water, gas and sewage
IS: 1554	PVC insulated (heavy duty) electric cables
IS: 2062	Steel for general structural purposes
IS: 2147	Degrees of protection provided by enclosures for low voltage switchgear and control gear
IS: 3109	Short link chain, Grade M (4)
IS: 3177	Code of practice for electric overhead travelling cranes and gantry cranes other than steel work cranes
IS: 3618	Phosphate treatment for iron and steel for protection against corrosion
IS: 3624	Vacuum and Pressure gauges
IS: 3815	Point hooks with shank for general engineering purposes
IS: 3938	Electric wire rope hoists
IS: 4029	Guide for testing three phase induction motors
IS: 4460	Method for rating of machine cut spur and helical gears
IS: 4691	Degrees of protection provided by enclosure for rotating electrical machinery
IS: 6005	Code of practice for phosphating of iron and steel
IS: 8329	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage

Standard No.	Title
IS: 11592	Code of practice for selection and design of belt conveyors
IS: 13349	Cast iron single faced thimble mounted sluice gates
BS: 436	Spur and helical gears
BS: 466	Specification for power driven overhead travelling crane, semi-goliath and goliath cranes for general use
BS: 1400	Specification for copper alloy ingots and copper alloy and high conductivity copper castings
BS: 2903	Specification for higher tensile steel hooks for chains, slings, blocks and general engineering purposes
BS: 2910	Methods for radiographic examination of fusion welded Circumferential butt joints in steel pipes
BS: 3017	Specification for mild steel forged ramshorn hooks
BS: 3100	Specification for steel castings for general engineering purposes.
BS: 3923	Methods for ultrasonic examination of welds
BS: 4360	Specification for weldable structural steels
BS: 4772	Specification for ductile iron pipes and fittings
BS: 4870	Specification for approval testing of welding procedures
BS: 4871	Specification for approval testing of welders working to approved welding procedures

12.2 SUPPRESSION OF NOISE

All plant and machinery offered shall be quiet in operation. The noise level within the building shall not be more than 85 decibels (+5 per cent on this over the audible frequency spectrum measured at mid-band.) "A" scale when measured along a contour 3 metres from any single item of plant during starting, running and stopping. The noise level outside the building shall not be more than 60 decibels (+5 per cent on this over the audible frequency spectrum measured at mid-band.) "A" scale when measured along a contour 3 metres from the external wall. Noise test measurements shall be made on completion of the installation of the plant at Site to verify that it complies with this Clause. Plant which fails to comply with the noise level limits when tested, will be liable for rejection unless it is satisfactorily modified at the Contractor's expense by the programmed commissioning date.

12.3 References to Standards

The following standards are referred to in this Clause

- IS 1570-1978 Part IV (ISO 683) Wrought steels for mechanical and allied engineering purposes
- IS 1520-1972 – Horicontal Centrifugal Pumps for Clear, Cold, fresh water
- IS 1710-1973 – Specification for pumps – Vertical Turbine Mixed and Axial flow for Cold Water
- IS 4111 – Part 1 to IV Code of Practice for ancillary structures – Sewerage System
- IS 12075 – 1987 Part I, Mechanical vibration in rotating electrical machines
- IS 4722 – 2001 Rotating electrical machines specifications.
- IS 9137 – 1978 Acceptance tests for centrifugal mixed flow and axial flow centrifugal pumps Part I Class C tests
- IS 3824 – Part I-IV Methods of calculating dynamic load ratings and rating life of rolling bearings
- IS 3961 – Part 3 – 1968 Recommended current ratings for cables – Part 3 rubber insulated cables.

- IS 1367 – Part 14 1984 Technical Supply Conditions for threaded steel fasteners
- IS 1646 – 1991 – Code of practice for fire safety of Buildings (general)
- IS 9537 – Part I – 1980 – Conduits for electrical installations.
- IS 9283 : 1995 Motor for Submersible pumpsets – Specification
- IS 14220 : 1994 Open well Submersible pumpsets – Specification
- IS 210 – 1983 – Grey Iron Casting – Specification
- IS 5120.1977 – Technical requirements for rotodynamic special purpose pumps.
- IS 14536: 1998 – Selection, Installation, operation and maintenance of Submersible pumpsets Code of practice.
- IS 8783 – 1978 – PVC insulated winding wires for submersible motors
- IS 325 – 1978 – Three phase Induction motors.
- IS 9137 – 1978 – Code for acceptance test for centrifugal, mixed flow and axial pumps, class C.
- IS: 2685 – 1971 - Code of practice for selection installation and maintenance
- BS 4999, General requirements for rotating electrical machines
- BS 5316 (ISO-2548) Acceptance tests for centrifugal mixed flow and axial flow centrifugal pumps Part 1 Class C tests
- BS 5345, Codes of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres
- BS 5512, (ISO-281) Methods of calculating dynamic load ratings and rating life of rolling bearings
- BS 6007, (IEC-245) Rubber insulated cables for electric power and lighting
- BS 6105, (ISO-3506) Corrosion-resistant stainless steel fasteners
- BS 6861, (ISO-1940) Balance quality of requirements of rigid rotors
- BS 7671, Requirements for electrical installations IS 8034 : 2002 Submersible pumpsets-Specification

13: HIGH TENSION (HT) WORKS

INDIAN STANDARD SPECIFICATION

IS 613: 2000	Copper Rods and Bars for Electrical Purposes - Specification
IS 1248 : PART 1: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 1 – Definition and General Requirements
IS 1248 : PART 2: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 2 – Special Requirements for Ammeters and Voltmeters
IS 1248 : PART 3: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 3 – Special Requirements for Wattmeter and VAR meters
IS 1248 : PART 4: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 4 – Special requirement for Frequency Meters.

IS 1248 : PART 5: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 5 – Special Requirements for phase meters, power factors meters and synchroscopes.
IS 1248 : PART 6: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 6 – Special requirements for Ohmmeters (Impedance meters) and Conductance meters.
IS 1248 : PART 7: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 7 – Special requirements for Multi Function Instruments.
IS 1248 : PART 8: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 8 – Special requirements for Accessories.
IS 1248 : PART 9: 2003	Direct Acting Indicating Analogue Electrical measuring Instrument and their Accessories – Specification –Part 9 – Test methods
IS 1271: 1985	Thermal evaluation and classification of electrical insulation
IS 1646: 1997	Code of practice for fire safety of buildings (general): Electrical installations
IS 1885: PART 9: 1992	Electro technical Vocabulary: Part 9 Electrical relays
IS 1897: 1983	Copper strip for electrical purpose
IS 2419 : 1979	Dimensions for panel mounted indicating and recording electrical instruments
IS 2448: PART 1: 1953	Adhesive insulating tapes for electrical purpose: part 1 Tapes with cotton textile substrates.
IS 2464: 1963	Built –up mica for electrical purposes
IS 3024: 1997	Grain oriented electrical steel sheets and strips
IS 3231: PART 1.2,3: SEC 1: 1986	Specification for Electrical relays for Power System Protection Part 1: General Requirements Section 1 : Contact Performance.
IS 3480: 1966	Flexible steel conduits for electrical wiring
IS 3837: 1976	Accessories for rigid steel conduits for electrical wiring
IS 3842: PART 12: 1976	Application guide for electrical relays for ac systems: part 12 Differential relays for transformers
IS 4483:PART 1: 1968	Preferred panel cutout dimensions for electrical relays: part 1 flush mounting IDMTL relays
IS 4648: 1968	Guide for Electrical Layout in Residential Buildings
IS 5216: PART 1 : 1982	Recommendations on safety procedures and Practices in Electrical work – part 1 : general
IS 9537 : PART 2 : 1980	Conduits for electrical installations: part 1 General requirements
IS 9537:PART 2 : 1981	Conduits for electrical installations part 2 Rigid steel conduits (superseding IS : 1653)
IS 9537: PART 3: 1983	Conduits for electrical installations: Part 3 Rigid plain conduits of insulating materials (superseding IS : 2509)
Is 9537 part 4 1983	Specification for conduits for Electrical Installations Part 4 Pliable Self–recovering Conduits for insulating Materials
IS 9537 : PART 5 : 2000	Conduits for Electrical Installations – part 5: Pliable conduits for insulating material

IS 9537 : PART 6: 2000	Conduits for Electrical Installations – part 6: Pliable conduits for metal or composite materials
IS 9537: PART 8: 2003	Conduits for Electrical Installations – Specification – Part 8 : rigid non-threadable conduits of aluminium alloy
IS 10381: 1982	Terms (and their Hindi equivalents) commonly used for name plates and similar data of electrical power equipment
IS 11005: 1984	Dust tight ignition proof enclosure of electrical equipment
IS 14927: PART 1: 2001	Cable trunking and ducting system for Electrical installations: part 1 General requirements
IS 14927: PART 2 : 2001	Cable Trunking abd ducting systems for electrical installations: part 2 cable trunking and ducting systems intended for mounting on walls or ceiling
IS 14930 : PART 1 : 2001	Conduit system for electrical installation – part 1 : general requirements
IS 14930 : PART 2 : 2001	Conduits system for electrical installations – part 2: Particular Requirements – Conduits System Buried Underground
SP 30: 1985	Special Publication – National Electrical Code
IS 2516- (L) PART I & II Section – I	LT air circuit breaker
IS 4064 (L)	Fuse switch units and switch fuse units
IS 2208 (L)	H RC fuse links
IS 2675 (L)	Distribution Boards
IS 10118 (PART 4) : 1982	Code of practice for selection installation and maintenance of switch gear and control gear: part 4 Maintenance
IS 12021 : 1987	Control transformers for switch gear and control gear for voltage not exceeding 1000 V ac (Amendment 1)
IS 12021 : 1987	Classification of degrees of protection provided by enclosure of electrical equipment
IS 13234 : 1992	Guide for short – circuit current calculations in three-phase as system (superseding IS 5728)
IS 13947: (PART 1) : 1993	Low voltage switchgear and control gear : Part 1 General rules (superseding IS 4237)
IS 13947 (PART 2) : 1993	Low voltage switchgear and control gear: part 2 circuit breakers (superseding IS 2516 (PART 1 & 2 / Sec 1) : 1985 (Amendment 1)
IS 13947 (PART 3): 1993	Low voltage switchgear and control gear : part 3 switches, disconnections, switch disconnections and fuse combination units (superseding IS 4064) PART 1 AND 2)
IS 13947 (PART 4/SEC 1): 1993	Low voltage switchgear and control gear : part 4 Contractors and motors starters, Sec 1 Electromechnical contactors and motors starters (superseding IS 2959 & IS 8544 (All parts)) (Amendment 1)
IS 13947 (PART 5/ SEC 1) : 1993	Low voltage switchgear and control gear : part 5 Control circuit devices and switching elements, Sec 1.Electromechnaical control circuits devices (superseding IS 6875 (All Parts)) Amendment 1
IS 14415: 1997	Volt-ampere hour meters for restricted power factor range (superseding IS 722 (Part 5 1980)

Standards:

The fabrication, galvanizing, testing etc. of the yard structure shall be in accordance with the clause no. 23 Part II ibid (for 110 KV Towers). These shall comply with the following standards, codes and rules also (with all their latest revisions).

IS 2062-1992	-	steel for general structural purposes
IS 209-1992	-	Zinc Ingot
IS 4759- 1984	-	Hot dip coatings on structural steel and allied product
IS 2633- 1986	-	methods of testing uniformity of coating on Zinc coated articles
IS 800- 1984	-	Code of practice for general construction in steel
IS 802-		
Part I	-	Load and permissible stresses
Section I- 1995	-	Materials and loads
Section II- 1992	-	Permissible stresses
Part II	-	Fabrication, Galvanising, Inspection & Packing
Part III- 1978	-	Testing
IS 808-1989	-	Dimensions for hot rolled steel beams, columns, channels and angle sections
IS 6639-1972	-	Hexagonal bolts for steel structures
IS 3063- 1994	-	Fasteners Single coil rectangular section spring washers
IS 1367- 1983	-	Hot dip galvanized coatings on fasteners
Part 13		
IS 6610-1972	-	Heavy washers for steel structures
IS 1573-1986	-	Electroplated coatings of zinc on iron and steel.
IS 456 – 1978	-	Code of practice for plain and reinforced concrete
IS 4091-1979	-	Code of practice for design and construction of foundations for transmission line towers and poles. Other wrought steel fittings.
IS 1239	-	Mild steel tubes, tubular and other wrought steel fittings.
Part I-1990	-	Mild steel tubes
Part II-1992	-	Mild steel tubular and other wrought steel pipe fittings

IS 3043 – Code of practice for earthing

CBIP Technical Report No. 3 : Manual on layout of substations

CBIP Publication No. 223	Manual on substations – chapter on design of earth mat for High voltage sub-stations.
IS 398 Part II-1976	ACSR Conductors
IS 6745-1972	Methods for determination of weight of Zinc coating on zinc coated iron and steel articles
IS 731-1971	Specification for porcelain insulators for overhead lines (3.3 KV and above)
IS 3188-1980	Characteristics for string insulators units
IS 2486	Specifications for insulators fittings
Part I-1993	For overhead lines of 1.0 KV and above, general requirements & tests
Part II-1989	(Part I), Dimensional requirements
Part III-1974	(Part II), Locking devices (Part III)
Part IV-1981	and tests for locking (Part IV)
IS 7811-1985	Phosphor Bronze rods and bars
IS 7814-1985	Phosphor bronze sheets, strips and foils
IS 2629-1985	Recommended practices for hot dip galvanizing of iron and steel.
IS 732-1989	Code of practice for Wiring Installations With latest amendments.

14: LT PANEL WORKS

The equipment shall be designed to confirm to the requirements of:

a)	IS 4237 - General requirements for switchgear and control gears for voltages not exceeding 1100 volts.
b)	IS 2147 - Degree of protection provided by enclosures for low voltages switchgear and control gear.
c)	IS 375 - Marking and arrangements of busbars Individual equipment housed in the power control to the following IS specifications:
i)	Air circuit breakers - IS 2516 (Part I & II/Sec.1) 1977
ii)	Fuse switch and switch fuse units - IS 4064: 1978.
iii)	HRC fuse links - IS 1108: 1962 or IS 9114: 1979.
iv)	Current Transformer - IS 2705.
v)	Voltage Transformer - IS 3156.
vi)	Relays - IS 3231.
vii)	Indicating Instruments - IS 1248.
viii)	Integrating Instruments - IS 711.
ix)	Control Switches and push buttons - IS 6875.
x)	Auxiliary contractors - IS 2959.

14.1 CABLES AND OTHER ITEMS:

i)	Specifications for XLPE Cables	:	IS 7098 - Part – I – 1988
ii)	Specification for PVC insulated	:	IS 1554 – 1964 (Heavy duty) electric cables Part – I for voltage upto 1100 Volts.
iii)	Specifications for PVC insulated	:	IS 694 - 1988 cables for voltage up to 1100V Part – II with aluminium conductors.
iv)	Glossary of terms for electrical cables	:	IS 1885 – 1971 and conductors.
v)	Code of practice for safety of buildings	:	IS 1646 – 1961 (General) Electrical installation.

5.3 Calibration and Weighing Equipment Accuracy

1. The following limits shall apply to all design-mixed concrete plants:

A) The accuracy, sensitivity and arrangement of the weighing devices shall be such as to enable the materials to be batched within the following tolerances:

1) Cement, mineral admixtures: Within + 2 percent of the quantity of the constituent being measured

2) Aggregate, chemical admixtures: With + 3 percent of the quantity and water of the constituent being measured

B) Analogue scales shall have scale increments not exceeding 5 kg for cement and mineral admixtures, 25 kg for aggregate and 2 kg for water.

C) Preset controls shall be calibrated in increments not exceeding 5 kg for cement and mineral admixtures, 10 kg for aggregate and 2 kg for water.

i. Digital readouts shall have a scale increment not exceeding 2 kg for cement and mineral admixtures, 10 kg for aggregate and 1 kg for water.

ii. At the time of installation, or reconditioning, the accuracy of the indicated mass at any point on the scale shall be within 0.25 percent of the full scale reading.

iii. At any other time during operation the accuracy shall be within 0.50 percent of the full scale reading.

iv. Chemical admixture dispensers shall have scale increments not exceeding:

Range of Scale(kg/l)	Scale increment(kg/l)
0.1 – 0.5	0.01
0.5 – 1.0	0.02
1.0 – 10.0	0.2
more than 10.0	0.4

v. All weighing and measuring equipment shall be tested and calibrated over its full working range at the following intervals:

1) Mechanical / knife edge systems : At least once every two months

2) Electrical /load cell systems : At least once every three months

2. Adequate and identified facilities shall be provided for the application of the test loads.

a. In the case of batch weighing systems, testing and calibration shall be based on the application test loads to the weigh hoppers.

b. Checks on continuous weigh systems shall be based on comparison of Preset quantities with those actually produced.

c. To achieve the required accuracy of calibration, a minimum of 500 kg of Stamped weights are required, except that for low capacity scales an acceptable limit on the total mass of calibration weights would be 20 percent of the scale capacity.

d. When calibration of weighing equipment is carried out all personnel involved should be competent and fully trained, the procedures should be fully documented, and special attention should be paid to the health and safety aspects of the procedure.

5.4 List of Approved Makes

SL. No.	MATERIAL	MAKES/MANUFACTURER
A	**Civil/Plumbing/Water Supply/Sanitary**	
1	Anti - Termite Treatment	Fosroc /BASF / Bayer
2	Chemical Admixtures	Sika//Fosroc/BASF
3	Heat Reflective Glass	AES / Saint Gobain
4	Adhesive For Door Work	Fevicol/Vamicol/Dunlop
5	Dash Fasteners	Hilti/ Faischer/ Bosch/ Canon
6	Door Locks	Godrej/ Harrison/ Link
7	Aluminium Doors & Windows Fixtures/ Fitting	Everlite / Argent/ Classic/ Crown/ Earl Bihari
8	Extruded Polystyrene Board	Styrofoam By Dow Chemicals / Insuboard By Supreme Indus Ries
9	Bitumastic Fibre Board	Shalimar Tar Product/Fosroc/BASF
10	Expansion Joint System	Hercules / J. Sons/Kantaflex
11	Fire Doors	Navair/ Shakti - Met Dor/ Godrej
12	Flush Door Shutters	Greenply/Century/Kutty/Kitply/Archid ply
13	Stainless Steel Hardware	Arkay/ Godrej/ D-Line/ Carl-F
14	Plywood/ Blockboard/ Ply Board	Duro/ Greenply/Century/ Kitply/ Greenlam/ Novapan/ Marrino/ Greenply/ Euro

15	Pre- Laminated Cement Board	Bison
16	Pvc Continuous Fillet For Periphery Packing of Glazings/ Structural/ Glazings	Roop/ Anand/ Forex Plastic/ Nagalia
17	Stainless Steel Bolts, Washers, Nuts & Screws	Kundan/ Puja/ Atuli
18	Stainless Steel Friction/Spring Hinges	Earl Bihari/ Securistyle/ Ebco / Arkay / Dorma / Yama / Spider / Union
19	M.S. Pipe	Jindal / Tata
20	Ceramic Tiles	Kajaria/ Somany / Asian
21	Ceramic Tiles Adhesive	Cico Tech Ltd / Bell/ Pidilite/Bal Endura/ BASF/Sika/Fair Mate
22	Compressed Chequered Tiles	Johnson/ Somany/ Kajaria/ Nitco / Asian
23	Vacuum Dewatered Flooring	Tremix/ Sun Build/ Avcon Technics
24	Vitrified Tiles	Kajaria/ Somany / Asian
25	Thermal Insulation /Rockwool /Mineral Wool/PUF	M/S Lloyd Insulations India Ltd./ Malarpur Entech/Armacell
26	Waterproofing Agencies/ Material	Shalimar Tar Products/ IWL (India) Ltd. / Llyod Insulations India Ltd. / Chemisol Adhesive Pvt. Ltd. Mumbai/ Indian Water Proofing /Overseas Water Proofing/ (Chemistik) Texas Ltd/ Fosroc /Sika / Cico Tech Ltd/ Mc Boucheme/ BASF
27	Metal Sheet Roofing	M/S Lloyd Insulations India Ltd./ M/S Kirby/ M/s Tata Blue Scope/ M/s Inter Arch/ Karthik Roofing
28	Distemper/Acrylic Washable Distemper	Asian , Nerolac, Jotun, British paints
29	Other Paints/ Primer	
30	Plastic Emulsion Paint	
31	Synthetic Enamel Paints	
32	Resin Based Paints	
33	External Emulsion Paint	
34	Texture Paint	Berger/ Johnson & Nicholsan /Narolac/Asian / ICI

35	Clear Glass/ Clear Float Glass/ Toughened Glass	Saint Gobain (Sg) /AIS
36	Gypsum False Ceiling	India Gypsum/ Laffarge /St. Gobain (Gyproc)
37	Metal False Ceiling	Nittobo/ Armstrong/ Durlum/ Trac/ Uniment/Hunter Duglus
38	Polysulphide Sealant	Pidilite/ Fosroc/ Choksey /Sika, Mc Bouchemie, BASF/Fair Mate
39	Aluminium Extrusion	Indal/ Hindalco/ Jindal.
40	Door Closer / Floor Spring	Hettich / Hafele / Ozone
41	Cement	ACC, Ultratech, Chettinad, Coramandal, Ramco, Zuari, Malabar
42	Ready Mix Concrete	ACC/ Unitech/RMC Ltd./ L&T / Coromandal
43	Reinforcement Steel	SAIL, Tata Steel Ltd., Jindal Steel & Power Ltd. and JSW Steel Ltd.,
44	Calcium Silicate Boards	Hilux / Aerolite / Armstrong
45	Calcium Silicate Tiles	Aerolite / Hilux/Armstrong
46	E.P.D.M. Gaskets	Anand Reddiplex/ Enviro Seals
47	Flexi Tape	Norton/ Bizzare /Euro / Pinnacle
48	Glass Fibre Acoustical Tiles	Ecophon/ Up Twiga / Armstrong
49	Silicon Sealants (I) Weather Sealant (Ii) Structural Glazing Sealant	Ge- Silicon/ Pidilite/Choksey/ Wacker/ Forsoc/ Cico/ Dow Corning/ Sika
50	White Cement	Birla White/ J.K. / Grasim
51	False Floor System	Dg False Flooring & Technologies Pvt. Ltd/United Access Floor Pvt. Ltd.
52	Protective Coating	BASF / Fosroc / Fixit
53	Acoustical Wall And Ceiling System	Gyproc / Nova / Armstrong / Decoustics
54	Vitreous china sanitary ware	Hindware / Parryware /Cera
55	W.C. seats & cover	Hindware / Parryware /Cera
56	Stainless Steel sinks	Jayna/Kingston/ Neelkanth /Nirali
57	C.P. fittings & accessories & flush valves	Jaquar/ Hindware / Cera
58	Liquid soap dispenser	Chilly/Euronics/Camry/ Utec / Kopal

59	UPVC pipes & fittings conforming to IS : 13592	Supreme / Finolex / Prince /AKG / Kisan
60	Ductile iron pipes (IS:8329)	Electrosteel/Kesoram/Jindal
61	Ductile iron fittings (IS:9523)	Electrosteel/Kesoram/Jindal/Kartar
62	RCC pipes	Indian Hume Pipe/Pragati Concrete Udyog/Thirunelveli Spun Pipes/Thuluvanikkal Pipes
63	G.I. pipes	Tata/ Jindal / Prakash / Surya
64	Malleable cast iron fittings	R/Ks / Unik / Zoloto
65	CPVC pipes & fittings	Ajay / Astral / Ashirwad /Supreme/Flow Guard
66	UPVC pipes conforming to IS: 4985-2000	Supreme / Finolex / AKG / Kisan/ Flow Guard
67	Gun metal valves (fullway, check and globe valves)	Zoloto / Leader / Sant/Kartar/Atam
68	C.I. valves (fullway, check and globe valves)	Zoloto/ Kirloskar / Sant / Castle / Kartar/Atam
69	Ball cocks, check & foot valve, prv, air valve	GPA/Sant/L & K / Tbs / Zoloto/Atam
70	C.I. manhole covers and frames	Neco / R.I.F. / B.C. /Neer/Hepco/Skf
71	Stainless Steel/C P grating	Chilly/Camry / Omkar
72	RCC/SFRC manhole covers/precast RCC grating	KK / S K precast concrete/advent concretovision
73	PVC-u pipes for sewerage and drainage conforming to IS:15328:2003	Supreme / Finolex / Kisan/Flow Guard
74	Mirror	Atul/ Modi Guard /Golden Fish / Saint Gobain
75	High density polyethylene(HDPE) water storage tank	Sintex / Rotex / Fusion Plasto / Polycon
B	**Electrical**	
HT & LT ELECTRICAL WORKS		
1	HT RMU	Vyoma Switchgear /MEI/ABB/ Schneider/Crompton
2	Transformers	Kiran Power /Eltra /Spec/Intrans/KEL/Kirloskar/ Voltamp/Universal
3	HT Cables	SBEEl /Havells /Polycab/RR Kable/Nicco/Torrent
4	HT Terminations	Raychem /3M/Densons
5	LT Cables	SBEEl /Havels /Polycab/ RR Kable/Nicco/Torrent , Finolex
6	Air Circuit Breakers	L&T/Legrand /ABB/ Schneider/ Crompton

7	MCCB	L&T (DH) /Legrand /C&S/ Seimens/ Havells
8	MCB /ELCBs / ELMCBs	Hager / Legrand (Lexic) / Schneider/ GE
9	Indicating meters	AE / ElMeasure / HPL/ Socomec /L&T/ HPL/ Socomec
10	KWH Meters	L&T/Enercon(Schneider)/Ducati/ HPL/ Socomec
11	Light fittings	Schneider /Philips /GE /Bajaj/WIPRO /Ligman/ Crompton
12	Main Panel/Sub Panels	Elegant Switchgear/Load Controls/ PCE /Pace Switchgears /ATS Power Control/CPRI approved vender in Kerala
13	Indicating Lamps	Technic / Vaishnov / BCH
14	Capacitors	Epcos / Neptune /Shreem/Schneider
15	Contactors	L&T / Schneider /ABB/C & S/ OEN
16	ELRs, CBCTs & CTs	Dattar / Voltamp / Kappa / Kalpa / Prokdvs
17	O/C & E/F Relays	GE / JVS / Seimens / SEGC
18	Cable Trays	Profab /Classic / Storac/Storabwel
19	ACCL	Electron /Prok Device /Havels
20	PVC Pipes	VIP /Universal /Nelco/Balco/Finolex/ Supreme
21	PVC wire	Finolex/ Polycab/ Havells/ RR Kables/ V-Guard
22	Switches & Sockets	Anchor/ Legrand/ Schneider/ L&T/ Philips
23	Metal clad Socket/ top	Crompton/ Indo-kopp/GE/ Legrand/ Clipsal
24	Lightning Arrester	OBO Betterman/ Eritech/ Foudretech
25	SPD	OBO Betterman/ Eritech/ Foudretech/Legrand/ Siemens
26	Enclosure	Rittal/Hensel/Mehar
27	Distribution Boards	GE/Legrand/ Schneider/ L&T
DATA		
1	Wall Mount Network Rack 18u	APW-PRESIDENT/RITTAL/HEI
2	Wall Mount Network Rack 42 U DDC Controller	APW-PRESIDENT/RITTAL/HEI
3	50/125 μm OM2 TYPE MULTI MODE INDOOR OPTICAL FIBER CABLE	R&M / FINOLEX / SYSTIMAX
4	Fibre Optic Drawer/Liu	R&M / SCHHNEIDER / SYSTIMAX
5	LC Adapter Plates	R&M / SCHHNEIDER / SYSTIMAX
6	Lockable Om-2 Multimode Fibre Patch Cord (LC-LC)	R&M / SCHHNEIDER / SYSTIMAX
7	Multi-Mode LC Pigtail	R&M / SCHHNEIDER / SYSTIMAX
8	Cat 6 UTP Cable	R&M / SCHHNEIDER / SYSTIMAX
9	CAT 6 RJ45 Jacks (Information outlet)	R&M / SCHHNEIDER / SYSTIMAX
10	Faceplate	R&M / SCHHNEIDER / SYSTIMAX
11	1 & 2 Meter Cat 6 UTP Patch Cords	R&M / SCHHNEIDER / SYSTIMAX

12	2 Meter Cat 6 UTP Lockable Patch Cords	R&M / SCHHNEIDER / SYSTIMAX
13	24 Port L-3 Ethernet Switch	ALLIED TELESIS / ALCATEL / CISCO
14	24 Port Managed L-2 Ethernet Switch	ALLIED TELESIS / ALCATEL / CISCO
15	Unified Treat Management (UTM)/Firewall	SONIC WALL / FORTIGATE / CHECKPOINT
16	Wireless LAN Access Point	ALLIED TELESIS / ALCATEL / CISCO
17	Wireless Controller	ALLIED TELESIS / ALCATEL / CISCO

NOTES:

(i) Equivalent material and finishes of any other specialized make may be used, in case it is established that the brands specified above are not available in the market but only after approval of the alternate brand by the Engineer-in-charge.

(ii) The Contractor shall quote his rates on the basis of the price of best quality product of the brand / make. In case any particular brand of item is not acceptable to the client, the Contractor shall supply items of other approved brands at no extra cost.

Volume III Conditions of Contract and Contract Forms

Section 6 - General Conditions of Contract

The use of standard conditions of contract for all building and civil works throughout a country will ensure comprehensiveness of coverage, general acceptability of its provisions, savings in cost and time in bid preparation and review, and the development of a solid background of legal case histories.

The form of Conditions of Contract that follows has been developed on the basis of considerable international experience in the drafting and management of contracts, bearing in mind a trend in the construction industry towards simpler, more straightforward language.

The GCC in this bidding document provide for the usual arrangement where the Contractor constructs the Works in accordance with design provided by the Employer, and also for contracts that include, or wholly comprise, Contractor -designed civil, mechanical or electrical works.

Table of Contents

General Conditions of Contract

A. General

1.1 Boldface type is used to identify defined terms.

1.Defenitions

(a) The **Accepted Contract Amount** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

(b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.

(c) The **DRB** is the person(s) appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 29.1 [Appointment of DRB] hereunder.

(d) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

(e) Compensation Events are those defined in GCC 49.1[Compensation Events] hereunder.

(f) The Completion Date is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 65.1 [Completion].

(g) The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below.

(h) The Contractor is the party whose Bid to carry out the Works has been accepted by the Employer.

(i) The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.

(j) The Contract Price is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

(k) Days are calendar days; months are calendar months.

(l) **Day works** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

(m) A **Defect** is any part of the Works not completed in accordance with the Contract.

(n) The **Defects Liability Certificate** is the certificate issued by Project Manager upon correction of defects by the Contractor.

(o) The **Defects Liability Period** is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects.

(p) **Drawings** include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(q) The **Employer** is the party who employs the Contractor to carry out the Works, as specified in the **tender** document**.**

(r) **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

(s) **Force Majeure** means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.

(t) **In writing** or **written** means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

(u) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

(v) The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the **tender** document. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

(w) **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the Contract at the date of acceptance.

(x) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(z) **Party** means the Employer or the Contractor, as the context requires.

(y) **Plant** is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

(z) The **Project Manager** is the person appointed by the Employer and notified to the Contractor, who is responsible for supervising the execution of the Works and administering the Contract.

(aa) **Retention Money** means the aggregate of all monies retained by the Employer pursuant to GCC 51.1 [Retention].

(ab) **Schedules** means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.

(ac) The Site is the area defined as such in the PCC.

(ad) Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(ae) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(af) The **Start Date** is given in the **PCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

(ag) A **Sub Contractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

(ah) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

(ai) A **Variation** is an instruction given by the Project Manager which varies the Works.

(aj) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the **PCC.**

(ak) **PCC** means Particular Conditions of Contract

2. Interpretation

2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

2.2 If sectional completion is specified in the **PCC**, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Contract Agreement,

(b) Letter of Acceptance,

(c) Letter of Bid,

(d) Particular Conditions of Contract,

(e) General Conditions of Contract,

(f) Bill of Quantities

(g) Specifications,

(h) Drawings,

(i) Completed Activity Schedules, and

3. Language and Law The language of the Contract and the law governing the Contract are stated in the PCC.

4.Contract Agreement The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

5. Assignment Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either party may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party.

6. Care and Supply of Documents The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.

6.1

6.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.

6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.

6.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

7. Confidential Details The Contractor 's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to

7.1 verify the Contractor 's compliance with the Contract and allow its proper implementation.

7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.

7.3 Notwithstanding the above, the Contractor may furnish to its Sub Contractor (s) such documents, data and other information it receives from the Employer to the extent required for the Sub Contractor (s) to perform its work under the Contract, in which event the Contractor shall obtain from such Sub Contractor (s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause.

8. Compliance with Laws

8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.

8.2 Unless otherwise stated in the Particular Conditions:

(a) the Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings which (i) such authorities or undertakings require the Employer to obtain in the Employer's name, and (ii) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract;

(b) the Contractor shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the […Employer's Country or country where the Site is located] which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor 's and Sub Contractor 's personnel and entry permits for all imported Contractor 's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under Sub-Clause 8.2(a) hereof and that are necessary for the performance of the Contract. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Employer or its personnel, including the Sub Contractor s and their personnel, but without prejudice to Sub-Clause 8.1 hereof.

9. Project Manager's Decisions

Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

10. Delegation The Project Manager may delegate any of his duties and responsibilities to other people, except to the DRB, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

11. Communications Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

12. Subcontracting The Contractor may subcontract with prior approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

13. Other Contractor s

13.1 The Contractor shall cooperate and share the Site with other Contractor s, public authorities, utilities, and the Employer.

13.2 The Contractor shall maintain good relations and assist all sub-Contractor s and all other Contractor s who are engaged by the Employer for different packages of the work which form part of this contract. The Contractor has to provide the sub-Contractor's electric supply, scaffolding, water and any other services that may be required by them, on mutually agreed up on terms and conditions like sub metering/ agreed up on rates. It shall be deemed the responsibility of the prime Contractor to give all such assistance to all other Contractor s engaged by the Employer

14 Personnel and Equipment

14.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid, to carry out the functions stated in the Schedule or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

14.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

14.3 If the Employer, Project Manager or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 14.2 above.

15. Employer's and Contractor 's Risks The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

16. Employer's Risks

16.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

16.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer' s risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

17. Contractor 's Risks

From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks are Contractor 's risks.

18. Insurance

18.1 The Contractor shall provide an ALL CAR policy, in the joint names of the Employer and the Contractor , valid from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the PCC for the following events which are due to the Contractor 's risks:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) Personal injury or death.

18.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager'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.

18.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

18.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

18.5 Both parties shall comply with any conditions of the insurance policies.

19. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **PCC,** supplemented by any information available to the Contractor.

20. Contractor to Construct the Works

The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

21. The Works to be Completed by the Intended Completion Date

The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

22. Designs by Contractor and Approval by the Project Manager

The Contractor shall carry out design to the extent specified in the **PCC**. The Contractor shall promptly submit to the Employer all designs prepared by him. Within 14 days of receipt, the Employer shall notify any comments. The Contractor shall not construct any element of the permanent work designed by

22.1 him within 14 days after the design has been submitted to the Employer or where the design for that element has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on taking these comments into account as necessary.

22.2 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings.

22.3 The Contractor shall be responsible for design of Temporary Works.

22.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

22.5 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

22.6 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

23. Safety

The Contractor shall be responsible for the safety of all activities on the Site.

24. Discoveries

Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager' s instructions for dealing with them.

25. Possession of the Site

The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the **PCC**, the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

26. Access to The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

27. Instructions, Inspections and Audits

27.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

27.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Sub Contractor s and sub consultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.

27.3 The Contractor shall permit the Employer to inspect the Contractor's accounts, records and other documents relating to the submission of bids and contract performance and to have them audited by auditors appointed by the Employer. The Contractor shall maintain all documents and records related to the Contract for a period of three (3) years after completion of the Works. The Contractor shall provide any documents necessary for the investigation of allegations of fraud, collusion, coercion, or corruption and require its employees or agents with knowledge of the Contract to respond to questions from Employer.

28. Appointment of the DRB

28.1 The DRB shall be appointed by the Appointing authority at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the DRB, the Employer will request the Appointing Authority designated in the **PCC**, to re-appoint the DRB within 14 days of receipt of such request. The cost of the DRB will be borne by the Employer.

28.2 Should the DRB resign or die, or should the Employer and the Contractor agree that the DRB is not functioning in accordance with the provisions of the Contract, a new DRB shall be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the DRB shall be designated by the Appointing Authority at the request of either party, within 14 days of receipt of such request.

29. Procedure for Disputes If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that

29.1 the decision was wrongly taken, the decision shall be referred to the DRB within 14 days of the notification of the Project Manager's decision.

29.2 The DRB shall give a decision in writing within 28 days of receipt of a notification of a dispute.

29.3 The DRB shall be paid by the Employer;

Either party may refer a decision of the DRB to an Arbitrator within 28 days of the DRB's written decision. If neither party refers the dispute to arbitration within the above 28 days, the DRB's decision shall be final and binding. A sole Arbitrator shall be appointed by the Employer.

29.4 The arbitration shall be conducted in accordance with the "***Arbitration and Conciliation Act***, ***1996"*** procedures published by the institution named and in the place specified in the **PCC**.

B. Staff and Labour

30 Forced Labor The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labor–contracting arrangements.

31 Child Labor The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

32 Non-Discrimination and Equal Opportunity The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on non-discrimination in employment, the Contractor shall meet this Sub-Clause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.

C. Time Control

33. Program

33.1 Within the time stated in the **PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

33.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

33.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the **PCC.** If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the **PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

33.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

34. Extension of the Intended Completion Date

34.1 The Engineer-in-Charge shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

34.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay (within 30 days of occurrence of the event) or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

35. Acceleration

35.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor . If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.

35.2 If the Contractor 's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

36. Delays Ordered by the Project Manager

The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

37. Management Meetings

Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review

37.1 the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

37.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

38. Early Warning

The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the

38.1 quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

38.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

D. Quality Control

39. Identifying Defects

The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

40. Tests

If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

41. Correction of Defects

The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in

41.1

the **PCC.** The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

41.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

42. Uncorrected Defects

If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the work shall be got carried out through an agency of the Employer 's choice. The amount incurred thus shall be deducted from any amount due to the Contractor.

E. Cost Control

43. Contract Price

In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

44. Changes in the Contract Price

In the case of an admeasurement contract:

(a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 50 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.

(b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 10 percent, except with the prior approval of the Employer.

(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

45. Variations

45.1 All Variations shall be included in updated Programs

45.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered. Pending approval of the variation order, the Project Manager can release 75% of the payment release to the Contractor.

45.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

45.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

45.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

45.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 44 [Changes in the Contract Price] or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.

46. Cash Flow Forecasts

When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast.

47. Payment Certificates

The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified

47.1 previously.

47.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

47.3 The value of work executed shall be determined by the Project Manager.

47.4 The value of work executed shall comprise:

a) In the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed.

47.5 The value of work executed shall include the valuation of Variations and Compensation Events.

47.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

47.7. The Contractor shall submit his running and final bills in a computerized format along with a hard copy of the same with pages numbered.

47.8 The Contractor shall record all the measurements and enter the same in the computerized format provided by the Employer and submit the same to the Engineer-in-Charge along with a hard copy.

47.9 After checking the same by the Engineer-in-Charge, the Contractor shall incorporate all such changes and corrections and submit the same to the Engineer-in-Charge along with the corrected measurements in the form of a book duly hard bound and machine numbered in the format and colour prescribed by the Engineer-in-Charge.

48. Payments

48.1 Following procedure shall be adopted for billing of works executed by the Contractor.

The contractor shall prepare and submit the bills(Ref appendix) showing quantity executed item wise along with the detailed measurement sheets in six copies. The bills shall be submitted on completion of milestone activities. Payments against Running Account Bill shall be released only on certification by the Architect in the following manner;

75% of the running account bill, after deductions will be released within 15 days of submission of the bill on the basis of checking and certificates by the Architect.

Balance 25% will be paid within 28 days of submission of bill. It is to be noted that as far as possible the Contractor will submit the bill after joint measurements and certified by the Engineer-in-charge. This is to expedite the billing procedure,

Measurements shall be recorded as per the methods of measurements spelt out in KPWD/KWA specifications and IS code 1200 if not mentioned in the specifications. Engineer shall be fully authorised and entitled for checking the measurements quantitatively and qualitatively as recorded in the measurements Books/Bills.

48.2 Secured Advance on Materials

Secured advance, if any provision is kept, shall be paid to the Contractor against materials brought to site for execution of work as certified by the Engineer for the item stipulated in S.C.C subject to a maximum of 75% of the value of materials.

48.3 Dispute in Mode of Measurement

In case of any dispute as to the mode of measurement not covered by the contract to be adopted for any item of work, mode of measurement as per latest Indian standard code shall be followed and the decision of the Engineer shall be final.

48.4 Rounding of Amounts

In calculating the amount of each item due to the contractor in every certificate prepared for payment , the total amount on each certificate shall be rounded off to the nearest rupees, i.e. sum of less than 50 paise shall be omitted and sum of 50 paise and more up to one rupee shall be reckoned as one rupee.

48.5 Running Account Payments to be Regarded as advance

All running account payment shall be regarded as payments by way of advance against the final payment only and not as payments for works actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract or any part thereof, in this respect or of the accruing of any claim by the Contract, nor shall it conclude, determine or affect in any way the powers of the owner under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract. The final bill shall be submitted by the Contractor within one month of the date of physical completion of the work, otherwise, the Architect certificate of the measurement and of total amount payable for the work accordingly shall be final and binding on all parties.

Monthly Statements

The Contractor shall submit to the Engineer after the end of each month six copies, each signed by the Contractor's representative approved by the Owner in such form as the Engineer-in-charge may from time to time prescribe, showing the amounts to which the Contractor considers himself to be entitled up to the end of the month in respect of the value of the works executed the percentage of the invoice value of listed materials, all stated in the special conditions of contract, delivered by the Contractor on the Site for incorporation in the Works but not incorporated in such Works any other sum to which the Contractor may be entitled under the Contract.

48.6 Payment of Contractors Bill

a The Contractor shall normally submit his running account bill as per approved format. The minimum value of such bills should not be less than Rs. 50,00,000/- and as stated in appendix to tender. The Contractor on submitting the bill thereof shall be entitled to receive a monthly payment proportionate to the part thereof approved & recommended by the Architect, vetted and passed by the Employer. Whole certificate of such approval & passing of the sum so payable shall be final and conclusive against the contractor. This payment shall be made after making necessary deductions as stipulated elsewhere in the contract documents for materials, security deposits, taxes etc.

b Payment due to the Contractor shall be made by the Employer by Account payee cheque forwarding the same to the registered office or the notified office of the Contractor to receive the cheque. In no case shall the Employer be responsible if the cheque is mislaid or misappropriated by unauthorized person/persons. In all cases the Contractor shall present his bill duly pre-receipted on proper revenue stamp.

c Payment of final bill shall be made to the Contractor within 120 days of the submission of bill on joint measurements after completion of all the obligations under the Contract.

d Receipt for payment made in account of works when executed by a firm or body or corporate must be signed by a person holding due power of attorney in this respect on behalf of the Contractor, except when the contractor is described in its tender as a limited company in which case, the receipt must be signed in the name of the company by one of its principal officers or by some other persons having authority to give effectual receipt for the company.

48.7 Correction of Certificates

The amount released against any certificate is subject to all necessary recoveries, advance etc if any or any other accounts whatsoever.

The extent of work paid under any certificate is subject to modification and correction at any subsequent stage of interim/final certificate.

The certificate issued is not by itself a conclusive evidence that work paid under that certificate are in accordance with contract and such works are approved finally.

48.9 All running account payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract or any part thereof, in this respect or of the accruing of any claim by the contract, nor shall it conclude, determine or affect in any way the powers of the owner under these conditions or any of them as to the final settlement and way vary or affect the contract. The final bill shall be submitted by the contractor within one month of the date of physical completion of the work, otherwise, the Architect certificate of the measurement and of total amount payable for the work accordingly shall be final and binding on all parties.

48.10 Statement at Completion

Not later than 90 days after the issue of the Taking Over certificate in respect of the whole of the works, the Contractor shall submit to the Architect a Statement at Completion with supporting documents showing in detail, in the form approved by the Architect.

the final value of all work done in accordance with the Contract up to the date stated in such Taking-Over Certificate.

Any further sums which the Contractor considers to be due and

An estimate of amounts which the Contractor considers will become due to him under the Contract.

Estimated amounts shall be shown separately in such Statement at Completion. The Architect shall certify payment in accordance with Sub-Clause 48.5.

48.11 Final Statement

Not later than 60 days after the issue of the Defects Liability Certificate pursuant to sub – clause 48.16 the Contractor shall submit to the Engineer for consideration a draft final statement with supporting documents showing in details, in the form approved by the Engineer,

the value of all work done in accordance with the Contract and

any further sums which the Contractor considers to be due to him under the Contract.

If the Architect disagrees with any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes in the draft as may be agreed upon between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed (for the purposes of these Conditions referred to as the "Final Statement").

48.12 Discharge

Upon submission of the Final Statement, the Contractor shall give to the Employer with a copy to the Engineer, a written discharge confirming that the total of the Final statement the Contractor arising out of or in respect of the Contract. Provided that such discharge shall become effective only after payment due under the Final Certificate issued pursuant to this Sub-Clause 48.12 has been made and the Security Deposit if any, has been returned to the Contractor.

48.13 Documents/Final Certificate

Completion Certificate Document

For the purpose of Clause 48.10 the following documents will be deemed to form the completion documents:

The technical documents according to which the work was carried out.

Six (6) sets of construction drawings showing therein the modification and corrections made during the course of execution and signed by the Engineer.

Completion Certificate for 'embedded' and 'covered' up work.

Certificates of tests performed for various works.

Material appropriation statement for the materials issued by the Owner for the works and list surplus materials returned to the Owner's store duly supported by necessary documents.

Final Certificate

Within 90 days after receipt of the Final Statement, and the written discharge, the Engineer shall issue to the Employer (with a copy to the Contractor) a Final Certificate stating.

the amount which, in the opinion of the Engineer, is finally due under the Contract, and

(ii) after giving credit to the Employer for all amount previously paid by the Employer to which the Contractor is entitled under the Contractor, other than GCC 66, the balance, if any due from the Employer to the Contractor or from the Contractor to the Employer as the case may be.

48.14 Cessation of Employer's Liability

The Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contractor or execution of the works, unless the Contractor shall have included a claim in respect thereof in his Final Statement and (except in respect of matters or things arising after the issue of the Taking Over Certificate in respect of the whole of the works) in the Statement at Completion referred to in Sub-Clause 48.10

48.15 Time for payment

The amount due to the Contractor against any interim certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall subject to Clause 48.1 and in the case the Final Certificate referred to in Sub-Clause 48.13, within 90 days, after such final certificate has been delivered to the Employer.

48.16 Approval only by Defects Liability Certificate

Only the Defects Liability Certificate, referred to in Clause 48.17, shall be deemed to constitute approval of the Works

48.17 Defects Liability Certificate

The work shall not be considered as completed until a Defects Liability Certificate shall have been signed by the Engineer and delivered to the Employer, with a copy to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Works and requiring the Contractor to remedy any defects therein to the Engineer's satisfaction. The Defects Liability Certificate shall be given by the Engineer within 28 days after the expiration of the Defects Liability period, or, if different defects liability periods shall become applicable to different Sections or parts of the Permanent Works, the Expiration of the latest such period, or as soon thereafter as any works instructed, pursuant to GCC 1.1 (o) and GCC 41.1, have been completed to the satisfaction of the Engineer. Provided that the issue of the Defects Liability Certificate shall not be a condition precedent to payment to the Contractor of the second portion of the Security Deposits in accordance with the conditions set out.

48.18 Unfulfilled Obligations

Notwithstanding the issue of the Defects Liability Certificate the Contractor shall remain liable for the fulfillment of any obligation covered under the provisions of the Contract prior to the issue of the Defects Liability Certificate which remains unperformed at the time such Defects Liability Certificate is issued and, for the purpose of determining in the nature and extent of any obligation, the Contract shall be deemed to remain in force between the concerned parties.

49. Compensation

49.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 25 [Possession of the Site].

(b) The Employer modifies the Schedule of Other Contractor s in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of
Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other Contractor s, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

49.2 If a Compensation Event would cause additional cost or would prevent

the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended

49.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

49.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor 's not having given early warning or not having cooperated with the Project Manager.

50. Tax

The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed from the date of submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC.

51. Retention

51.1 The Employer shall retain from each payment due to the Contractor 2.5% of the gross amount of each running bill until Completion of the whole of the Works. The retention amount can be released against Bank Guarantee on its accumulation to a minimum amount of Rs. 5,00,000/-. However, the minimum amount of Bank Guarantee shall not be less than Rs. 5,00,000/- at any time.

51.2 Upon the issue of Virtual Certificate of Completion of the Works by the Project Manager, in accordance with GCC 65 [Completion], half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" bank guarantee.

52. Liquidated Damages

52.1 The Contractor shall pay liquidated damages to the Employer at the rate stated in the PCC for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed 10%. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

52.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 48 [Payments].

53. Bonus The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the PCC for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

54. Advance Payment

54.1 The Employer shall make advance payment to the Contractor of the amounts stated in the PCC by the date stated in the PCC, against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.

54.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

54.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

54.4 During the progress of the work, the Contractor is entitled to receive Secured Advance on the material brought to site, in connection with the work, which is non-perishable, non-fragile and noncombustible, provided the same has not been consumed in the work at the time of payment of such advance. The material shall be properly stored and protected against damage by weather or other causes.

54.5 The contractor can also claim Secured Advance against perishable, non-fragile and combustible materials provided the contractor provides a comprehensive insurance cover for the full assessed cost of the material and prior approval is taken for such claim.

54.6 The Contractor can also claim Secured advance for any material purchased by him but not brought to the site of work, however the material is brought to an approved workshop for fabrication of any item of work to be consumed in the work, provided the contractor has taken prior approval and the full cost of such material is covered through an irrevocable Bank Guarantee.

54.7 The amount of Secured Advance payable shall be as per PCC 54.6
The amount Secured Advance paid shall be recovered/deducted from the next payment made to the contractor under any of the clause/clauses of this agreement.

55. Securities

55.1 The Performance Security shall be 5% of contract price provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the **PCC,** in the shape of instruments as per PCC, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a bank guarantee.

55.2 Additional Performance Security will be required in case the rates quoted by the successful Bidder falls below 10% of the PAC, but within the maximum permissible lower limit of 25% of the PAC as per PCC.

56. Day works

56.1 If applicable, the Day works rates in the Contractor ’s Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way

56.2 A Day work Schedule should be included by the Employer if the probability of unforeseen work, outside the items included in the Bill of Quantities, is relatively high. The Contractor may quote suitable rates in the Day work schedule provided by the Employer

56.3 If applicable, the Day works rates in the Contractor 's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance, for additional work to be paid for in that way

57. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

F. Force Majeure

58. Definition of Force Majeure

58.1 In this Clause, "Force Majeure" means an exceptional event or circumstance:

(a) which is beyond a Party's control,

(b) which such Party could not reasonably have provided against before entering into the Contract,

(c) which, having arisen, such Party could not reasonably have avoided or overcome, and

(d) which is not substantially attributable to the other Party.

58.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

(a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,

(b) rebellion, terrorism, sabotage by persons other than the Contractor 's Personnel, revolution, insurrection, military or usurped power, or civil war,

(c) riot, commotion, disorder, strike or lockout by persons other than the Contractor 's Personnel,

(d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor 's use of such munitions, explosives, radiation or radio-activity, and natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

59. Notice of Force Majeure

59.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

59.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.

59.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

60. Duty to Minimize Delay

60.1 Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure.

60.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

61.Consequences of Force Majeure

If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC Sub-Clause 59 [Notice of Force Majeure], and suffers delay and/or incurs Cost by

61.1 reason of such Force Majeure, the Contractor shall be entitled subject to GCC Sub-Clause 29.1 [Procedure for Disputes] to:

(a) an extension of time for any such delay, if completion is or will be delayed, under GCC Sub-Clause 34 [Extension of the Intended Completion Date], and

(b) if the event or circumstance is of the kind described in subparagraphs (a) to (d) of GCC Sub-Clause 58.2 [Definition of Force Majeure] and, in the case of sub-paragraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC Sub Clause 18 [Insurance].

61.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC Sub-Clause 9 [Project Manager's Decisions] to agree or determine these matters.

62. Force Majeure Affecting Sub-Contractor

If any Sub Contractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

63. Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under GCC Sub-Clause 59 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure,

63.1 then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC Sub-Clause 69.5 [Termination].

63.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate which shall include:

a the amounts payable for any work carried out for which a price is stated in the Contract;

the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor , or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;

other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

the Cost of removal of Temporary Works and Contractor 's Equipment from the Site and the return of these items to the Contractor 's works in his country (or to any other destination at no greater cost); and

the Cost of repatriation of the Contractor 's staff and labor employed wholly in connection with the Works at the date of termination.

Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:

(a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and

(b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC Sub-Clause 63 [Optional Termination, Payment and Release] if the Contract had been terminated under GCC Sub-Clause 59.

G. Finishing the Contract

65. Completion The Contractor shall request the Project Manager to issue a certificate of Virtual Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.

66. Taking Over The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

67. Final Account The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

68. Operating and Maintenance Manuals

68.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the PCC in triplicate and a soft copy also.

68.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the PCC pursuant to GCC 68.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the PCC from payments due to the Contractor.

69. Termination

69.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

69.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate;

(e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Sub-Clause 21 [The Works to be Completed by the Intended Completion Date] and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager;

(g) the Contractor does not maintain a Security, which is required;

(h) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **PCC**; and

(i) if the Contractor , in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 70 [Fraud and Corruption].

69.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 69.2 above, the Project Manager shall decide whether the breach is fundamental or not.

69.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

69.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

70.Fraud and Corruption

Government of Kerala – Corrupt and Fraudulent Practices

The Client follows Government of Kerala's policy for anti-corruption and fraudulent practices to maintain sound procurement principles of open competition, economy and efficiency, transparency, and fairness. The Client requires the Consultant to observe the following Government manuals (amended from time-to-time) during the selection process and in execution of such contracts

(i) The Kerala Financial Code (KFC), 2008 (7th Edition, 1st Edition was in 1963),

(ii) The Stores Purchase Manual (SPM), 2013,

71. Payment upon Termination

71.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the PCC. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

71.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

72. Property All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

73.Release from Performance If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

Secretary
Cochin Co Operative Hospitals Society Ltd No: E 288

Section 7 - Particular Conditions of Contract

The *Particular Conditions of Contract* (PCC) complement the *General Conditions of Contract* (GCC) to specify data and contractual requirements linked to the special circumstances of the country, the Employer, the Project Manager, the sector, the overall project, and the Works. The PCC complement the GCC in a manner similar to the way in which the Bid Data Sheet complements the Instructions to Bidders.

The PCC are more detailed terms and conditions that the Employer will apply in administering the specific contract. These provisions do not constitute a complete standard set of provisions.

Particular Conditions of Contract

Except where otherwise indicated, all PCC should be filled in by the Employer prior to issuance of the Bidding Documents. Schedules and reports to be provided by the Employer should be annexed.

	A. General
GCC 1.1 (q)	Additional Secretary, ASAP, Higher Education Department, Government of Kerala
GCC 1.1 (w)	16 months from the Start Date as per GCC 1.1(af)
GCC 1.1 (ac)	The Location of the site of the work is: Mattakkuzhy – Vennikkulam Road, Thiruvaniyur Panchayath, Mamala, Ernakulam District.
GCC 1.1 (af)	The Start Date shall be the 14th day from the date of issue of letter of acceptance
GCC 1.1 (aj)	The Works consists of **Construction of College Building of Indira Gandhi College Of Nursing at Thiruvaniyur Panchayath, Ernakulam District ,on 3.00 Acre of land having plinth area of 4809.45 sq.m in three stories and a lower floor including Civil works like RCC footing, super structure, masonry, doors & windows, structural glazing, flooring & finishing, water supply & sanitary arrangements & electrification.**
GCC 2.2	Sectional Completions are:
	Milestone 1: completion of foundations-3 months from the start of work;
	Milestone 2: super structure including roof-7 months from the start of work;
	Milestone 3: finishing works - 11 months from the start of work;
	Milestone 4: plumbing & electrical works-13 months from the start of work;
	Milestone 5: external finishing & development works-14 months from the start of work
	Milestone 6: Clearing Site, Commissioning & Handing over the building-16 months from the start of work;
	Milestone penalties shall be Rs. 1,00,000/- (Rupees one Lakh) per week of delay or part thereof for not achieving each milestone. This shall be deducted until the milestone is achieved by the Contractor. If the Contractor achieves the subsequent milestone, the amount thus deducted shall be released along with the next running bill. However, the maximum of such penalties including the liquidated damages as per clause 52. shall be limited to 10% of the contract price.
GCC 3.1	The language of the contract is English
	The law that applies to the Contract is the law of Indian Contract Act 1872.
GCC 10	The Project Manager may delegate any of his duties and responsibilities.

GCC 13.1	Other Contractor includes Agencies employed for Works of equipment supply, Lift, Landscaping, Finishing, Interior and the like
GCC 18.1	The minimum insurance amounts and deductibles shall be equivalent to the contract value.
	(a) for loss or damage to the Works, Plant and Materials.
	(b) for loss or damage to Equipment.
	(c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract.
	(d) for personal injury or death:
	(i) of the Contractor 's employees
	(ii) of other people
GCC 19	Site Investigation Reports including soil analysis reports are attached
GCC 22.1	The following shall be designed by the Contractor :
	1. staging and form work
	2. Structural glazing
GCC 25	The Site Possession Date(s) shall be immediately on acceptance of LOA.
GCC 28.1	Appointing Authority for the DRB: Secretary, Higher Education Department, Government of Kerala.
GCC 29.3	The DRB shall be paid by the Employer.
GCC 29.4	Institution whose arbitration procedures shall be used:
	B. Contracts with domestic Contractors:
	Arbitration shall be conducted in accordance with the "Arbitration and Conciliation Act 1996" of India.
	C. Time Control
GCC 33.1	The Contractor shall submit for approval a Program for the Works within 28 days from the date of the Letter of Acceptance.
GCC 33.3	The period between Program updates is every 90 days.
	The amount to be withheld for late submission of an updated Program is Rupees 10,000/- per week or part thereof.
	D. Quality Control
GCC 41.1	The Defects Liability Period is: 12 Months.
	E. Cost Control
GCC 51.1	The proportion of payments retained is: 5%.

GCC 52.1	The liquidated damages for the whole of the Works are 0.1% per day. The maximum amount of liquidated damages for the whole of the Works is 10% of the final Contract Price
GCC 53	The Bonus for the whole of the Works is 0.1% of the 'value of the Contract' per day. The maximum amount of Bonus for the whole of the Works is 5% of the final Contract Price.
GCC 54.1	The Advance Payments shall be 5% contract value as mobilization advance and another 5% for equipment, tools and plants, site office and facilities on production of proof and shall be paid to the Contractor no later than on production of bank guarantee by the Contractor.
GCC 54.3	Repayment of the Advance Payments shall be on pro-rata basis from each payment certificate and shall be fully recovered when the gross bill of amount reaches 80% of the contract value.
GCC 54.6	The Secured Advance against material payable shall be 90% of the assessed value of the material.
GCC 55.1	The Performance Security amount is 5 percent of the PAC. 50% of the Performance Security shall be in the form of Treasury Fixed Deposits and the rest shall be in the form of Bank Guarantee in the format given.
GGCC 55.2	The amount of Additional Performance Security shall be the difference in percentage, between the actual percentage falling below the PAC less 10% of the PAC multiplied by the PAC.
GCC 56.1	Day work Schedule not included as the probability of unforeseen work, outside the items included in the Bill of Quantities, is relatively low.
G. Finishing the Contract	
GCC 68.1	The date by which operating and maintenance manuals are required is one month after virtual completion of the work.
	The date by which "as built" drawings are required is 100 days.
GCC 68.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 72.1 is Rupees one Lakh peer week of delay up to a maximum of Rupees Ten Lakhs.
GCC 69.2 (h)	The maximum number of days is 100 days.
GCC 71.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 25 percent.

Section 8 - Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Table of Forms

Letter of Acceptance

---- on letterhead paper of the Employer ----

. . . . . date. . . . . .

To: . . . . . *name and address of the Contractor* . . . . . .

Subject: . . . . . *Notification of Award Contract No.* . . . . . .

This is to notify you that your Bid dated . . . . *date* . . . . for execution of the . . . . . .*name of the contract and identification number, as given in the Bid Data Sheet* . . . . . for the Accepted Contract Amount of the equivalent of . . . . . .*amount in figures and words and name of currency* . . . . . as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section 8 (Contract Forms) of the Bidding Document.

[Choose one of the following statements:]

We accept that _____*[insert the name of DRB proposed by the Bidder]* be appointed as the DRB.

[or]

We do not accept that _____*[insert the name of the DRB proposed by the Bidder]* be appointed as the DRB, and by sending a copy of this Letter of Acceptance to _____*[insert name of the Appointing Authority],* the Appointing Authority, we are hereby requesting such Authority to appoint the DRB in accordance with GCC 28.

Authorized Signature:.....

Name and Title of Signatory: .....

Name of Agency:.....

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the . . . . . .day of . . . . . ., ..., between . . . . . *name of the Employer*. . . . . (hereinafter "the Employer"), of the one part, and . . . . . *name of the Contractor* . . . . .(hereinafter "the Contractor "), of the other part:

WHEREAS the Employer desires that the Works known as . . . . . *name of the Contract. . . .* should be executed by the Contractor , and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall be interpreted in the following order of priority and shall prevail over all other Contract documents.

   a) the Contract Agreement,
   b) the Letter of Acceptance,
   c) the Letter of Bid,
   d) the Particular Conditions of Contract,
   e) the General Conditions of Contract,
   f) the Bill of Quantities
   g) the Specification,
   h) the Drawings,
   i) the Completed Activity Schedules, and
   j) any other document listed in the **PCC** as forming part of the Contract.

3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

   IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of . . . . . *name of the borrowing country*. . . . .on the day, month and year indicated above.

Signed by.....

for and on behalf of the Employer

in the presence of:

Witness, Name, Signature, Address, Date

Signed by .....

for and on behalf the Contractor

in the presence of:

Witness, Name, Signature, Address, Date

Performance Security

Bank's Name, and Address of Issuing Branch or Office

Beneficiary: ..... *Name and Address of Employer* .....

Date: .....

Performance Guarantee No.: .....

We have been informed that . . . . . *name of the Contractor . . . . .* (hereinafter called "the Contractor") has entered into Contract No. . . . . *reference number of the Contract. . . . .* dated . . . . . .with you, for the execution of . . . . . *name of contract and brief description of Works. . . . .* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we . . . . . *name of the Bank. . . . .* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *name of the currency and amount in figures*[1] *. . . . . .* (. . . . . *amount in words. . . . .*) such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the . . . . . Day of . . . . . , ... [2], and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458[3], except that subparagraph (ii) of Sub-article 20(a) is hereby excluded.

. . . . . .

Seal of Bank and Signature(s)

Advance Payment Security

Bank's Name, and Address of Issuing Branch or Office

Beneficiary: ..... *Name and Address of Employer* ..... **Date:** .....

Advance Payment Guarantee No.: .....

We have been informed that . . . . . *name of the Contractor . . . . .* (hereinafter called "the Contractor") has entered into Contract No. . . . . *reference number of the Contract. . . . .* dated . . . . . .with you, for the execution of . . . . . *name of contract and brief description of Works. . . . .* (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum . . . . . *name of the currency and amount in figures* [1]*. . . . . .* (. . . . . *amount in words. . . . .*) is to be made against an advance payment guarantee.

At the request of the Contractor , we . . . . . *name of the Bank. . . . .* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *name of the currency and amount in figures*[1]*. . . . . .* (. . . . . *amount in words. . . . .*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number . . . . . *Contractor 's account number. . . . .* at . . . . . *name and address of the Bank. . . . .* .

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty percent (80%) of the Contract Price has been certified for payment, or on the . . . day of . . . . . , ... [2], whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458[3].

. . . . . .

Seal of Bank and Signature(s)

Integrity Pact

To

Sub: Construction of College Building of Indira Gandhi College Of Nursing

Dear Sir,

It is here by declared that …….. is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the Integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/Bidder will stand disqualified from the tendering process and the bid of the Bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the Employer ……..

Yours faithfully

Engineer-in-Charge.
……

ANNEXURE "A"

To

The Secretary

.....

.....

Sub: Construction of College Building of Indira Gandhi College Of Nursing

Dear Sir,

I/We acknowledge that Cochin Co Operative Hospital Society Ltd No. E 288 is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed Integrity Agreement, which is an integral part of tender documents, filing which I/We will stand disqualified from the tendering process. I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by Cochin Co Operative Hospital Society Ltd No. E 288. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledgement that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, Cochin Co Operative Hospital Society Ltd No. E 288 shall have unqualified, absolute and unfettered right to disqualify the tenderer/Bidder and reject the tender/bid is accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

INTEGRITY PACT

To be signed by the Bidder and same signatory competent / authorized to sign the relevant contract on behalf of Cochin Co Operative Hospital Society Ltd No. E 288.

This Integrity Agreement is made at ……. on this ……..day of ……. 2025.

BETWEEN

Secretaryrepresented through Chief Engineer (Hereinafter referred as the **Principal/Owner',** which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

……

(Name and Address of the Individual/Firm/Company)

through…… (Hereinafter referred to as the (Details of duly authorized signatory) "**Bidder /Contractor"** and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal / Owner has floated the Tender NIT No.: ……; (hereinafter referred to as **"Tender/Bid"**) and intends to award, under laid down organizational procedure, contract of Construction of College Building of Indira Gandhi College Of Nursing , Kerala: hereinafter referred to as the **"Contract".**

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as **"Integrity Pact" or "Pact"),** the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

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

b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

c) The Principal/Owner shall endeavor to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

d) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal Code (IPC)/Prevention of Corruption Act, 1998 (PC Act) of is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of **fraud or corruption or coercion or collusion** of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

2) The Bidder(s)/Contractor (s) commits himself to take all measured necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

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

b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

c) The Bidder(s)/ Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor (s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representative, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

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

4) The Bidder(s)/Contractor (s) will not, directly or through any other person or firm indulge in fraudulent practice **means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by of causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.**

5) The Bidder(s)/Contractor (s) will not, directly or through any other person or firm use Coercive Practices (means the act f obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any right that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case or breach of this Integrity Pact by the Bidder(s)/ Contractor(s) and the Bidder /Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

1) If the Bidder (s)/Contractor (s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14days notice to the Contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract award processed. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. **Such exclusion may be forever or for a limited period as decided by the Principal/Owner.**

2) **Forfeiture of EMD & Additional Security/Performance Guarantee/Security Deposit:** If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract of has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit,

3) and Security Deposit of the Bidder /Contractor .

4) **Criminal Liability:** if the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/holiday listing of the Bidder /Contractor as deemed fit by the Principal/Owner.

3) If the Bidder /Contractor can prove that he has resorted /recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractor s/Sub Contractor s

1) The Bidder(s)/ Contractor (s) undertake(s) to demand from all Sub Contractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Sub Contractor s/ sub-vendors.

2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the Bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6: Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor /Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other Bidders, till the Contract has been awarded.
If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, Cochin Co Operative Hospital Society Ltd No. E 288

Article 7: Other Provisions

1) This Pact is subject to Indian Law, place of performance and jurisdiction is the **Headquarters of the Division** of the Principal/Owner, who has floated the Tender.

2) Changes and supplements need to be made in writing. Side arrangements have not been made.

3) If the Contractor is a partnership or a consortium, this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intensions.

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

5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this **Integrity Agreement/Pact or interpretation thereof shall not be subject to arbitration.**

Article 8: Legal and Prior Rights

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

……. …….

(For and on behalf of Principal / Owner) (For and on behalf of Bidder /Contractor)

WITNESSES:

1) .....
(Signature, Name and Address)

2) .....
(Signature, Name and Address)

Place:

Date:

Bill Format

Running Account Bill

[**For Contractor s:** This form provides for (1) Advance Payments and (2) Payments for Measured Works. The form of Account of Secured Advances, which has been printed separately should be attached, where necessary]

Division …….. ……Sub-Division
Cash Book Voucher No…….. dated ……..
Name of Contractor ……
Name of Work……
Serial No. of this bill …….
No. and date of the previous bill for this work …….
Reference to Agreement No. …… … ……
Date of written order to commence work …….
Date of actual completion of work ……

I – ACCOUNTS OF WORK EXECUTED

Items of Work	Unit	Rate (Rs.)	Quantity executed up-to date as per Measurement Book	Payments on the basis of actual measurements		Remarks
				Up-to-date (Rs.)	Since previous bill (Rs.)	
1	2	3	4	5	6	7

Total Value of work done to-date (A)
Deduct – Value of work shown on previous bill
Net value of work since previous bill (F)
Figure (F) in words Rs……

II – CERTIFICATES AND SIGNATURES

1. The measurements on which are based the entries in column 1 to 6 of Account I, were made by ……. on …… and are recorded at page …… of Measurement Book No. ……..

* 2. Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 4 of Account I, some work has actually been done in connection with several items and the value of such work (after deducting therefrom the proportionate amount of secured advances, if any, ultimately recoverable on account of the quantities of the materials used therein) is in no case, less than the advance payments as per item 2 of the memorandum of payments, made or proposed to be made, for the convenience of the Contractor , in anticipation of and subject to the results of, detailed measurements, which will be made as soon as possible.

Dated signature of officer preparing the bill (Rank) …….
……

¶ Dated signature of officer authorizing payment (Rank) …….
……

…….
Dated signature of Contractor

---

* This certificate must be signed by the Sub-Divisional or Divisional Officer.

¶ This signature is necessary only when the officer who prepares the bill is not the officer who authorizes the payment. In such a case the two signatures are essential.

III – MEMORANDUM OF PAYMENTS

1. Total value of work actually measured, as per Acct.1, Col.5, Entry (A)
2. Total "up-to-date" Advance Payments for work not yet measured, as per details given below:

    (a) Total as per previous bill …….. (B)
    (b) Since previous bill ……. as per page ……of M.B. No. …… (D)

3. Total "up-to-date" Secured Advances on security of materials as per Annexure (Form26A), Col.8 Entry (C) ……
4. Total (items 1+2+3) ……
5. Deduct – Amount withheld -
    (a) From previous bill as per last Running Account Bill……..
    (b) From this bill……
6. Balance i.e., "up-to-date" payment (item4-5) ……(K)*
7. Total amount of payments already made as per Entry (K), of last Running Account Bill No. …… of ……forwarded with accounts for ……20…….
8. Payments now to be made, as detailed below :
    (a) By recovery of amounts creditable to this work - (a)……..…….
    (b) By recovery of amounts creditable to other works or Heads of Account. (b)
        (i) 0021- Income Tax @ 2%
        (ii) other Recoveries
    (c) By cheque ± …….

Pay Rs. ¶ (……..) ……..
± (by cheque)

Dated initials of Disbursing Officer

Received Rs. ¶ ¶ (……..) …….
as per above memorandum, on account of this work.

Dated ……. 20……..

Stamp

**Witness …….

Signature of Contractor

Paid by me, vide cheque No……. dated ……20…….

Dated initials of person actually making the payment

---

* This figure should be tested to see that it agrees with the total of items 7 and 8.

± If the net amount to be paid is less than Rs.10 and it cannot be included in a cheque the payment should be made in cash, this entry being altered suitably and the alteration attested by dated initials.

¶ Here specify the net amount payable, vide item 8(c).

¶ ¶ The payee's acknowledgement should be for the gross amount paid as per item 8 (i.e. a+b+c).

** Payment should be attested by some known person when the payees acknowledgement is taken by mark, seal or thump impassion.

(±)**May be considered for deletions in terms of Note 3 below Rule 42 of CGA (R&P) Riles, 1983**

IV – REMARKS

(This space is reserved for any remarks which the Disbursing Officer or the Divisional Officer may wish to record in respect of the execution of the work, check of measurements or the state of Contractor 's account.)

For use in Divisional Office

Checked

Accounts Clerk *Divisional Accountant.*

For use in Pay and Accounts Office

Audited Reviewed

Accountant JAO/AAO Pay & Accounts Officer

Guarantee for Water Proofing Works

Guarantee to be executed by Contractor s for removal of defects after completion in respect of water proofing works

The Agreement made this ..... day of ..... two thousand and ..... between..... son of ..... of ..... (hereinafter called the Guarantor of the one part) and the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288 (hereinafter called Client of the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the Contract) dated ..... and made between the GUARANTOR of the one part and the Client of the other part, whereby the Contractor , *inter alia*, undertook to render the buildings and structures in the said contract recited completely water and leak-proof.

AND WHEREAS GUARANTOR agreed to give a guarantee to the effect that the said structures will remain water and leak-proof for five years from the date of giving of water proofing treatment.

NOW THE GUARANTOR hereby guarantees that water proofing treatment given by him will render the structures completely leak-proof and the minimum life of such water proofing treatment shall be five years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or alteration and for such purpose:

(a) Misuse of roof shall mean any operation which will damage proofing treatment, like chopping of firewood and things of the same nature which might cause damage to the roof;
(b) Alteration shall mean construction of an additional storey or a part of the roof or Construction adjoining to existing roof whereby proofing treatment is removed in parts;
(c) The decision of the Engineer-in-Charge with regard to cause of leakage shall be final.

During this period of guarantee the guarantor shall make good all defects and in case of any defect being found, render the building water-proof to the satisfaction of the Engineer-in-Charge at his cost, and shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer-in-Charge calling upon him to rectify the defects, failing which the work shall be got done by the Department by some other Contractor at the GUARANTOR'S cost and risk. The decision of the Engineer-in-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if GUARANTOR fails to execute the water proofing or commits breach there under then the GUARANTOR will indemnify the Principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Client the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligor .....and by..... and for and by the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288 on the day, month and year first above written.

Signed, sealed and delivered by OBLIGOR in the presence of—

1.

2.

Signed by the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288In the presence of—

1.

2.

Guarantee for Structural Glazing Works

Guarantee bond for removal of defects in curtain glazing & aluminium works (used in aluminium windows, doors and curtain glazing).

This Agreement made this _____ day of _____ two thousand and _____between _____ son of _____(hereinafter called the Guarantor on the one part) and the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288 (hereinafter called Client on the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the contract) dated_____ and made between the GUARANTOR on the one part and the Client on the other part for construction _____(Name of the work) where by the GUARANTOR, *inter alia*, undertook to render the work of aluminium and curtain glazing in the said contract recited completely structurally safe, water tight and free from defects in functional performance of glass, glazed units, anodizing, aluminium sections, EPDM/Silicon gaskets and sealants.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said work of aluminium and curtain glazing in the said contract recited completely will remain structurally stable, completely leak proof and guaranteed against faulty material and workmanship, powder coated finishing for ten years from the date of completion of the work under this tender.

NOW THE GUARANTOR hereby guarantees that Curtain glazing and aluminium works executed by him will remain structural stable completely leak proof and guaranteed against faulty material and workmanship, powder coated finishing for ten years from the date of completion of the work under this tender.
The decision of the Engineer-in-charge with regard to cause of defect(s) small be final.

During this period of guarantee, the GUARANTOR shall make good all defects to the satisfaction of the Engineer-in-charge at his cost and commence the work for such rectification within seven days from the date of issue of notice from the Engineer-in-charge calling upon him to rectify the defects failing which the work shall be got done by the department of some other Contractor at the GUARANTOR's cost and risk. The decision of Engineer-in-charge as to the cost, payable to the GUARANTOR shall be final and binding.

That if the GUARANTOR fails to execute the necessary rectification of water proofing or commits breach there under, then the Guarantor will indemnify Engineer-in-charge and his successors against all loss, damage, cost expense or otherwise which may be incurred by him by reasons of any default on the part of GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and / or cost incurred by the Client, the decision of the Engineer – in – Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents has been executed by the Obligator _____and by _____and the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288on the day, month and year first above written.

Signed, sealed and delivered by **OBLIGATOR** in the presence of:

1.

2.

SIGNED BY the Secretary, Cochin Co Operative Hospital Society Ltd No. E 288 …….. in the presence of:

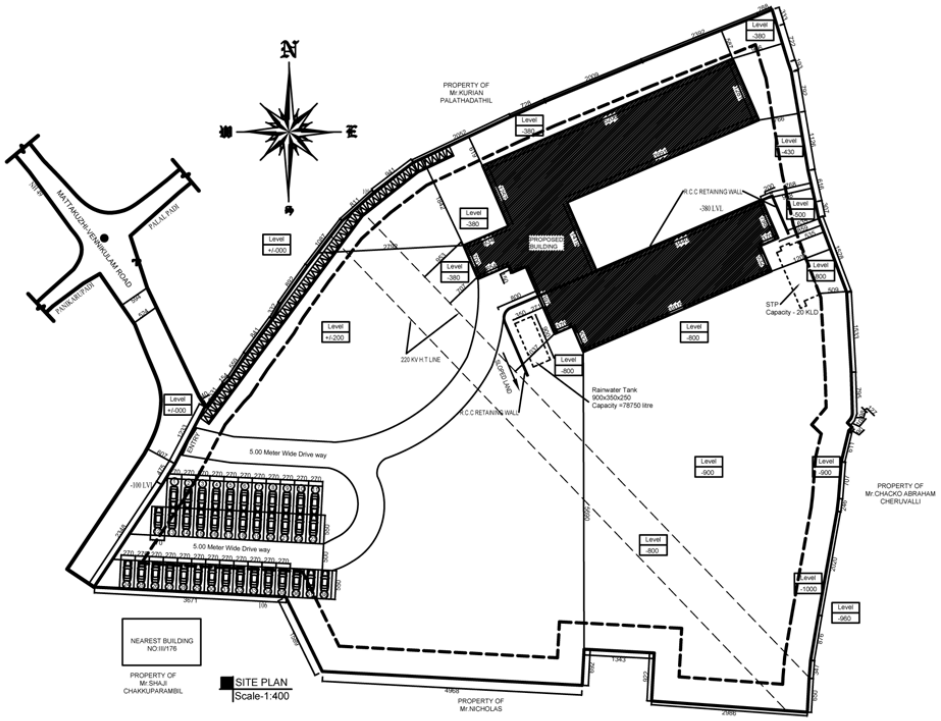
1.

2.

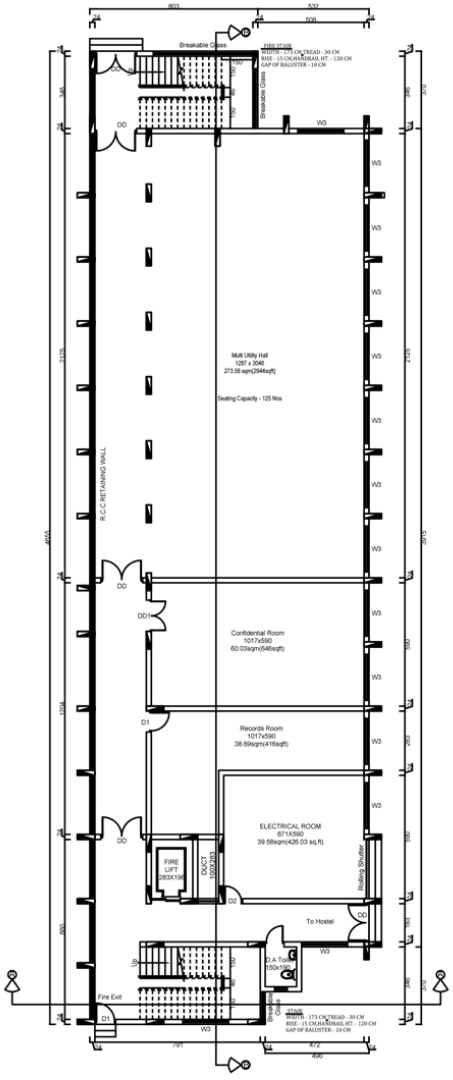
NOTE: The Guarantee bond to be furnished on a 'Non-Judicial' stamp paper worth Rs.200/- and shall be duly notarized.

Volume IV Drawings and Bill Of Quantities

Section 1 – Drawings

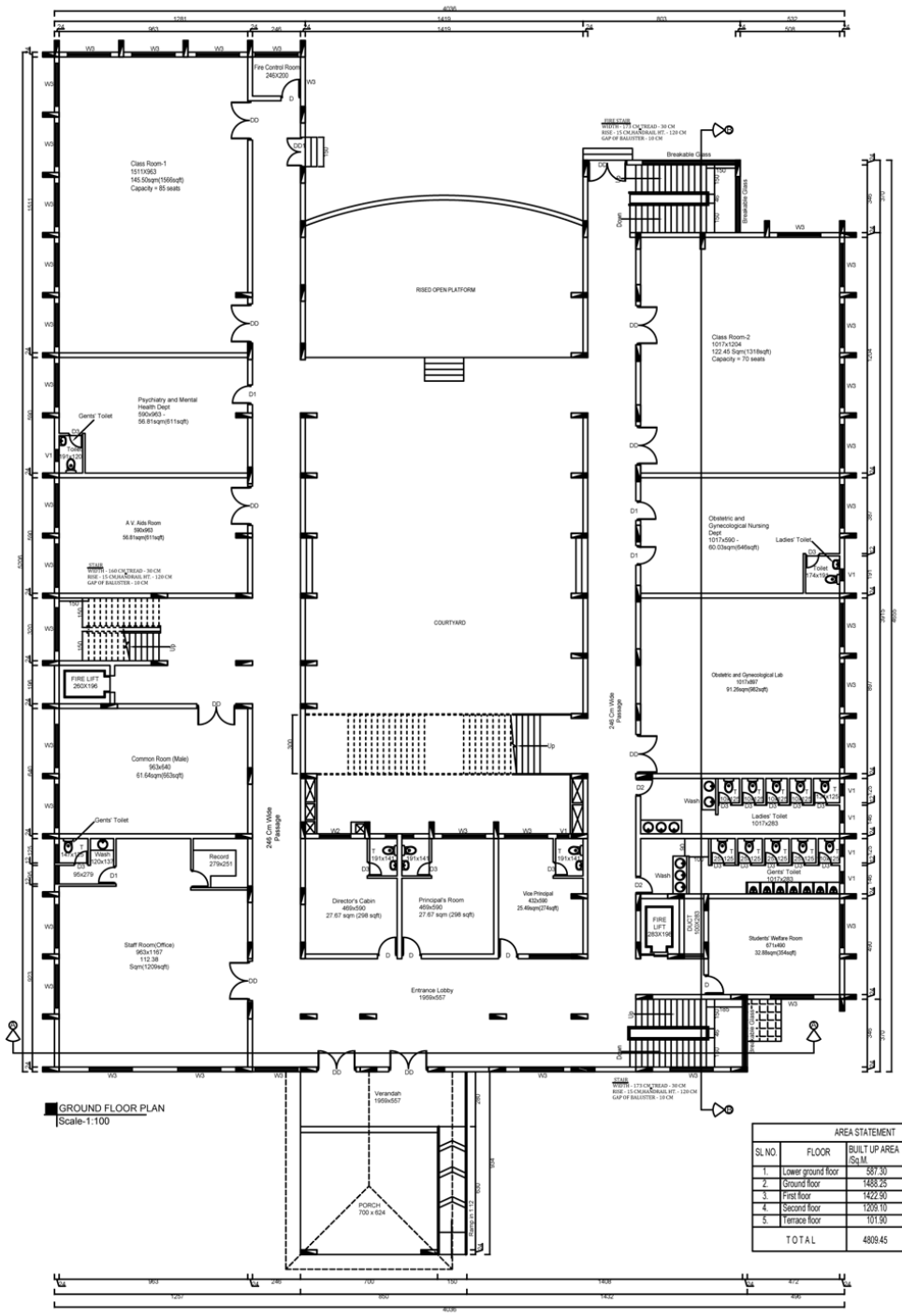


NOTES:	AREA STATEMENT IN SQ.FT			PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -587.30 M²	ARCHITECTS	SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				SITE PLAN	Checked: P.P	
				Rev No: 0 / DGte : 11.09.24 / Drawing No: WD.01	Sheet No: 01	



AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	584.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
TOTAL		4809.45	4500.60

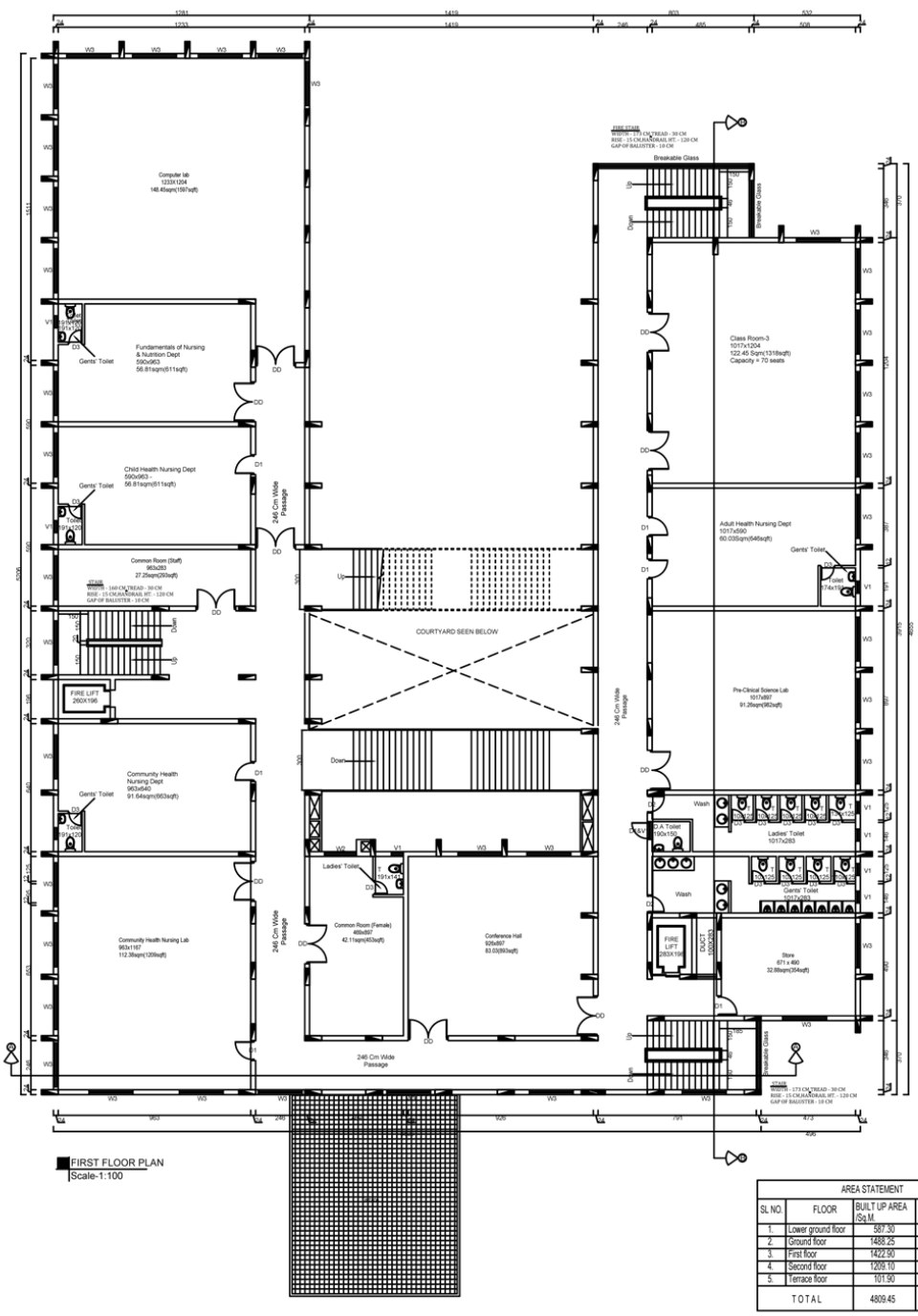
NOTES:	AREA STATEMENT IN SQ.FT			PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -587.30 M²	ARCHITECTS	SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE		Drawn : AZEEZ
Dimensions are to be read only and not to be scaled from the drawing				LOWER GROUND FLOOR PLAN		Checked: P.P
				Rev No: 0	DGte : 11.09.24	Drawing No: WD.01	Sheet No: 02



GROUND FLOOR PLAN
Scale-1:100

AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	594.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
	TOTAL	4809.45	4500.60

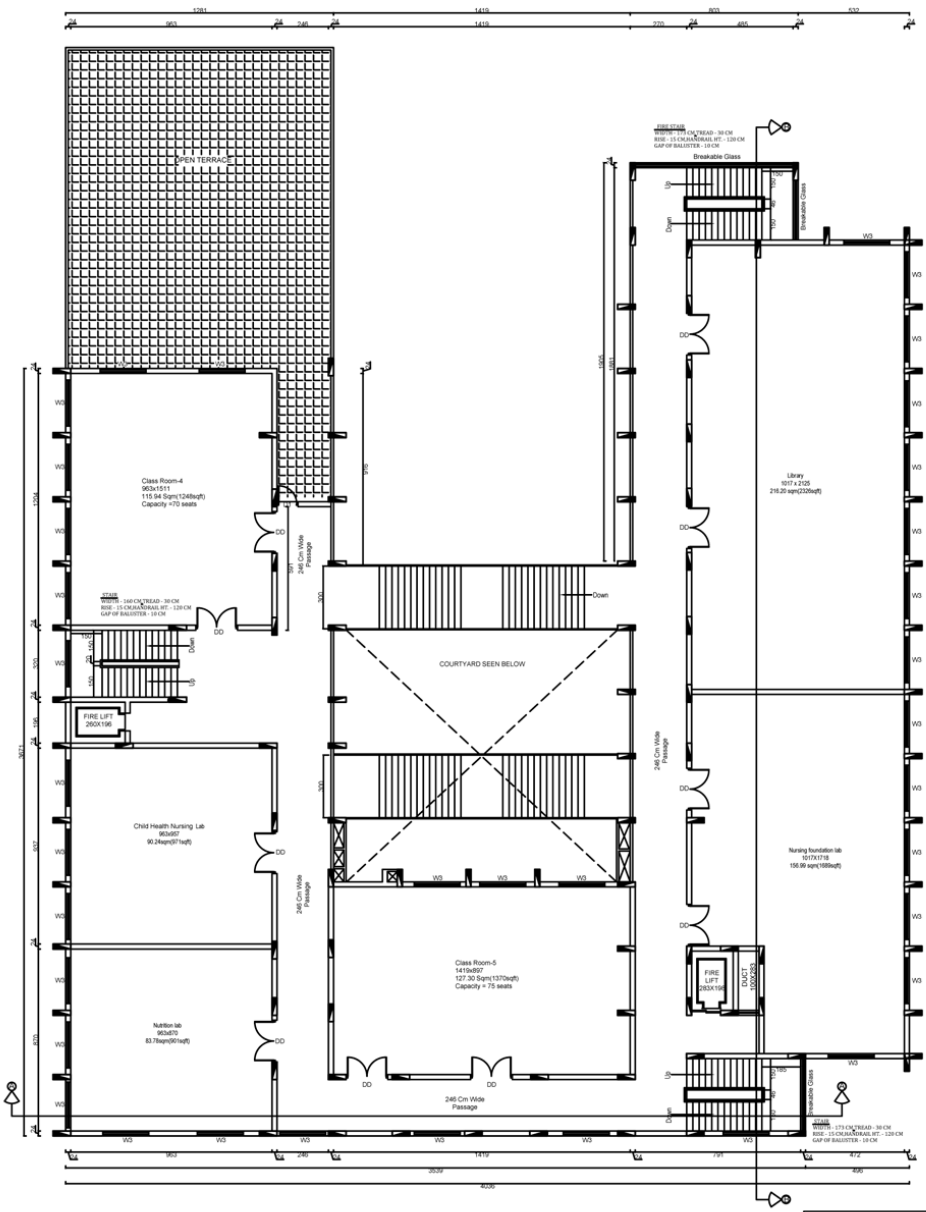
NOTES:	AREA STATEMENT IN SQ.FT			PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -1488.25 M²	ARCHITECTS	SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				GROUND FLOOR PLAN	Checked: P.P	
				Rev No: 0 / DGte : 11.09.24 / Drawing No: WD.01	Sheet No: 03	



FIRST FLOOR PLAN
Scale-1:100

AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	584.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
TOTAL		4809.45	4500.60

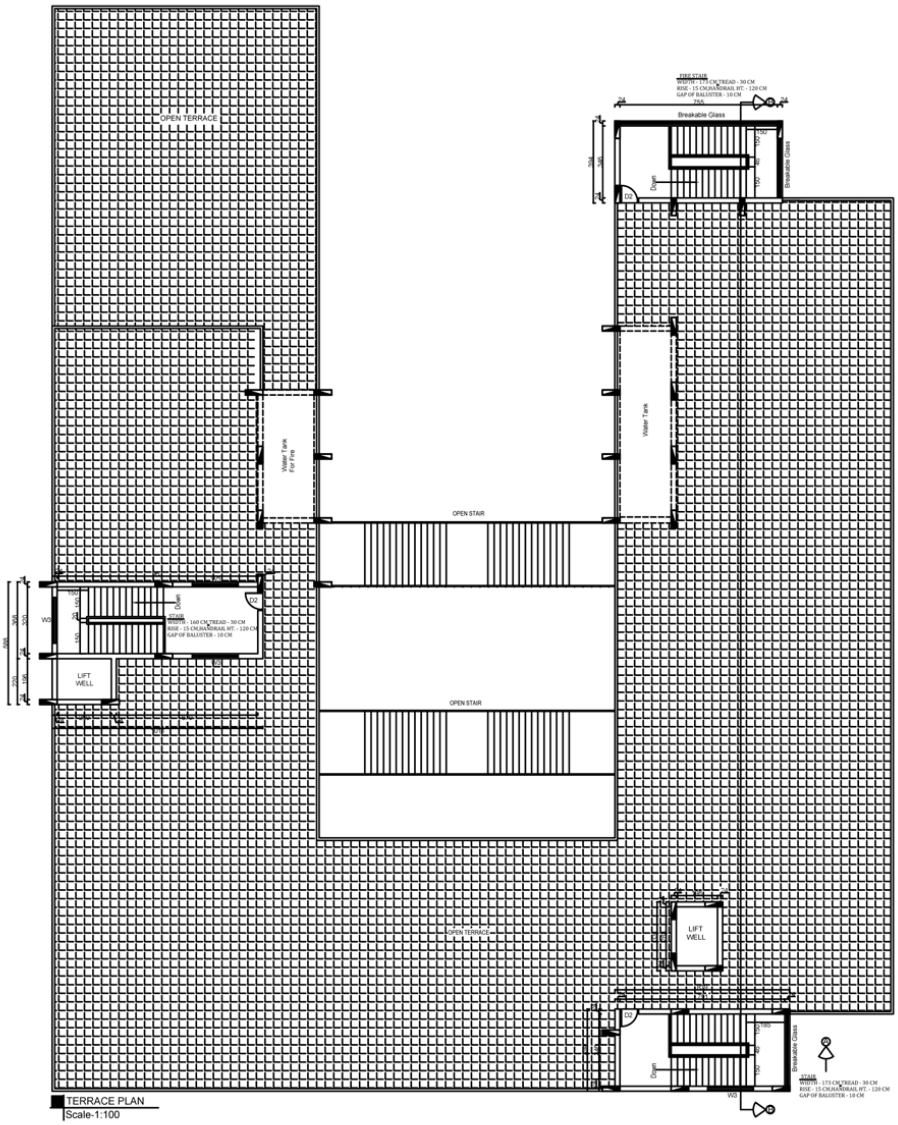
NOTES:	AREA STATEMENT IN SQ.FT			PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -1422.90 M²	ARCHITECTS	SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				FIRST FLOOR PLAN	Checked: P.P	
				Rev No: 0 / DGte : 11.09.24 / Drawing No: WD.01	Sheet No: 04	



SECOND FLOOR PLAN
Scale-1:100

AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	584.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
TOTAL		4809.45	4500.60

NOTES:	AREA STATEMENT IN SQ.FT	ARCHITECTS		PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -1209.10 M²		SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				SECOND FLOOR PLAN	Checked: P.P	
				Rev No: 0 / DGte : 11.09.24 / Drawing No: WD.01	Sheet No: 05	



AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	584.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
TOTAL		4809.45	4500.60

NOTES:	AREA STATEMENT IN SQ.FT	ARCHITECTS		PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	AREA -101.90 M²		SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				TERRACE FLOOR PLAN	Checked: P.P	
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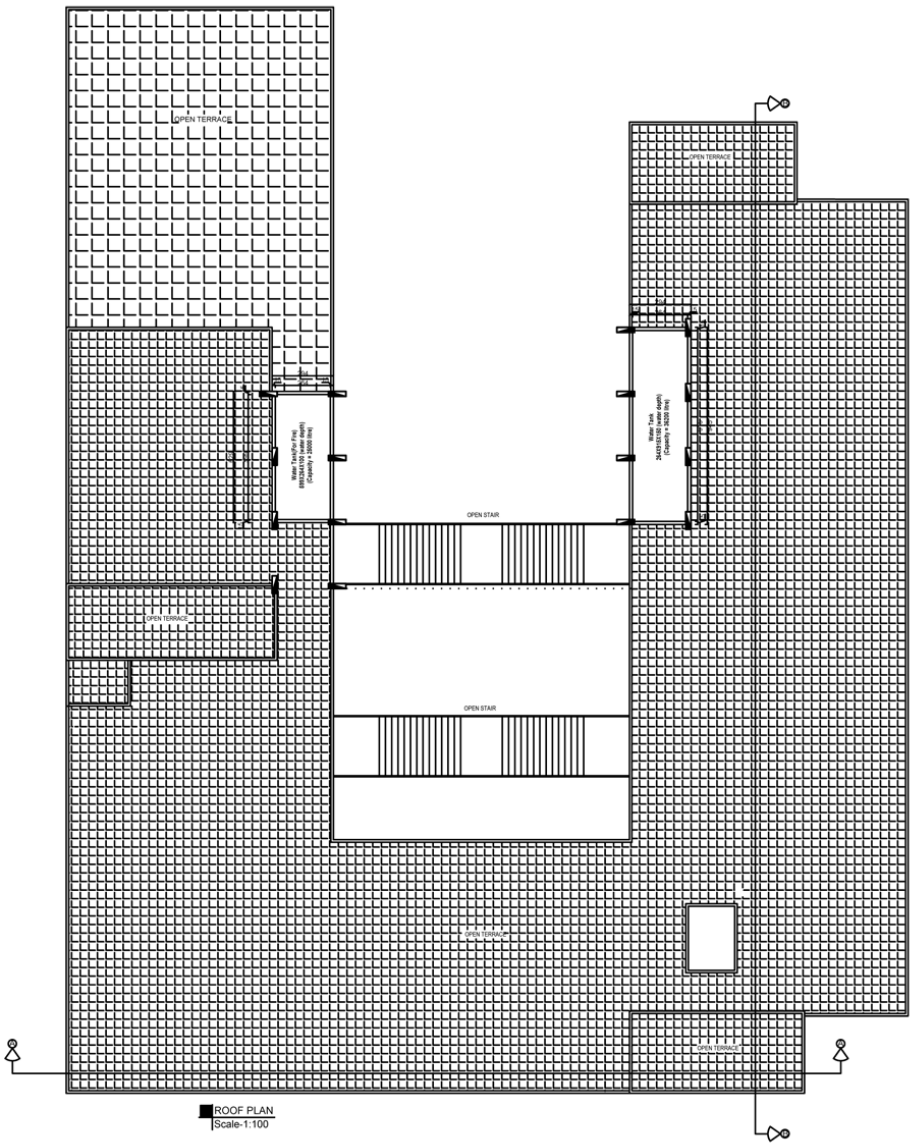
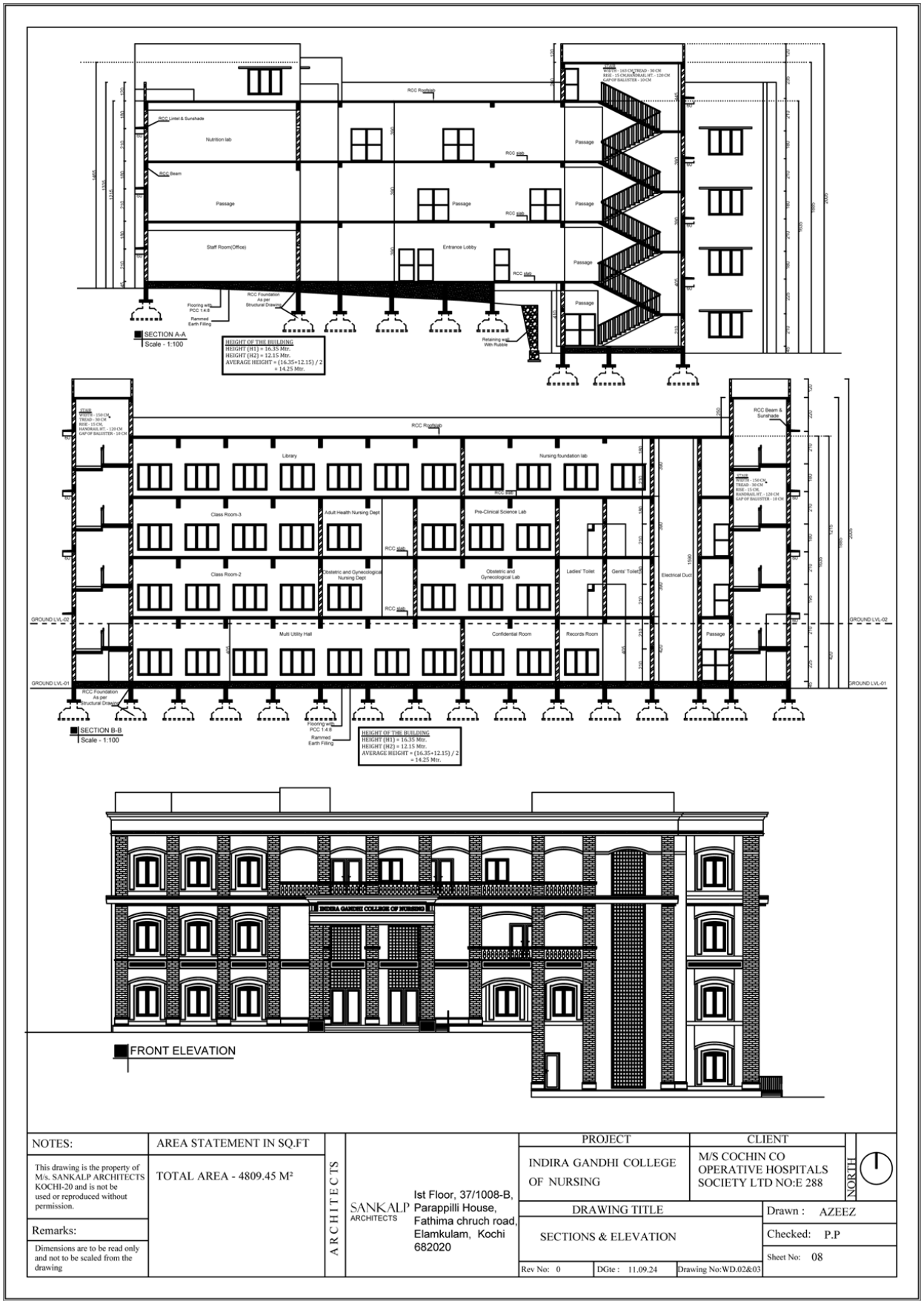


ROOF PLAN
Scale-1:100

AREA STATEMENT			
SL NO.	FLOOR	BUILT UP AREA /Sq.M.	FLOOR AREA /Sq.M.
1.	Lower ground floor	587.30	584.47
2.	Ground floor	1488.25	1358.75
3.	First floor	1422.90	1330.57
4.	Second floor	1209.10	1124.91
5.	Terrace floor	101.90	101.90
TOTAL		4809.45	4500.60

NOTES:	AREA STATEMENT IN SQ.FT			PROJECT	CLIENT	
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	TOTAL AREA - 4809.45 M²	ARCHITECTS	SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288	NORTH
Remarks:				DRAWING TITLE	Drawn : AZEEZ	
Dimensions are to be read only and not to be scaled from the drawing				ROOF PLAN	Checked: P.P	
				Rev No: 0 / DGte : 11.09.24 / Drawing No: WD.01	Sheet No: 07	



NOTES:	AREA STATEMENT IN SQ.FT		PROJECT	CLIENT
This drawing is the property of M/s. SANKALP ARCHITECTS KOCHI-20 and is not be used or reproduced without permission.	TOTAL AREA - 4809.45 M²	ARCHITECTS	INDIRA GANDHI COLLEGE OF NURSING	M/S COCHIN CO OPERATIVE HOSPITALS SOCIETY LTD NO:E 288
Remarks:		SANKALP ARCHITECTS Ist Floor, 37/1008-B, Parappilli House, Fathima chruch road, Elamkulam, Kochi 682020	DRAWING TITLE: SECTIONS & ELEVATION	Drawn : AZEEZ
Dimensions are to be read only and not to be scaled from the drawing				Checked: P.P
			Rev No: 0 / DGte : 11.09.24 / Drawing No:WD.02&03	Sheet No: 08

NORTH

Section 2 – Bill Of Quantities

Construction of College Building of Indira Gandhi College Of Nursing at Thiruvaniyur, Ernakulam District

		Date	Tender No:		

Bill of Quantities

PART I - CIVIL WORK					
SL NO	**ITEM OF WORK**	**QUANITY**	**UNIT**	**RATE**	**AMOUNT**
I	**SITE CLEARING:**				
1	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared	5952.00	Sqm		
II	**EARTH WORK :**				
1	Excavation work by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soils as directed, within a lead of 50 m. Hard rock (blasting prohibited)	3101.20	Cum		
2	Diluting and injecting chemical emulsion for POST -CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion):Along external wall where the apron is not provided using chemical emulsion @ 7.5 litres / sqm of the vertical	290.00	m		

	surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: With Chlorpyriphos /Lindane E.C. 20% with 1% concentration				
3	Diluting and injecting chemical emulsion for POST -CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion): Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1:2 (1 cement : 2 coarse sand) to match the existing floor: With Chlorpyriphos/Lindane E.C. 20% with 1% concentration	1902.00	Sqm		
4	Supplying chemical emulsion in sealed containers including delivery as specified. Chlorpyriphos / Lindane emulsifiable concentrate of 20%	982.90	Ltr		
5	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	2170.84	Cum		
6	Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as	976.54	Cum		

	per direction of site Engineer-in-charge				
7	Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered). Depth exceeding 1.5 m but not exceeding 3 m	537.97	Sqm		
8	Extra for planking, strutting and packing materials for cavities (in close timbering) if required to be left permanently in position. (Face area of timber permanently left to be measured).	537.97	Sqm		
9	Extra rates for quantities of works, executed: In or under water and/or liquid mud, including pumping out water as required	537.97	Sqm		
10	Bailing out water using pump above 5 HP and Up to 10 HP-Bailing out water with engine and pump set above 5HP and up to 10HP, including conveyance to site and erection,cost of fuel, lubrication oil and other stores, pay of staff etc complete	180.00	Hrs		
III	**PLAIN CEMENT CONCRETE WORK :**				
1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering-All work up to plinth level 1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone aggregate 40 mm nominal size)	282.15	Cum		
2	Providing and laying damp-proof course 50 mm thick with cement concrete 1:2:4(1 cement : 2 coarse sand : 4 graded stone	129.20	Sqm		

	aggregate 20 mm nominal size).				
3	Making plinth protection 50 mm thick of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75 mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including finishing the top smooth.	74.67	Sqm		
4	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .	2067.50	Kg		
IV	**REINFORCED CEMENT CONCRETE WORK :**				
1	Centering and shuttering including strutting, propping etc. and removal of form work for: Foundations, footings, bases for columns	102.14	Sqm		
2	Centering and shuttering including strutting, propping etc. and removal of form work for: Foundations, footings, bases for columns	819.88	Sqm		
3	Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	873.45	Sqm		
4	Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	3479.49	Sqm		

5	Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform	5956.50	Sqm		
6	Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers	6692.29	Sqm		
7	Centering and shuttering including strutting, etc. and removal of form for: Stairs, (excluding landings) except spiral - staircases)	333.34	Sqm		
8	Centering and shuttering including strutting, etc. and removal of form for: Arches, domes, vaults up to 6m span	46.90	Sqm		
9	Centering and shuttering including strutting, etc. and removal of form for: Small lintels not exceeding 1.5 m clear span, moulding as in cornices, window sills, string courses, bands, copings, bed plates, anchor blocks and the like	7.02	Sqm		
10	Centering and shuttering including strutting, etc. and removal of form for: Edges of slabs and breaks in floors and walls Under 20 cm wide	349.13	Sqm		
11	Centering and shuttering including strutting, etc. and removal of form for: Weather shade, Chajjas, corbels etc., including edges	469.93	Sqm		

12	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	635.16	Cum		
13	Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement : 1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	147.63	Cum		

14	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	1659.14	Cum		
15	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	1806.77	Cum		
16	Providing and fixing Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level using Thermo - Mechanically	273892.02	Kg		

	Treated bars of grade Fe-500D or more				
17	Providing and fixing in position copper plate as per design for expansion joints.	323.24	Kg		
18	Providing and filling in position, blow bitumen in expansion joints.	34.44	Cum		
19	Providing and fixing sheet covering over expansion joints with iron screws as per design.	91.83	m		
20	Providing and Fixing of precast concrete Baluster using concrete mix not weaker than grade M 40 and fixing using rich cement mix including cost and conveyance of all materials, labour etc complete as per the design and directons of the Engineer in charge.	258	Nos		
V	**STONE AND BRICK WORK :**				
1	Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) upto plinth level with :Cement mortar 1:6 (1 cement : 6 coarse sand)	17	Cum		
2	Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	785.60	Cum		

3	Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure above floor two level upto floor five level thickness 20cm and above in : CM 1:6 (1 cement : 6 coarse sand sand) etc complete	34.40	Cum		
4	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x10 cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level for 10 cm thick wall in : CM 1:6 (1 cement : 6 coarse sand) including cost of scaffolding complete	102.33	Cum		
VI	**PLASTERING:**				
1	Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers.	219.40	KG		
2	12 mm cement plaster of mix: 1:4 (1 cement : 4 fine sand)	8438.94	Sqm		
3	15 mm cement plaster on the rough side of single or half brick wall of mix:1:4 (1 cement :4 fine sand)	3043.65	Cum		
4	Extra for plastering exterior walls of height more than 10 m from ground level for every additional height of 3 m or part thereof.	764.19	Sqm		
5	Extra for plastering done on moulding cornices or architraves including neat finish to line and level: In two coats	221.01	Sqm		
6	Extra for lining out plaster to imitate stone or concrete blocks walling.	388.96	Sqm		

7	Add for plaster drip course / groove in plastered surface or moulding to R.C.C. projections.	871.57	m		
8	Pebble dash plaster upto 10 m height above ground level with a mixture of washed pebble or crushed stone 6 mm to 12.5 mm nominal size, dashed over and including fresh plaster in two layers under layer 12 mm cement plaster 1:4 (1 cement : 4 coarse sand) and top layer 10 mm cement plaster with cement mortar 1:3 (1 cement : 3 fine sand) mixed with 10% finely grounded hydrated line by volume of cement .	5	Sqm		
9	9 mm cement plastering of mix : 1:3 (1 cement : 3 fine sand) including all cost of materials, labour charges etc complete	18609.62	Sqm		
10	Water proof plastering with Cement Mortar 1:4 (1 cement : 4 fine sand) 12mm thick plaster finished with a floating coat of neat cement mixed with water proofing compound of approved make @ 2kg/m2 of mix floated hard and troweled smooth including all labour, material, conveyance charges etc complete.	1482.40	Sqm		
11	Providing and fixing wire mesh of wire diameter 0.4mm and mesh size not exceeding 10mm x 10mm to the rescessed area and making good surface for plastering including all labour, tools and scafolding etc complete as per the direction of Engineer in charge.	2197.07	Sqm		
12	12 mm thick plain cement mortar bands in cement	678	m/cm		

	mortar 1:4 (1 cement : 4 fine sand) :Moulded Band				
VII	**GRANITE WORK :**				
1	Providing and fixing 18 mm thick gang saw cut, mirror, polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations, of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Area of slab over 0.50 sqm	51	Sqm		
2	Extra for fixing marble/ granite stone, over and above corresponding basic item, in facia and drops of width upto 150 mm with epoxy resin based adhesive, including cleaning etc. complete.	58	M		
3	Extra for providing opening or required size & shape for wash basin/kitchen sink in kitchen platform, vanity counter and similar location in marble/granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	18	Nos		
4	Providing edge moulding to 18 mm thick marble stone counters, vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by	657	M		

	Engineer -in-Charge.Granite work				
VIII	**JOINERY WORK:**				
1	Providing and fixing factory made uPVC door frame made of uPVC extruded sections having an overall dimension as below (tolerance 1 mm), with wall thickness 2.0mm (0.2 mm), corners of the door frame to be jointed with galvanized brackets and stainless steel screws, joints mitred and plastic welded. The hinge side vertical of the frames reinforced by galvanized M.S. tube of size 19 x 19 mm and 1 mm (0.1 mm) wall thickness and 3 nos. stainless steel hinges fixed to the frame complete as per manufacturer's specification and direction of Engineer-in-charge Extruded section profile size 42x50 mm	37	M		
2	Providing and fixing to existing door frames.30 mm thick Fiberglass Reinforced Plastic (F.R.P) flush door shutter in different plain and wood finish made with fire retardant grade unsaturated polyester resin, moulded to 3 mm thick FRP laminate all around, with suitable wooden blocks inside at required places for fixing of fittings and polyurethane foam (PUF) / Polystyrene foam to be used all filler material throughout the hollow panel, casted monoolithically with testing parameters of F.R.P. laminate conforming to table - 3 of IS : 14856,	14	Sqm		

	complete as per direction of Engineer-in-charge.				
3	Providing and fixing IS : 12817 marked stainless steel butt hinges with stainless steel screws etc. complete: 125x64x1.90 mm	342.00	Nos		
4	Providing and fixing IS : 12817 marked stainless steel butt hinges with stainless steel screws etc. complete: 125x64x1.90 mm	124.00	Nos		
5	Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete:250x10 mm	24.00	Nos		
6	Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete: 150x10 mm	344.00	Nos		
7	Providing and fixing bright finished 100 mm mortice lock with 6 levers without pair of handles of approved quality for aluminium door, with necessary screws etc complete as per direction of Engineer- in-charge.	47.00	Nos		
8	Providing and fixing aluminium handles, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete: 125 mm	609.00	Nos		
9	Providing and fixing aluminium hanging floor door stopper, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour and shade, with necessary screws etc. complete.Twin rubber stopper	14.00	Nos		

10	Providing and fixing aluminium casement stays, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour and shade, with necessary screws etc. complete.	25.00	Nos		
11	Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width form 701 mm to 1000 mm), with double speed adjustment with necessary accessories and screws etc. complete.	114.00	Nos		
12	Providing and fixing M.S. Grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.Fixed to openings/ wooden frames with rawl plugs screws etc	11745.72	Kg		
13	Providing and fixing with 8mm thick bison panel both side laminated for top , bottom and middle panels of door shutters with EPDM rubber gaskets, etc Complete as per the directions of the Engineer in Charge	102.38	Sqm		
14	Providing Wall mounted cubicle system with compact laminate 12mm with single colour HPL board for toilet with over all height of 2105mm (including bottom gap of 150mm) with standard section accessories such as aluminium U channel	31	Nos		

	powder coated, aluminum door stopper channel, H sections, top rail with wall bracket, S.S hook(304), S.S privacy thump turn occupancy indicator, excess door knob, S.S hinges with cover, rubber door topper lining, excess screws, PVC wall plugs etc. complete as per Drg & as directed by the Engineer in charge				
15	Providing Wall mounted cubicle system with compact laminate 12mm with single colour HPL board for urinal partition of size 450 mm (width) and 1195 mm (height) stainless steel (304 L)with standard section accessories . complete as per Drg & as directed by the Engineer in charge	3	Nos		
IX	**STEEL WORK :**				
1	Supplying and fixing rolling shutters of approved make, made of required size M.S.laths, interlocked together through their entire length and jointed together at the end by d locks, mounted on specially designed pipe shaft with brackets, sideguides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover	15.05	Sqm		

2	Extra for providing grilled rolling shutters manufactured out of 8 mm dia M.S. bar instead of laths as per design approved by Engineer -in-Charges, (area of grill to be measured).	1.20	Sqm		
3	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)	1124.69	Kg		
X	**FLOORING :**				
1	Providing and laying Polished Granite stone flooring in required design andpatterns, in linear as well as curvilinear portions of the building all complete asper the architectural drawings with 18 mm thick stone slab over 20 mm (average)thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed withcement slurry and pointing with white cement slurry admixed with pigment	170.20	Sqm		

	ofmatching shade including rubbing , curing and polishing etc. all complete asspecified and as directed by the Engineer-in-Charge. Polished Granite stone slab jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.				
2	Providing and laying flamed finish Granite stone flooring in required designand patterns, in linear as well as curvilinear portions of the building all completeas per the architectural drawings with 18 mm thick stone slab over 20 mm(average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid andjointed with cement slurry and pointing with white cement slurry admixed withpigment of matching shade including rubbing, curing and polishing etc. allcomplete as specified and as directed by the Engineer-in-Charge : Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye orequivalent.	273.75	Sqm		
3	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1:4 (1 cement : 4 coarse sand) 25 mm thick	888.71	Sqm		
4	Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg).	4342.32	Sqm		

	including filling /grouting and finishing complete as per direction of Engineer-in-charge.				
5	Chequerred precast cement concrete tiles 22 mm thick in footpath & courtyard, jointed with neat cement slurry mixed with pigment to match the shade of tiles, including rubbing and cleaning etc. complete on 20 mm thick bed of cement mortar 1:4 (1 cement : 4 coarse sand).Dark shade pigment using ordinary cement	74	Sqm		
6	Providing and laying Vitrified tiles of size 1200mm x 600mm of Eternia range of Kajaria Tiles or Equivalent (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting, riser of steps, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand), including grouting the joint with white cement & matching pigments etc. complete. Size of Tile 1200mm x 600mm	3915.94	Sqm		
7	Providing and laying Vitrified tiles in different sizes of size 1200mm x 600mm of Eternia range of Kajaria Tiles or Equivalent (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS : 15622, of approved brand & manufacturer,in all colours and shade, in skirting, riser of steps, laid	426.38	Sqm		

	with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately). Size of Tile 1200mm x 600mm				
8	Brick tile work for wall lining upto 10 m height with special adhesive over 12mm thick bed of cement mortar 1:3 (1 cement :3 coarse sand), including pointing in white cement with an admixture of pigment to match the stone shade.	383	Sqm		

XI	FALSE CEILING				
1	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry	169	Sqm		

	wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with :				
XII	**FINISHING:**				
1	Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface: Water thinnable cement primer	27048.56	Sqm		
2	Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete.	825.80	Sqm		
3	Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers	8049.99	Sqm		

	specifications: Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of special primer applied @ 0.75 ltr /10 sqm				
4	Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade: Two or more coats on new work	5956.50	Sqm		
5	Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade: New work (Two or more coats applied @ 1.43 ltr/ 10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm)	3043.65	Sqm		
6	Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	345.06	Sqm		
XII	**DRAINAGE:**				
1	Providing and fixing in position pre-cast R.C.C. manhole cover and frame of required shape and approved quality H D - 20 Circular shape 560 mm internal diameter	8	Nos		

2	Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steeel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	40	Nos		

3	Constructing brick masonry circular manhole 1.52 m internal dia at bottom and 0.56 m dia at top in cement mortar 1:4 (1 cement:4 coarse sand) inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 (1 cement:3 coarse sand: 6 graded stone aggregate 40 mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement:2 coarse sand: 4 graded stone aggregate 20 mm nominal size)finished with a floating coat of neat cement, all complete as per standard design: 2.30 m deep with SFRC cover and frame (heavy duty HD - 20 grade designation)560 mm internal diameter conforming to IS:12592, total weight of cover and frame to be not less than 182 kg fixed in cement concrete 1:2:4 (1 cement:2 coarse sand: 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately):With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	10	Nos		

4	Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design:Inside dimensions 455x610 mm and 45 cm deep for single pipe line:With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	5	Nos		
5	Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete	5	Nos		

	1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design:Inside dimensions 500x700 mm and 45 cm deep for pipe line with one or two inlets:With common burnt clay F.P.S (non modular) bricks of class designation 7.5				
6	Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design:Inside dimensions 600x850 mm and 45 cm deep for pipe line with three or more inlets:With common burnt clay F.P.S.	5	Nos		

	(non modular) bricks of class designation 7.5				
XIII	**ALUMINIUM WORK:**				
1	Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS : 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminnium snap beading for glazing /paneling, C.P. brass/ stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(Glazing, paneling and dash fasteners to be paid for separately):For fixed portion Powder coated aluminium (minimum thickness of powder coating 50 micron)	4392	Kg		
2	For shutters of doors, windows & ventilators including providing and fixing hinges / pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber/ neoprene gasket required (Fittings	4952	Kg		

	shall be paid for separately)Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micorn)				
3	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer - in -Charge. (Cost of aluminium snap beading shall be paid in basic item): With float glass panes of 4.0 mm thickness	517.48	Sqm		
4	Filling the gap in between aluminium frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete. Upto 5mm depth and 5 mm width	3565	M		
5	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS: 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors including cost of cutting floors, embeding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer -in-Charge.With stainless steel	41.00	Nos		

	cover plate minimum 1.25 mm thickness				
6	Providing and fixing anodised aluminium grill (anodised transparent or dyed to required shade according to IS : 1868 with minimum anodic coating of grade AC 15) of approved design/pattern, with approved standard section and fixed to the existing window frame with C.P brass/stainless steel screws @ 200 mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved anodised aluminium standard section around the opening, all complete as per requirement and direction of Engineer-in-charge.(Only weight of grill to be measured for payment).	917.53	Kg		
XIV	**WATER PROOFING:**				
1	Providing and applying integral crystalline slurry of hydrophilic in nature for water proofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber	348.85	Sqm		

	brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage. For vertical surface two coats @0.70 kg per sqm				
2	Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control	1538.04	Sqm		

	concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For horizontal surface one coat @1.10 kg per sqm.				
3	Providing and laying water proofing treatment in sunken portion of WCs, bathroom etc., by applying cement slurry mixed with water proofing cement compound consisting of applying : a) First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm. This layer will be allowed to air cure for 4 hours. b) Second layer of slurry of cement @ 0.242 kg /sqm mixed with water proofing cement compound @ 0.126 kg/ sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. The rate includes preparation of surface, treatment and sealing of all joints, corners, junctions of pipes and masonry with polymer mixed slurry.	118.65	Sqm		

XVI	**STRUCTURAL GLAZING & ALUMINIUM COMPOSITE PANEL:**				
1	Designing, fabricating, testing, protection, installing and fixing in position semi(grid) unitized system of structural glazing (with open joints) for linear as well ascurvilinear portions of the building for all heights and all levels, including:a) Structural analysis & design and preparation of shop drawings for the specifieddesign loads conforming to IS 875 part III (the system must passed the proof testat 1.5 times design wind pressure without any failure), including functional designof the aluminum sections for fixing glazing panels of various thicknesses, aluminiumcleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clampsetc., structural and weather silicone sealants, flashings, fire stop (barrier)-cumsmokeseals, microwave cured EPDM gaskets for water tightness, pressureequalisation & drainage and protection against fire hazard including:b) Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3Dimentional movement for achieving perfect verticality and fixing structural glazingsystem rigidly to the RCC/	39.82	Sqm		

	masonry/structural steel framework of building structureusing stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetalliccontacts with nuts and washers etc. of stainless steel grade 316, of the requiredcapacity and in required numbers.c) Providing and filling, two part pump filled, structural silicone sealant and onepart weather silicone sealant compatible with the structural silicone sealant ofrequired bite size in a clean and controlled factory / work shop environment ,including double sided spacer tape, setting blocks and backer rod, all of approvedgrade, brand and manufacture, as per the approved sealant design, within and allaround the perimeter for holding glass.d) Providing and fixing in position flashings of solid aluminium sheet 1 mm thickand of sizes, shapes and profiles, as required as per the site conditions, to seal thegap between the building structure and all its interfaces with curtain glazing tomake it watertight.e) Making provision for drainage of moisture/ water that enters the curtain glazingsystem to make it watertight, by incorporating principles of pressure equalization,providing suitable gutter profiles at bottom (if required), making necessary holesof required sizes and of required numbers etc. complete. This item includes costof all inputs of				

	designing, labour for fabricating and installation of aluminium grid,installation of glazed units, T&P, scaffolding and other incidental charges includingwastages etc., enabling temporary structures and services, cranes or cradles etc.as described above and as specified. The item includes the cost of getting all thestructural and functional design including shop drawings checked by a structuraldesigner, dully approved by Engineer-in-charge.The item also includes the cost of all mock ups at site, cost of all samples of theindividual components for testing in an approved laboratory, field tests on theassembled working structural glazing as specified, cleaning and protection till thehanding over of the building for occupation. In the end, the Contractor shall providea water tight structural glazing having all the performance characteristics etc. allcomplete as required, as per the Architectural drawings, as per item description,as specified, as per the approved shop drawings and as directed by the Engineerin-Charge.Note:- 1. The cost of providing extruded aluminium frames, shadow boxes, extrudedaluminium section capping for fixing in the grooves of the curtain glazing andvermin proof stainless steel wire mesh shall be paid for separately under relevantitems under				

	this sub-head. However, for the purpose of payment, only the actualarea of structural glazing (including width of grooves) on the external face shallbe measured in sqm. up to two decimal places.Note:-2. The following performance test are to be conducted on structural glazingsystem if area of structural glazing exceeds 2500 Sqm from the certified laboratoriesaccreditated by NABL(National Accreditation Board for Testing and CalibrationLaboratories), Department of Science & Technologies, India. Cost of testing ispayable separately. The NIT approving authority will decide the necessity of testingon the basis of cost of the work, cost of the test and importance of the work.Performance Testing of Structural glazing systemTests to be conducted in the NBL Certified laboratories1. Performance Laboratory Test for Air Leakage Test (-50pa to ? 300pa) & (+50pa to+300pa) as perASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr?2. Static Water Penetration Test. (50pa to 1500pa) as per ASTME-331-09 testingmethod for a range up to 2000 ml.?3. Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01-05 testingmethod for a range upto 2000 ml?4. Structural Performance Deflection and deformation by static air pressure test(1.5 times				

	desing wind pressure without any failure) as per ASTME-330-10 testingmethod for a range upto 50 mm?5. Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09 testing method forQualitative test? Tests to be conducted on site6. Onsite Test for Water Leakage for a pressure range 50 kpa to 240 kpa (35psi)upto 2000ml?				
XV	**RAIN WATER HARVESTING :**				
1	Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit,over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer - in-Charge	202.50	Cum		
2	Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000x450x50 mm, reinforced with 8 mm dia four nos longitudinal & 9 nos cross sectional T.M.T. hoop bars, including providing 50 mm dia perforation @ 100 to 125 mm c/c, including providing edge binding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineer - in-charge.	45.00	Nos		
	TOTAL AMOUNT FOR CIVIL WORK				
PART II - PLUMBING WORK					

1	Providing and fixing white vitreous china extended wall mounting water closet of size 510x365x380 mm CERA make, Carnival Rimless model, Cat. no. S1043144 or equivalent including seat cover, and cistern fittings, nuts,bolts and gasket etc complete.	42.00	Nos		
2	Providing and fixing concealed flushing cistern Geberit make, Alpha Kombifix model, Cat no.110121.00.1 with dual flush fitting, of flushing capacity 3 litre/ 6 litre (partial/full flush), including seat cover, and cistern fittings, nuts,bolts and gasket etc complete.	11.00			
3	Providing & fixing concealed flushing valve Shell make, Compact II model, Cat no.01.194.00.99 with dual flush fitting, of flushing capacity 3 litre/ 6 litre (partial/full flush), including seat cover, and flush valve accessories, flush plate, fittings, nuts,bolts and gasket etc complete.	31.00			
4	Supplying and fixing CP Health Faucet superior quality CERA make, F8030107AB or equvalent make including cost of materials and labour charges etc complete as per the direction of site Engineer-in-charge.	44.00			
5	Providing and fixing wash basin 440 X 440X 345 mm CERA make, Chamber Neo model, Cat. no. S2010110 with C.I. brackets, 15 mm C.P. pillar taps CERA make, Cat no F1015101, 32 mm SS waste coupling CERA make, Cat no F8050601, including	11.00			

	painting of fittings and brackets, cutting and making good the walls wherever require:				
6	Providing and fixing counter wash basin 550 X 405X 205 mm CERA make, CAMRY model, Cat. no.S2030105 IVORY, 15 mm C.P. pressmatic pillar taps CERA make, Cat no F9020151, 32 mm SS waste coupling CERA make, Cat no F8050601, including painting of fittings and brackets, cutting and making good the walls wherever require:	24.00			
7	Providing and fixing CP Bottle Trap CERA make, Cat no F8060406	40.00			
8	Providing and fixing CP angle valve, CERA make, Cat no F8040302	47.00			
9	Providing and fixing CP Bib cock with wall flange and aerator, CERA make, Cat no F1015151	10.00			
10	Providing and fixing vitreous china flat back type lipped front urinal basin of 365X335X670 mm CERA make, CALCIA model, S4020107 Cat no, with standard flush pipe and C.P. brass spreaders with brass unions and G.I. clamps complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required	8.00			

11	Providing and fixing European Water closet 710X370X770 mm, CERA make, Cat no S1013200 one piece EWC S Trap 300mm, with soft seat cover cistern fittings, nuts,bolts and gasket etc, Wall hung wash basin 665X545X190mm CERA make, Cat. no. S2040159 with C.I. brackets, 15 mm C.P. single lever clinical faucet CERA make, Cat no F9030453, 32 mm CP waste coupling CERA make, Cat no F8050601, Wall mounted grab bar 600mm long CERA make, Cat no B2210106, Wall mounted hinged hand rail 750x100, CERA make, Cat no B2210108 including painting of fittings and brackets, cutting and making good the walls and floors wherever required as part of Disabled toilet	2.00			
12	Providing and fixing CP long nose sink cock with wall flange and aerator, CERA make, Cat no F2013301	5.00			
13	Providing and fixing CP Stop cock with wall flange consisting of exposed part and concealed part, CERA make, Cat no F2013351 & F4050502	11.00			
14	Providing and fixing cast steel Y Strainer 65 mm dia, ZOLOTO make, Cat no.1073 including flanges / union, nuts, bolts, washer etc., complete as required	4.00			
15	Providing and fixing bronze Automatic air vent, SKS make, Cat no.SKS200 including flanges / union, nuts, bolts, washer etc., complete as required	14.00			

16	Providing and fixing SS floor drain grating 127x127 SANJAY CHILLI make, SCCT-R-LI-127 Cat no, heavy quality with frame. (Suitable for wet area SWR PVC Multi trap) complete as required	60.00			
17	Supply, Fixing/ Laying of SWR PVC Multi inlet floor trap SUPREME make, NP1SPTSMF06L Cat no. and 110 x 75 mm outlet with necessary cement concrete.	60.00			
18	Supply & Fixing/ Laying, testing and commissioning of SS Roof drain parapet type 110 mm diameter SANJAY CHILLI make, SSRDPT-4" for rain collection. The quoted rate shall include for necessary grouting the roof drain base with approved sealant complete all as specified.	20.00			
19	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS:13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required :510x1040 mm bowl depth 250 mm	5.00			
20	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing. Rectangular shape 453x357 mm	42.00			
21	Providing and fixing PTMT Soap Dish Holder having length of 138 mm, breadth 102 mm, height of 75 mm with concealed fittings	30.00			

	arrangements, weighing not less than 106 gms.				
22	Providing and fixing PTMT towel ring trapezoidal shape 215 mm long, 200 mm wide with minimum distances of 37 mm from wall face with concealed fittings arrangement of approved quality and colour, weighing not less than 88 gms	30.00			
23	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints completeas per direction of Engineer in Charge.Concealed work, including cutting chases and making good the walls etc. 15mm nominal outer dia pipes	0.00			
24	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of jointing of pipes &	200.00			

	fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints completeas per direction of Engineer in Charge.Concealed work, including cutting chases and making good the walls etc. 20mm nominal outer dia pipes				
25	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints completeas per direction of Engineer in Charge.Concealed work, including cutting chases and making good the walls etc. 25mm nominal outer dia pipes	50.00			
26	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of jointing of pipes & fittings with one step CPVC	100.00			

	solvent cement and the cost of cutting chases and making good the same including testing of joints completeas per direction of Engineer in Charge.Concealed work, including cutting chases and making good the walls etc. 32mm nominal outer dia pipes				
27	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 20 mm nominal outer dia Pipes	91.00			
28	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 25 mm nominal outer dia Pipes	32.00			

29	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 32 mm nominal outer dia Pipes	45.00			
30	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 40 mm nominal outer dia Pipes	110.00			
31	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge.	115.00			

	Internal work - Exposed on wall 50 mm nominal outer dia Pipes				
32	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 62.5 mm nominal outer dia Pipes	360.00			
33	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 80 mm nominal outer dia Pipes	75.00			
34	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent	280.00			

	cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall 100 mm nominal outer dia Pipes				
35	Providing and fixing gun metal gate valve (brass) of approved quality. 20 mm nominal bore	1.00			
36	Providing and fixing gun metal gate valve (brass) of approved quality. 25 mm nominal bore	1.00			
37	Providing and fixing gun metal gate valve (brass) of approved quality. 32 mm nominal bore	1.00			
38	Providing and fixing gun metal gate valve (brass) of approved quality. 40 mm nominal bore	1.00			
39	Providing and fixing gun metal gate valve (brass) of approved quality. 50 mm nominal bore	1.00			
40	Providing and fixing gun metal gate valve (brass) of approved quality. 65 mm nominal bore	1.00			
41	Providing and fixing gun metal gate valve (brass) of approved quality. 80 mm nominal bore	1.00			
42	Providing and fixing gun metal ball valve (brass) of approved quality. 100 mm nominal bore	1.00			
43	Providing and fixing gun metal non- return valve 50 mm nominal bore, of approved quality (screwed end)	1.00			
44	Providing and fixing ball valve (brass) 25 mm nominal bore, of approved quality, high or low pressure with plastic floats complete	1.00			

45	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chases and making good the wall etc. 50 mm pipe 10 kgf/cm2	110.00			
46	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chases and making good the wall etc. 75 mm pipe 6 Kgf/cm	135.00			
47	Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chased and making good the wall etc. 110 mm pipe 6kgf/cm2	175.00			
48	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching, refilling & testing of Joints complete as per direction of engineer in charge.110 mm dia 6Kgf/cm2	110.00			
49	Providing and fixing PVC pipes includings jointing of pipes with one step PVC solvent cement, trenching,	420.00			

	refilling & testing of Joints complete as per direction of engineer in charge.150 mm dia 6Kgf/cm2				
50	Providing and fixing PVC pipes including fixing the pipe with clamps/clips at 1.00 m spacing. This included jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 75 mm dia 6Kgf/cm2 - External work- Exposed on wall	120.00			
51	Providing and fixing PVC pipes including fixing the pipe with clamps/ clips/ at 1.00 m spacing . This includes jointing of pipes with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 110 mm dia 6 Kgf/cm2 - External work- Exposed on wall	570.00			
52	Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design:180x150 mm size P type With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	9.00			
53	Supply, installation, testing commissioning of three phase monoblock pump Kirloskar make, KDS-335++, SIZE 50mm X 40mm with SS body and impeller inlcluding electrical provisions like cables,	1.00			

	starter to transfer domestic water from UG tank to OH tank with all fittings, accessories, complete. The pump motor shall be of maximum efficiency/ IE3, three phase and the pump shall have minimum 3 star BEE rating or equivalent efficiency.				
54	Supply, installation, testing commissioning of three phase monoblock pump Kirloskar make, KDS-235+, SIZE 50mm X 40mm with SS body and impeller inlcluding electrical provisions like cables, starter to transfer flush water from UG tank to OH tank with all fittings, accessories, complete. The pump motor shall be of maximum efficiency/ IE3, three phase and the pump shall have minimum 3 star BEE rating or equivalent efficiency.	1.00			
55	Supplying, installing, testing and commissioning at terrace Booster pumps (1W+1A = 1 Set) for flush water supply to all floors. The system shall comprise of pump, pressure tank, pressure guage, pressure switch, pump controllers with variable frequency drive, starter, selector switch, level controllers and all accessories complete required duty condition of each pump 2.5 LPS 15 m head mounted on common base plate and wiring from panel to motor etc., complete. Cut in pressure: 1.0Kg/Sqcm, Cut off pressure: 2.0Kg/Sqcm. The pump motor shall be of IE2 efficiency, three phase and	1.00			

	the pump shall have minimum 3 star BEE rating or equivalent efficiency. (Electrical connection from Local Isolator to pump shall be included and done by the contractor)				
56	Providing and fixing Unplasticized Polyvinyl Chloride (UPVC) Schedule 80 pipes for chute system, including all UPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step UPVC solvent cement and testing of joints complete as per direction of Engineer -in-Charge. Internal work - Exposed on wall. 200 mm nominal outer dia pipes	40.00			
57	Constructing brick masonry circular manhole 1.52 m internal dia at bottom and 0.56 m dia at top in cement mortar 1:4 (1 cement:4 coarse sand) inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 (1 cement:3 coarse sand: 6 graded stone aggregate 40 mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement:2 coarse sand: 4 graded stone aggregate 20 mm nominal size)finished with a floating coat of neat cement, all complete as per standard design: 2.30 m deep with SFRC cover and frame (heavy duty HD - 20 grade designation)560 mm	42.00			

	internal diameter conforming to IS:12592, total weight of cover and frame to be not less than 182 kg fixed in cement concrete 1:2:4 (1 cement:2 coarse sand: 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately): With common burnt clay F.P.S. (non modular) bricks of class designation 7.5				
58	Cutting holes up to 15x15 cm in R.C.C. floors and roofs for passing drain pipe etc. and repairing the hole after insertion of drain pipe etc. with cement concrete 1:2:4 (1 cement : 2 coarse sand: 4 graded stone aggregate 20 mm nominal size), including finishing complete so as to make it leak proof.	100.00			
59	Providing and fixing fire resistant door frame of section 143x57 mm having built in rebate made out of 16 SWG G.I. sheet (zinc coating not less than 120 gm/ sqm) duly filled with vermuculite based concrete mix, suitable for mounting 60 minutes fire rated door shutters. The frame is fitted with intumuscent fire seal strip of size 10x4 mm (minimum) alround the frame and fixing with dash fastener of approved size and make, including applying a coat of approved brand fire resistant primer etc. complete as per direction of Engineer -in-charge (Dash fastener to be paid for separately)	45.50			

60	Providing and fixing 50 mm thick glazed fire resistant door shutters of 60 minutes fire rating conforming to IS : 3614 (Part - II), tested and certified as per laboratory approved by Engineer-in-Charge, with suitable mounting on door frame, consisting of vertical styles, lock rail, top rail 100 mm wide, bottom rail 200 mm wide, made out of 16 SWG G.I. sheet (zinc coating not less than 120 gm/m2) duly filled FR insulation material and fixing with necessary stainless steel ball bearing hinges of approved make including applying a coat of approved fire resistant primer etc. all complete as per direction of Engineer - in-charge (panneling to be paid for separately).	17.50			
61	Providing and fixing glazing in fire resistant door shutters, fixed panels &partitions etc., with G.I. beading made out of 1.6 mm thick G.I. sheet (zinccoating not less than 120 gm/m2) of size 20 x 33 mm screwed with M4 x 38 mmSS screws at distance 75 mm from the edges and 150 mm c/c , includingapplying a coat of approved fire resistant primer/powder coating of not lessthan 30 micron on G.I. beading, & special ceramic tape of 5 x 20 mm size etccomplete in all respect as per NBC 2016, IS 16231 (Part 3):2016 and as perdirection of Engineer-in-charge with glass of required thickness having 60minutes of fire resistance both integrity & radiation control (EW60)	31.80			

	andminimum 20 minutes of insulation (EI20). The manufacturer have to give testreport/certification of fire glass and the glass should have the stamp showingthe value of E, EW & EI. The glass shall be tested in approved NABL accreditedlab or by any other accreditation body which operates in accordance withISO/IEC 17011 and accredits labs as per ISO/IEC 17025 for testing andcalibration scopes shall be eligible. The maximum glazing size shall not bemore than 1100x2200 mm (w x h) or 2.42 sqm. 9.138.1 With clear fire resistant glass panes 6 mm thick of approved brand, having minimum 60 minutes fire resisitance				
62	Providing and fixing panic bar / latch (Double point) fitted with a single body, Trim Latch & Lock on back side of the Panic Latch of reputed brand and manufacture to be approved by the Engineer - in-charge, all complete.	5.00			
63	Providing and fixing aluminium die cast body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 35 kg and door width upto 700 mm), with necessary accessories and screws etc. complete.	5.00			
64	Supplying and fixing Liquid soap Dispenser EURONICS make, ES04 model number or equvalent make including cost of materials	16.00			

	and labour charges etc complete as per the direction of site Engineer-in-charge.				
65	Supplying and fixing Hand drier EURONICS make, EH03 model number or equvalent make including cost of materials and labour charges etc complete as per the direction of site Engineer-in-charge.	6.00			
66	Supply & Installing water level control system LENORE make, WLC 50 HT model or equivalent to be integrated with pump operation for filling OH tanks while monitoring water level at UG & OH tanks and safeguarding from dry running	2.00			
67	Supply & Installing 1.5 sq mm four-core armored copper cable for level control POLYCAB make	80.00			
68	Supply, installation, testing commissioning of three phase submersible openwell pump Kirloskar make, KDS-335++ , SIZE 50mm X 40mm with CI body and impeller or equivalent inlcluding electrical provisions like cables, starter to transfer flush water from UG tank to OH tank with all fittings, accessories, complete. The pump motor shall be of maximum efficiency/ IE3, three phase and the pump shall have minimum 3 star BEE rating or equivalent efficiency.	1.00			
69	Providing and fixing gun metal ball valve (brass) of approved quality. 20 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	24.00			

70	Providing and fixing gun metal ball valve (brass) of approved quality. 25 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	6.00			
71	Providing and fixing gun metal ball valve (brass) of approved quality. 32 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	2.00			
72	Providing and fixing gun metal ball valve (brass) of approved quality. 40 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	1.00			
73	Providing and fixing gun metal ball valve (brass) of approved quality. 50 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	3.00			
74	Providing and fixing gun metal ball valve (brass) of approved quality. 65 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	2.00			
75	Providing and fixing gun metal ball valve (brass) of approved quality. 80 mm nominal bore of ZOLOTO make, Art no:1008B or equivalent	6.00			
76	Providing and fixing kitchen sink with C. I brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste complete, including painting the fittings and brackets, cutting and making good the walls wherever required: Quartz kitchen sink Reginox make, AMSTERDAM model, or black silvery of size internal dimension 500x400x200 mm	1.00			

77	Supply & Fixing of 2 mm thick GI Slotted Rails, Rail Legs with Anchor fasteners and 10 mm thick threaded rods, nuts Washers etc Complete make Hi-Tech or equivalent.	10.00	Mtr		
	TOTAL AMOUNT FOR PLUMBING WORK				
PART III- ELECTRICAL WORK					
I	**WIRING:**				
1	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required	497	Nos		
2	Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit alongwith 1 No. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	4000	Mtr		
3	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required.2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire	8000	Mtr		
4	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit	200	Mtr		

	as required.2 X 4 sq. mm + 1 X 4 sq. mm earth wire				
5	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required . 20mm	10500	Mtr		
6	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. 25mm	1500	Mtr		
7	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.32mm	500	Mtr		
8	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required.	230	Nos		
9	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required.	50	Each		
10	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch,	127	Each		

	connections etc. as required.				
11	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required	69	Each		
12	Supplying and fixing 3 pin, 5 A ceiling rose on the existing junction box/ wooden block including connections etc. as required.	230	Each		
13	Installation, testing and commissioning of pre-wired, fluorescent fitting / compact fluorescent fitting of all types, complete with all accessories and tube/lamp etc. directly on ceiling/ wall, including connections with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable and earthing etc. as required.	497	Each		
14	Surface mounting decorative fluorescent tube light fitting complete with lamp with complete accessories duly wired up for use on 230 V AC . Surface mounting LED 40W LED Batten with out put 4000 lumen for use on 250V AC supply.	497	Each		
15	Installation of exhaust fan in the existing opening, including making good the damage, connection, testing, commissioning etc. as required. Upto 450 mm sweep	18	Each		

16	Supplying and drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in the existing surface/ recessed steel/ PVC conduit as required.	100	Mtr		
17	Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed Steel/ PVC conduit as required				
	1 run of cable	8000	Mtr		
18	Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed Steel/ PVC conduit as required				
	2 run of cable	1000	Mtr		
19	Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed Steel/ PVC conduit as required				
	3 run of cable	500	Mtr		
20	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independentswitch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required	1500	Mtr		
21	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providng and fixing 2 nos. 3 pin 5/6 A modular socket outlet and 2 nos. 5/6 A modular switch, connections etc. as required. (For light plugs to	104	Each		

	be used in non residential buildings).				
22	Supply & installation of light fittings on 'C/U' shaped flat iron bracket Supply, conveyance, installation, testing and commissioning the light fittings of following types made from 0.5mm CRCA sheet complete with all accessories and lamps etc. directly on wall using 2 nos. 'C/U' brackets made from 20 x 3 mm MS flat, painting the flat iron bracket and giving connections with required length of 16/0.20mm 3 core copper conductor flex wire conforming to relevant ISS or extending the original wiring and giving connection etc. as required. 1200 mm 1X20W LED Lamp with box type fixture	56	Each		
23	Supply & installation of light fittings on 'C/U' shaped flat iron bracket Supply, conveyance, installation, testing and commissioning the light fittings of following types made from 0.5mm CRCA sheet complete with all accessories and lamps etc. directly on wall using 2 nos. 'C/U' brackets made from 20 x 3 mm MS flat, painting the flat iron bracket and giving connections with required length of 16/0.20mm 3 core copper conductor flex wire conforming to relevant ISS or extending the original wiring and giving connection etc. as required. 1200 mm 2x20W LED Lamp with box type fixture				

24	Supply, conveyance, installation, testing and commissioning of ceiling fans of the following sizes using standard accessories excluding resistance type regulator, wiring the down rod with 16/0.20mm PVC insulated and PVC sheathed 650/1100V grade 3 core round copper conductor flex wire or with extended original wiring etc. as required. 1200mm sweep -5star rated ceiling fan complete with 300mm down rod , canopies, shackles and blades working on 230V/240V single phase A/C	230	Each		
25	Charges for cutting holes suitable for accommodating exhaust fans up to 305mm sweep including plastering colour washing etc. as required.	18	Each		
26	Supply Conveyance, installation, testing and commissioning of 100W LED Flood light output greater than 105lumen/W 4000-6000 K with IP 66 protection LED Chip make Cree/Lumilled/Nichea with power factor greater than 0.95 at full load, internal surge protection up to 8 KV,and Aluminium pressure die-cast Powder coated housing, acrylic cover complete with THD less than 10%, power factor greater than 0.98, RoHS compliant, duly wired up for use on 230 V AC supply. Driver compartment should be seperatly accessible for maintenance (LM 79&80 certificates from NABL accredited Third party lab	4	Each		

	to be produced mentioning chip manufacturer)				
II	**MCCB, MCB & DBS:**				
1	Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) 12 way , Double door	1	Each		
2	Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)				
	4 way (4 + 12), Double door	1	Each		
3	Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)				
	6 way (4 + 18), Double door	13	Each		

4	Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without MCBs and incomer) as required . (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.)				
	8 way (4 + 24), Double door	9	Each		
5	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
	Single pole	388	Each		
6	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
	Triple pole	26	Each		
7	Supplying and fixing following rating, double pole, 240 V, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required	1	Each		
	40 A				

8	Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
	40A	13	Each		
9	Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
	63A	10	Each		
10	Supplying and fixing DP sheet steel enclosure on surface/ recess along with 25/32 A 240 V "C" curve DP MCB complete with connections, testing and commissioning etc. as required.	18	Each		
11	Supplying and fixing TP sheet steel enclosure on surface/ recess along with 16/25/32 A 415 V "C" curve TP MCB complete with connections, testing and commissioning etc. as required.	5	Each		
12	Supplying and fixing 20 A, 240 V, SPN Industrial type socket outlet, with 2 pole and earth, metal enclosed plug top alongwith 20 A "C" curve, SP, MCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and	2	Each		

	commissioning etc. as required				
13	Supplying and fixing 30 A, 415 V, TPN Industrial type socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 30 A "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.	2	Each		
14	Providing and fixing H.T. danger notice plate of 250 mm X 200 mm, made of mild steel, at least 2 mm thick, and vitreous enameled white on both sides, and with inscription in single red colour on front side as required.	2	Each		
15	Supplying and fixing Cable End Box (Loose Wire Box) suitable for following single pole and neutral, sheet steel, MCB distribution board, 240 Volts, on surface/ recess, complete with testing and commissioning etc. as required For 10 way, Double door SPN MCBDB	1	Each		
16	Supplying and fixing Cable End Box (Loose Wire Box) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 Volts, on surface/ recess, complete with testing and commissioning etc.as required.				
	For 4 way, Double door TPN MCBDB	1	Each		

17	Supplying and fixing Cable End Box (Loose Wire Box) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 Volts, on surface/ recess, complete with testing and commissioning etc.as required.				
	For 6 way, Double door TPN MCBDB	13	Each		
18	Supplying and fixing Cable End Box (Loose Wire Box) suitable for triple pole and neutral, sheet steel, Vertical MCB distribution board, 415 Volts, on surface/ recess, complete with testing and commissioning etc. as required.	9	Each		
III	**Cable Trays**				
1	Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	200 mm width X 50 mm depth X 1.6 mm thickness	150	Each		
2	Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	600 mm width X 50 mm depth X 2.0 mm thickness	100	Each		

3	Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	900 mm width X 62.5 mm depth X 2.0 mm thickness	30	Each		
4	Supplying and installing following size of perforated painted with powder coating M.S. cable trays bends with perforation not more than 17.5%,, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	200 mm width X 50 mm depth X 1.6 mm thickness	14	Each		
5	Supplying and installing following size of perforated painted with powder coating M.S. cable trays bends with perforation not more than 17.5%,, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	600 mm width X 50 mm depth X 2.0 mm thickness	4	Each		
6	Supplying and installing following size of perforated painted with powder coating M.S. cable trays bends with perforation not more than 17.5%,, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				

	900 mm width X 62.5 mm depth X 2.0 mm thickness	2	Each		
7	Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required				
	200 mm width X 50 mm depth X 1.6 mm thickness	4	Each		
8	Supplying and installing following size of perforated painted with powder coating M.S. cable trays Cross Member with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	200 mm width X 50 mm depth X 1.6 mm thickness	200	Each		
9	Supplying and installing following size of perforated painted with powder coating M.S. cable trays Cross Member with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	600 mm width X 50 mm depth X 2.0 mm thickness	80	Each		

10	Supplying and installing following size of perforated painted with powder coating M.S. cable trays Cross Member with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
	900 mm width X 62.5 mm depth X 2.0 mm thickness	40	Each		
IV	**Earthing**				
1	Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving connection as required				
	3.15 mm copper conductor (10 SWG)	1000	Mtr		
2	Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving connection as required				
	4.00 mm copper conductor (8 SWG)	50	Mtr		
3	Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving connection as required				
	4.75 mm copper conductor (6 SWG)	60	Mtr		
4	Supply and clamping the following size of strips on surface of wall/ parapet/ existing cable tray using clamps fabricated from 20 X 3 mm GI flat duly painted or heavy duty GI spacer saddles spacing of clamps not exceeding 1 m, making good the damages, colour				

	washing etc. as required (for horizontal run)				
	25 x 3 mm copper strip	250	Mtr		
5	Earthing with G.I. earth pipe 4.5 metre long, 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal/ coke and salt as required.	2	set		
6	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	12	set		
V	**Lighting Conductor**				
1	Providing and fixing of lightning conductor finial, made of 25 mm dia 300 mm long, G.I. tube, having single prong at top, with 85 mm dia 6 mm thick G.I. base plate including holes etc. complete as required.	4	each		
2	Jointing copper / G.I. tape (with another copper/ G I tape, base of the finial or any other metallic object) by riveting / nut bolting/ sweating and soldering etc as required.	12	each		
3	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required.(For horizontal run)	400	mtr		
4	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor	200	mtr		

	complete as required.(For vertical run)				
5	Providing and fixing testing joint, made of 20 mm X 3 mm thick G.I. strip, 125 mm long, with 4 nos. of G.I. bolts, nuts, chuck nuts and spring washers etc. complete as required.	12	each		
6	Providing and laying G.I. tape 32 mm X 6 mm from earth electrode directly in ground as required.	100	mtr		
VI	**HT Cable Laying**				
	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 11 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required Above 120 sq. mm and upto 400 sq. mm	100	mtr		
VII	**MV Cable End Termination & Jointing**				
	-				
1	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3 X 10 sq. mm (22mm)	2	each		
2	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3½ X 50 sq. mm (35mm)	6	each		

3	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3½ X 70 sq. mm (38mm)	6	each		
4	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3½ X 95 sq. mm (45mm)	4	each		
5	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3½ X 150 sq. mm (50mm)	2	each		
6	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	3½ X 185 sq. mm (57mm)	8	each		
7	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	4 X 10 sq. mm (25mm)	80	each		

8	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	4 X 25 sq. mm (28mm)	18	each		
9	Supplying and making outdoor end termination with cast resin compound including aluminium lugs and other jointing materials for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required. 3½ X 185 sq. mm (57mm)	2	each		
	10 .HV Cable Jointing & End Termination				
1	Supplying and making indoor cable end jointing with cast resin compound, including lugs and other jointing materials, for following size of 3 core, XLPE aluminium conductor cable of 11 KV grade as required : 300 sq. mm	1	each		
2	Supplying and making outdoor cable end jointing with cast resin compound, including lugs and other jointing materials, for following size of 3 core, XLPE aluminium conductor cable of 11 KV grade as required : 300 sq. mm	2	each		

3	supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size of 3 core, XLPE aluminium conductor cable of 11 KV grade as required : 300 sq. mm	1	each		
	OBSERVED DATA : ELECTRICAL				
	MSB				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication.	29.6	sqm		

	Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 2.00mm CRCA sheet, powder coated (excluding base frame)				
2	Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required 400 Amp, 50 KA, 4 pole	1	each		
3	MCCB Accessories Supply and fixing one number under voltage release for all voltage range up to 630A MCCB	1	each		
4	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.250A, 35/36 kA (Ics=100%Icu), 4 pole, current limiting type MCCB with microprocessor based release with overload setting of 50 - 100% having adjustable OL & SC	1	each		
5	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI	1	each		

	marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 320 Amp TP&N				
6	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 125A, 35/36 kA (Ics=100%Icu), 4 pole, current limiting type MCCB with microprocessor based release with overload setting of 50 - 100% having adjustable OL & SC	1	each		
7	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 400 Amp TP&N	1	each		
8	Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required 200 Amp, 25 KA,TPMCCB	1	each		
9	Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making	6	each		

	connections, etc. as required 125 Amp, 36 KA				
10	Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required 100 Amp, 30 KA 4 Pole	3	each		
11	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
12	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	60	mtr		
13	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	70	mtr		
14	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	8	mtr		
15	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	3225.6	cum		
16	Supply and providing copper earth bus in the panel board	825	cum		
	CSB				

1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)	14	sqm		

2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 320 Amp TP&N	1	each		
3	Supply & fixing the following Power Capacitors 3 phase delta connected in positon and giving connection. 25 KVAr, 3 phase, 520 V, Metalised Poly Propylene Heavy duty, Box type resin filled Capacitor suitable for APFC panel with block reactor.	1	each		
4	Supply & fixing the following Power Capacitors 3 phase delta connected in positon and giving connection. 20 KVAr, 3 phase, 520 V, Metalised Poly Propylene Heavy duty, Box type resin filled Capacitor suitable for APFC panel with block reactor.	1	each		
5	Supply & fixing the following Power Capacitors 3 phase delta connected in positon and giving connection. 10KVAr, 3 phase, 520 V, Metalised Poly Propylene Heavy duty, Box type resin filled Capacitor suitable for APFC panel with block reactor.	1	each		
6	Supply & fixing the following Power Capacitors 3 phase delta connected in positon and giving connection. 5 KVAr, 3 phase, 520 V, Metalised Poly Propylene Heavy duty, Box type resin	1	each		

	filled Capacitor suitable for APFC panel with block reactor.				
7	Supply & fixing the following Power Capacitors 3 phase delta connected in positon and giving connection. 3 KVAr, 3 phase, 520 V, Metalised Poly Propylene Heavy duty, Box type resin filled Capacitor suitable for APFC panel with block reactor.	3	each		
8	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
9	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
10	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
11	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
12	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	230	cum		
13	Supply and providing copper earth bus in the panel board	225	cum		
	SB_1				

1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)	9.6	sqm		

2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		
4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and providing heavy duty 'A' section neoprene gasket in the panel board Supply and providing 40 x 3mm heavy duty flat neoprene gasket in the panel board				

8	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
9	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		
10	Supply and providing copper earth bus in the panel board	225	cum		
	SB_2				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone	9	sqm		

	be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)				
2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		
4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		

6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
8	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		
9	Supply and providing copper earth bus in the panel board	225	cum		
	SB_3				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc,	12	sqm		

	detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)				
2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		
4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection /	1.2	sqm		

	terminations etc. including required nut & bolt etc.				
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
8	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		
9	Supply and providing copper earth bus in the panel board	225	cum		
	SB_4				

1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)	12	sqm		

2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		
4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
8	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus	135	cum		

	chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.				
9	Supply and providing copper earth bus in the panel board	225	cum		
	SB_UTY				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding,	12	sqm		

	shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)				
2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	7	each		
4	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 63 Amp TP & N	1	each		
5	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene	30	mtr		

	beeding suitable for 1.60/ 2.00 mm sheet				
7	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
8	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
9	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		
10	Supply and providing copper earth bus in the panel board	225	cum		
	SB_UPS				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for	12	sqm		

	mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)				
2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		

4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
8	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		
9	Supply and providing copper earth bus in the panel board	225	cum		
	SB_UPS BYPASS PANEL				

1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding, shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)	7.5	sqm		

2	Providing and fixing following capacity TP&N disconnector fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125 Amp TP & N	1	each		
3	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 25/35 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL	6	each		
4	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
6	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
7	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
8	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus	135	cum		

	chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.				
9	Supply and providing copper earth bus in the panel board	225	cum		
	SOLAR METER PANEL				
1	Fabrication, supply, conveyance, installation testing and commissioning of floor or wall mounting, dust and vermin proof, cubicle type MV panel board comprising of the following components/ devices & complying to IS 8623. Fabrication of fully partitioned, dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 (with latest amendments) using CRCA sheet as per approved design and requirement, with front and rear access facility, bus bar chambers, hinged doors for all switch gear compartments, earthing the doors using 4 sq mm braided copper conductor, providing necessary cut-outs for mounting meters, relays, indication lamps, bus bar interconnection etc, detachable covers for bus bar chamber and cable alley, powder coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication. Angles/ flats/ slotted angles etc shall not be used for the fabrication of panel assembly. The measurments will be taken the area of the complete sheets used for panel board including partitions, folding,	5.6	sqm		

	shrouding etc. Supply and fabrication of MV panel board using 1.6mm CRCA sheet, powder coated (excluding base frame)				
2	Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 125A, 35/36 kA (Ics=100%Icu), 3 pole, current limiting type MCCB with microprocessor based release with overload setting of 50 - 100% having adjustable OL & SC	1	each		
3	Supply and providing 3mm SMC sheet as shrouding for bus interconnection / terminations etc. including required nut & bolt etc.	1.2	sqm		
4	Supply and providing heavy duty 'A' section neoprene gasket in the panel board A' section neoprene beeding suitable for 1.60/ 2.00 mm sheet	30	mtr		
5	Supply and providing heavy duty 'A' section neoprene gasket in the panel board U' section rubber beeding suitable for 1.60/ 2.00 mm sheet	45	mtr		
6	Supply and fabrication conveyance and installation of base frame of panel board using 75 x 40 mm rolled steel channel (ISMC)	11	mtr		
7	Supply and providing copper bus bars including finger type SMC bus bar supports in the bus chamber, suitable size nut & bolt, providng heat shrink sleeves etc. as required.	135	cum		

8	Supply and providing copper earth bus in the panel board	185	cum		
9	Supply & laying of one No. PVC insulated and PVC sheathed armoured aluminium power cable of 1.1 KV grade of the following sizes in the existing masonry open duct as required. 3.5 core 185 sq mm	70	mtr		
10	Supply & laying of one No. PVC insulated and PVC sheathed armoured aluminium power cable of 1.1 KV grade of the following sizes in the existing masonry open duct as required. 3.5 core 70 sq mm	100	mtr		
11	Supply & laying of one No. PVC insulated and PVC sheathed armoured aluminium power cable of 1.1 KV grade of the following sizes in the existing masonry open duct as required. 3.5 core 50 sq mm	90	mtr		
12	Supply & laying of one No. PVC insulated and PVC sheathed armoured aluminium power cable of 1.1 KV grade of the following sizes in the existing masonry open duct as required. 4 core 16 sq mm	300	mtr		
13	Supply & laying of one No. PVC insulated and PVC sheathed armoured aluminium power cable of 1.1 KV grade of the following sizes in the existing masonry open duct as required. 4 core 10 sq mm	1050	mtr		

14	Supply & laying of one number PVC insulated and PVC sheathed armoured copper power cable of 1.1KV grade of the following sizes in the existing RCC/ HUME / STONE WARE/ GI/ DWC pipe as required. 3 core 4 sq mm	120	mtr		
15	Supply of superior quality copper tubular cable socket and making core termination of cables of the following sizes including crimping etc. as required. 4 sq mm	22	each		
1	**MSB**				
	Supply, conveyance and fixing the following types & current rated control gears & switchgears, relays,contactors, fuses etc suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.				
	Meters	-	-	-	-
	Multi function meter EM6400 or equ. with RS 485 port	3	NOS		
	3nos metering CTs Class1 10VA,300/5A,3 nos 2A Cut out fuses	2	SET		
	3nos metering CTs Class1 10VA,200/5A,3 nos 2A Cut out fuses	1	SET		
	3nos metering CTs Class1 10VA,150/5-100/5A,3 nos 2A Cut out fuses	11	SET		
	Three phase KWH meter	10	NOS		
	AMF RELAY:				

	Automatic Mains Fail control with PLC based AMF control				
	between incommers using AMF & auxillary relays	1	SET		
	Stand by Earth fault relay type 51G -1no	1	NO		
	Indication lamps				
	Red, Yellow and Blue Indication Lamps 3nos, 2A Control fuses	3	SET		
	CONTACTORS				
	325A 4P AC 3 duty power contactor with auxillary contacts	2	SET		
	250A 4P AC 3 duty power contactor with auxillary contacts	1	SET		
	125A 4P AC 3 duty power contactor with auxillary contacts	1	SET		
	(4+0) Class B&C/ Type 1&2 Tested as per IEC 61643 Part 11:2016 . Total Impulse current-100 KA (10/350µ sec) & Total Max Discharge current 260KA (8/20µ sec), Voltage protection level <1.5 kV. The Surge Protection Devices should have TOV withstand for 120 Min : 442 V and with out Follow Current & Leakage Current. Protective Elements are High Energy MOV & GDT & the Protection Modes for : L & N to PE . Short- Circuit Current rating (Isccr) – 50 kA/50 Hz . Back up fuse required more than 315AgG/gL. Health Status Indication required in all cartridge. Total Response time <100 nano sec -1set	1	SET		

1.1	**CSB**				
	Supply, conveyance and fixing the following types & current rated control gears & switchgears, relays,contactors, fuses etc suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.				
	-				
	Automatic power factor control relay with RS port with 8 steps				
	having inbuilt facility for PF adjustment switching time adjustment, auto detecting/ correcting derating capacitance,alarm etc.	1	SET		
1.2	**SB-1,SB-2,SB-3,SB-4 ,SB-UTY & SB-UPS**				
	Supply, conveyance and fixing the following types & current rated control gears & switchgears, relays,contactors, fuses etc suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.				
	-				
	Multifunction meter (A/V/F/PF)	6	NOS		
1.3	**SOLAR METER PANEL**				
	Supply, conveyance and fixing the following types & current rated control gears & switchgears, relays,contactors, fuses etc suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.				
	Three phase KWH meter	1	NOS		

	125A 4P AC 3 duty power contactor with auxillary contacts	1	SET		
	3nos metering CTs Class1 10VA,100/5A,3 nos 2A Cut out fuses	1	SET		
1.4	**BYPASS PANEL**				
	Supply, conveyance and fixing the following types & current rated control gears & switchgears, relays,contactors, fuses etc suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required.				
	1nos 100A 4P ON LOAD COS and inter connection mechanism-1set	1	SET		
	Red, Yellow and Blue Indication Lamps 3nos, 2A Control fuses	2	SET		
2	**LIGHTING FIXTURES**				
	-				
	Supply & Installation of the following outdoor/indoor type light				
	fittings, including supply of all materials required for				
	erection, all wiring, terminations and				
	interconnections, earthing from the terminal block				
	BULKHEAD Halonix MAKE 15W HLBH02015CW	8	NOS		
	STREET LIGHT 3.5mtr 50 W Halonix Make HLDPL-06-50-CW-D1-3.5 mtr	20	NOS		
3	**EXHAUST FANS**				
	Supply & Installation and testing of the following				

	exhaust fans, as required with all				
	wiring,terminations and interconnections including				
	earthing from terminal block / ceiling rose to the fan.				
	1no Light Duty Exhaust fan of 300mm Sweep.	17	NOS		
4	**METERING UNIT OUT DOOR TYPE**				
	Supply ,Erection, testing and commissioning of 11KV metering cubicle with				
	load break switch OUT DOOR type with the following				
	11KV, 50c/s, 630Amps, 250MVA, Air Break SFU panel with 24 Volt				
	D.C. tripping mechanism with remote trip facility				
	Indoor, Floor mounting type complete with Opening,				
	Closing, Tripping and Earthing Mechanism with				
	16A fuse.				
	11KV Cast resin CT/PT unit consisting of 10/5A, class 0.2S, 15VA				
	current transformers, 11KV/110V class 0.2S, 100VA				
	potential transformers. And Tri vector meter with TOD meter in a suitable weather proof sheet steel enclosure				
	as per state electricity board norms including supply and				
	fixing of Test fuses and 10.0Cx2.5 sq.mm armoured copper cable between CT/PT terminal block,				

	control unit and TOD meter provision				
	Provision for 11 KV XLPE in and out cables etc.	1	SET		
5	**250 KVA CAST RESIN UNITISED SUB STATION (INDOOR)**				
	Supply,Erection, testing and commissioning of 11KV, 50c/s,				
	VCB panel with lt tripping mechanism with remote trip facility				
	Outdoor, Floor mounting type complete with Opening,				
	Closing, Tripping and Earthing Mechanism				
	Transformer 250KVA, 11KV/433V, 50c/s, cast resin DRY				
	type, Vector Group DYN-11, Copper Wound				
	outdoor type with cable box at the 11KV side and L.T.side,				
	OFF load tap at the 11KV side, and shall include the following.				
	(The client will supply only USS. All other items				
	shall be supplied by the Contractor).	1	NO		
6	**D.G.SETS.**				
	160 KVA DG SET				
	Supply,Erection, Testing and commissioning of 160KVA				
	415Volts, 3Phase, 50c/s, Diesel Engine coupled				
	Alternator working at 0.8 p.f. comprising of				
	Starting equipment for the Diesel Engine and				
	including the following.				

	Fixing of DG contro panel				
	Fixing of antivibration mountings for the D.G.Set.				
	Fixing of battery including supply of battery stand.				
	Fixing of diesel tank and supply and fixing of Fuel				
	line for the diesel engine.				
	Fixing of residential silencer for the engine.	1	NOS		
	Supply and fixing of exhaust line and				
	Aluminium clading up to top for exhaust line	17	MTRS		
7	**82.5 KVA DG SET**				
	Supply,Erection, Testing and commissioning of 82.5KVA				
	415Volts, 3Phase, 50c/s, Diesel Engine coupled				
	Alternator working at 0.8 p.f. comprising of				
	Starting equipment for the Diesel Engine and				
	including the following.				
	Fixing of DG contro panel				
	Fixing of antivibration mountings for the D.G.Set.				
	Fixing of battery including supply of battery stand.				
	Fixing of diesel tank and supply and fixing of Fuel				
	line for the diesel engine.				
	Fixing of residential silencer for the engine.	1	NOS		
	Supply and fixing of exhaust line and Aluminium clading up to top for exhaust line	17	MTRS		
8	**H.T. 11KV(E) CABLES**				
	Supply, testing and commissioning of the following PVC Insulated Armoured Aluminium XLPE (A2XCEFY) H.T Cables				

	3.0Cx185 SQ.MM. XLPE	80	MTRS		
	TOTAL AMOUNT FOR PLUMBING WORK				
GRAND TOTAL AMOUNT In Figures			**Rs.**		

Amount in Words: Rupees:

Signature of the Contractor

Name of the Contractor