INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) TIRUPATI

VOLUME I

TECHNICAL BID

“CONSTRUCTION OF UG BLOCK WITH ASSOCIATED SERVICES" AT

IISER TIRUPATI

NIT NUMBER : 2/IISER/TIRUPATI/2018-19

Index

"CONSTRUCTION OF UG BLOCK WITH ASSOCIATED SERVICES" AT

IISER TIRUPATI NIT NUMBER :2/IISER/TIRUPATI/2018-19

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) TIRUPATI

An Autonomous Institution, Ministry of Human Resource Development, Govt. of India
(An Autonomous Institution of the Ministry of HRD, Govt. of India)
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NOTICE INVITING e-TENDER (e-Procurement mode)

Indian Institute of Science Education and Research, Tirupati invites online percentage composite bids in open bid system from reputed construction agencies, found eligible as per the minimum requirements defined in clause 2 & 3 of NIT for the work mentioned below:

Brief Details of Tender:

Sr. No.	Description of work in Brief	Estimated cost put to bid (Rs.)	Earnest Money (Rs.)	Period of Completion	Pre bid meeting Date & time	Last date & time of submission of technical bid	Time & date of opening of technical bids
1	2	3					
1.	CONSTRUCTION OF UG BLOCK with associated SERVICES" AT IISER TIRUPATI Andhra Pradesh. NIT NUMBER-2 / IISER/ TIRUPATI/ 2018-19	1516 lakh (Civil-1165Lakh + E&M and HVAC 351 lakh)	25 lakh	6 months	07 02 2019 at 11 00 hrs	16 02 2019 at 15 00 hrs	18 02 2019 at 15 30 hrs

The Tender Document can be downloaded from Central Public Procurement (CPP) Portal https://eprocure.gov.in/eprocure/app or Institute website www.iisertirupati.ac.in and bid is to be submitted online only through the E-procurement portal up to the last date and time of submission of tender.

Critical Dates of Tender

Sr.No	Particulars	Date	Time in hrs
1	Date of Online Publication	24 01 2019	11 00
2	Pre-Bid Meeting	07 02 2019	11 00
3	Technical Bid Submission Start Date	11 02 2019	15 00
4	Technical bid Submission Close Date	16 02 2019	15 00
5	Opening of Technical bids	18 02 2019	15 30

No manual bids will be accepted. Bids should be submitted in the E-procurement portal.

Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 0120-4200462, 0120-4001002, 91-8826246593.

1) Information & Instructions for Online Bid Submission:

1.1 This tender document has been published on the Central Public Procurement Portal (URL:https://eprocure.gov.in/eprocure/app) & Institute website www.iiserTirupati.ac.in . The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.
More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app .

1.1 The intending bidder must read the terms and condition of NIT carefully. Bidder should submit his bid only if he considers himself eligible and he is in possession of all the required documents.

1.2 Bid documents should be submitted online complete in all respect along with requisite amount of tender fee (cost of bid documents) . Complete set of tender documents comprising Volume I, II, III has been made available at e-tender portal (URL:https://eprocure.gov.in/eprocure/app)

1.3 The bidder would be required to register at e-tender portal (URL:http://eprocure.gov.in/eprocure/app For submission of the bids, the bidder is required to have digital Signature Certificate (DSC) from one of the authorized Certifying Authorities.

1.4 Information and instruction for bidders posted on website shall form part of the bid document.

1.5 The bid document consisting of Vol-I – Technical bid, Vol-II- Technical specifications, Vol-III- Tender drawings and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website (URL:https://eprocure.gov.in/eprocure/app) free of cost.

1.6 But the bid can only be submitted after uploading the mandatory scanned documents such as receipt of online payment towards tender fee, in favour of Director, IISER Tirupati, scan copies of other required documents as specified in the NIT. The tender fee should be deposited online with IISER Tirupati within the period of bid submission as specified in the bid document.

1.7 Those contractors not registered on the website mentioned above, are required to get registered beforehand. If needed they can be imparted training on online tendering process as per details

available on the website. The intending bidder must have valid class-III digital signature to submit the bid.

1.8 On opening date, the contractor can login and see the bid opening process. After opening of bids he will receive the competitor bid sheets.

1.9 Contractor can upload documents in the form of JPG format and PDF format.

1.10 Certificate of Financial Turn Over: At the time of submission of bid contractor may upload Affidavit/ Certificate from CA mentioning Financial Turnover of last 3 years or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids. There is no need to upload entire voluminous balance sheet.

1.11 The tender document can be downloaded from http://eprocure.gov.in/eprocure/app and be submitted only through the same website.

2. REGISTRATION of Bidder on e-Procurement Portal

2.1 Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL:http://eprocure.gov.in/eprocure/app) by clicking on the link "Click here to Enroll". Enrolment on the CPP Portal is free of charge.

2.2 As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

2.3 Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

2.4 Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.

2.5 Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.

2.6 Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken.

2.7 The CPP Portal also has user manual with detailed guidelines on enrollment and participation in the online bidding process. Any queries related to process of online bids or queries related to CPP Portal may be directed to the 24x7 CPP Portal Helpdesk.

2.8 The Institute will not be responsible for any type of technical issue regarding uploading of tender on website. URL:http://eprocure.gov.in/eprocure/app) and any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is **0120-4200462, 0120-4001002, 91-8826246593.**

3. SEARCHING FOR TENDER DOCUMENTS

3.1 There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may

combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.

3.2 Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

3.3 The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

4. PREPARATION OF BIDS

4.1 Bidder should take into account any corrigendum published on the tender document before submitting their bids.

4.2 Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

4.3 Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS formats. Bid documents may be scanned with 100 dpi with black and white option.

4.4 To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

5. SUBMISSION OF BIDS

5.1 Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

5.2 The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

5.3 The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

5.4 The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

5.5 Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

5.6 Kindly add scanned PDF or JPG format files of all relevant documents in a single PDF file of compliance sheet.

6 ASSISTANCE TO BIDDERS

6.1 Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

6.2 Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is **0120-4200462, 0120-4001002, 91-8826246593**.

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH(IISER)

TIRUPATI SECTION I - i) NOTICE INVITING e-TENDERING

1. Indian Institute of Science Education and Research, Tirupati invites online percentage composite bids in open bid system from reputed construction agencies, found eligible as per the minimum requirements defined in clause 2 & 3 of NIT for the work mentioned below:

Name of work &Location	:	Construction of UG BLOCKwith associated services at IISER Tirupati, Andhra Pradesh.
NIT NUMBER	:	2/IISER/TIRUPATI/2018-19
Estimated cost	:	**Rs. 1516Lakh (Civil- Rs. 1165/- Lakh + E & M, HVAC- Rs 351/- Lakh)**
Period of completion	:	6 months.
Cost of tender documents	:	Rs. 1500/- (One thousand and five hundred only) – (Non – refundable)
Last Dates & time to fill/upload the tender through e-tendering.	:	16/02/ 2019 up to 15 00 hrs
Pre bid meeting date &time	:	07/02/2019 at 11:00 hours at the office of Director, IISER Tirupati Transit Campus at Sree Rama Engineering College Building, Karakambadi Road, Mangalam (B.O), Tirupati - 517 507 +91 (0877) 2500 400
Time & date of opening of Technical bids	:	At 3:30 PM on 18 02 2019

2. The applicant should be a well-established and reputed civil engineering / building contractor of long standing experience and capability in the construction of sophisticated building in RCC framed structure projects fulfilling following requirement will be eligible to apply. Work executed for private body will be considered only if contractor/ firm produces tax deduction at source certificate.

Joint Ventures shall not be acceptable.

a) Should have experience of having successfully completed works during the last seven years ending previous day of the last date of submission of tenders
(i) 3 similar works each costing not less than Rs. **6 crore** or completed two similar works each costing not less than **Rs 9** crore or completed one similar work costing not less than **Rs 12 crore.**

and

ii) One similar work of (either part of (i) above or a separate one) costing not less than Rs 6 Cr value with some Central/State Government/Central Autonomous Body/Central Public Sector Undertaking.

b) Components of work executed other than those included in definition of similar work shall be deducted while calculating cost of similar work. Bidder shall submit abstract of cost of work in support of this.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum, calculated from the date of completion to the last date of receipt of applications for tender.

Similar work means: Construction of Buildings with RCC framed Structure, under composite tender consisting of Civil, Plumbing & Sanitary, Electrical works, HVAC and Fire protection system etc. Documentary evidence is required to be produced.

This should be certified by an officer not below the rank of Executive Engineer in Govt. Departments and Superintending Engineer/ Chief Project manager or Equivalent in other organizations.

c) Should have had average financial turnover (Gross) of at least **Rs 15 Cr** on Civil & Electrical construction work during the immediate last three consecutive years balance sheets duly audited by Charted Accountant. Year in which no turnover is shown would also be considered for working out the average. No enhancement in the value of turnover for the past years shall be made for bringing them to current turnover level.

d) Should not have incurred any loss (profit after tax should be positive) during the immediate last two consecutive financial years ending 31st March, 2018, duly certified and audited by the Charted Accountant.

e) Should have solvency of **Rs. 6 Cr certified** by a Scheduled Bank and obtained not earlier than three months before the date of submission of Bid.

f) Bidder should have sufficient number of Technical and administrative employees for proper execution of the contract. The bidder shall have to submit a list of these employee stating clearly how these would be involved in this work within 15 days of award of work.

3. CONTRACT ELIGIBILITY CRITERIA

Further, the contract eligibility includes the following:

3.1 Experience on similar type of completed works executed during the **last seven years**; and

details like monetary value, clients, proof of satisfactory completion.

Similar work means: Construction of Buildings with RCC framed Structure, under a composite tender consisting of Civil, Plumbing & Sanitary, Electrical works, HVAC and Fire protection system etc. Documentary evidence is required to be produced.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7 % per annum, calculated from the date of completion to previous day of last date of submission of tender.

3.2 Enlistment/Registration, if any, with specified departments (CPWD, State PWDs, MES, Railways, PSUs etc)/ Organizations, class / type of registration or previous pre- qualification(s) for similar projects.

3.3 Documentary evidence of adequate financial standing, Certified by Bankers, Audited Profit & Loss A/c and Balance Sheet, Annual turnover in **last five years**, access to adequate working capital.

3.4 Information regarding projects in hand, current orders, regarding litigation, exclusion/expulsion or black listing, if any.

3.5 Construction Equipment proposed to be deployed for the project and proof of its availability; equipment proposed to be purchased or leased.

3.6 Key personnel available and proposed to be engaged for management and supervision of the Project, their qualifications and experience.

3.7 Project planning and quality control procedures to be adopted. Construction methodology & QA manual to be submitted along with the tender.

3.8 Bidders not meeting the minimum eligibility criteria shall be summarily rejected.

3.9 Copy of the enlistment order and certificates of work experience and other required as specified in the bid documents shall be scanned and uploaded to the e-tendering website within period of bid submission.

3.10 Bidder should not have been blacklisted by any state/Central Departments/PSUs/Autonomous bodies during the last 7 years of its operations. Affidavit shall be made in current date after the date of invitation of the tender as per **Form F** and shall be furnished on a 'Non-Judicial' stamp paper worth Rs.100/- otherwise the tender shall be rejected.

3.11 Willingness of the associated agency for Architectural & Structural consultancy & E & M works shall be submitted as per **Form G.**

3.12 MOU between the Main contractor and Associated agency shall be submitted after the award of work.

4 The time allowed for carrying out the work will be **6 months** from the date of start as defined in schedule 'C' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the tender.

5 The bid document is Two stage two Envelope e-tendering system can be seen from the Central Public Procurement Portal (URL:https://eprocure.gov.in/eprocure/app) & Institute website www.iiserTirupati.ac.in The contents of Envelope I & Envelope II are specified in the NIT.

6 Submission of Technical Bid Documents

Information and instruction for bidder for e-tendering forming part of bid document uploaded on website. Last date and time of submission of technical bid, Tender fee and other documents as specified in the NIT.

List of Document to be scanned and uploaded within the period of bid submission:

I. Transaction Receipt of online deposit of tender fee and EMD.

II. Enlistment Order of the Contractor (Attested copy) if required.

III. Certificates of work Experience certificates submitted shall clearly indicate the:
   a) Type and nature of work
   b) Completion cost
   c) Time period, actual completion date.
   In case, if any of above details are not included in the work done certificates, then such bids will not be considered for opening.

IV. Complete set of TDS certificate (Form 16) shall be uploaded in case the similar work is executed from a private body which shall form basis for establishing the completion cost of work executed.

V. Certificate of Registration for GST and acknowledgement of up to date filed return if required.

VI. Scanned Copies of all eligibility documents required as per NIT **Annexure –I**

Tender documents should be submitted online complete in all respect along with requisite amount of tender fee (cost of bid document). Complete set of tender documents comprising Volume I, II, III and financial bids has been made available at e-tender portal http://www.eprocurement & www.iiserTirupati.ac.in

7 Director, Indian Institute of Science Education & Research, Tirupati shall be the "Accepting Authority" hereinafter referred to as such for the purpose of this Contract.

8 Bids must be accompanied by tender fee and bid-security/EMD (Earnest Money Deposit) amount specified for the work in clause 10 payable at Tirupati and drawn in favour of The Director; IISER Tirupati Bid Security shall have to be valid for 90 days beyond the validity of the bid.

9 **Tender fee shall be Rs. 1500/-(One thousand and five hundred only) non-refundable fee required to be deposited in IISER Tirupati Bank account through net banking as detailed below failing which the bid will be declared non responsive.**

Name-IISER Tirupati
Bank-State Bank of India
Branch- Korlagunta Branch, Tirupati 517507
Current A/c No. 35029946671
IFSC-SBIN0001901

Scanned copy of the net banking transaction receipt towards payment of tender fee shall be uploaded on the e-tendering website within the period of bid submission failing which the bid will be declared non responsive.

10 **Bid Security/EMD,**

10.1 **Bid security/EMD amounting to Rs 25, 00,000 /-(Twenty Five Lakh) in any one of the following forms shall be deposited with IISER Tirupati in the following form before the date and time fixed for opening of bid failing which the bid will be declared non responsive.**

a) 100% EMD amount can be deposited in **IISER Tirupati Bank account** through net banking as detailed below.

Name-IISER Tirupati
Bank-State Bank of India
Branch- Korlagunta Branch, Tirupati 517507
Current A/c No. 35029946671
IFSC-SBIN0001901

b) A part of earnest money is acceptable in the form of bank guarantee also.
In such case, **50% of earnest money or Rs. 20 lakh, whichever is less**, will have to be deposited in shape prescribed above and balance in shape of irrevocable Bank Guarantee from a Scheduled Bank and shall be valid 90 days after the validity of the offer (as per standard proforma attached).

10.2 Bid Security/EMD of unsuccessful Bidders will be returned to them within 90 days from the date of acceptance of bid of the successful Bidder.

10.3 The Bid Security may be forfeited, if

a) The Bidder withdraws / modifies his Bid or any item thereof after opening of bid.

b) The successful Bidder fails within the specified time limit to commence the work.

10.4 Scanned copy of net banking transaction receipt and Bank Guarantee towards security /EMD shall be uploaded to the e-tendering website within the Period of bid submission Failing which the bid will be declared non responsive.

11 A pre-bid meeting will be held on **07 02 2019 at 11 00** hours at the office of The Director, IISER Tirupati, to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in Clause 12.

12 **Pre-bid meeting**

12.1 The Bidder or his officially authorized representative is invited to attend a pre-bid meeting, which will take place as referred in clause 11 of NIT. Bidder/ bidder representative who wish to attend Pre-bid meeting should carry a valid identity proof certifying his designation with said firm.

12.2 The purpose of the meeting is to clarify issues and to answer questions on matters that may be raised at that stage.

12.3 The Bidder is requested to submit their questions/ queries/ clarifications in writing or by email/ fax to reach the IISER Tirupati before the meeting. Bidders can send Pre-bid queries on their letter head referring tender number by Speed post on above said address so as to reach IISER Tirupati or on e-mail address pvnrao@iisertirupati.ac.in **before 07 02 2019** up to 11 00 Hours.

12.4 Minutes of the meeting (MOM), including the text of the questions raised (without identifying the source of enquiry) and the responses given will be uploaded as corrigendum on website (URL:https://eprocure.gov.in/eprocure/app) and www.iisertirupati.ac.in

13 Any modification of the bidding documents which may become necessary as a result of the pre-bid meeting shall be made by the IISER, Tirupati through pre bid MOM and this shall form part of bidding document.

14 IISER Tirupati reserves the right to reject any prospective applicant without assigning any Reason and to restrict the list of technically qualified bidders to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.

15 Site visit, availability of site and cost of bidding

15.1 The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the IISER, Tirupati will in no case be responsible and liable for these costs.

15.2 The Bidder should inform the IISER in advance about the proposed site visit.

15.3 The Bidder, at his own responsibility and risk is encouraged to visit, inspect and survey the Site and its surroundings and satisfy himself before submitting his bid as to the form and nature of the Site, the means of access to the Site, the accommodation he may require, etc.

15.4 In general, Bidders shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A Bidder shall be deemed to have full knowledge of the Site, whether he inspects it or not and no extra claims due to any misunderstanding or otherwise shall be allowed.

15.5 The costs of visiting the Site shall be at the Bidders' own expense. Any report shared at the site, by the IISER is subject to verification by the contractor. Any deviations of information in the report and the actual site will not be the responsibility of the IISER.

15.6 The site for the work is available.

15.7 The architectural and structural drawings shall be made available in phased manner as per requirement of the same as per approved program of completion submitted by the contractor after award of the work.

16 Content of Bidding Documents

16.1 Submission of a bid by a Bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be executed and local conditions and other factors having a bearing on the execution of the works.

16.2 The Bidder shall submit the Bid, which satisfies each and every condition laid down in the bid documents, failing which, the bid is liable to be rejected.

16.3 Notice Inviting e-Tender shall form part of the Contract document.

16.3.1 The documents listed below comprises one set of bid document that are issued to Bidders:

PART – I
Technical Bid
Envelope –I
Volume I

a) Notice Inviting Tender (Including eligibility criteria)

b) Tender Form and General Rules and Directions for the Guidance of the Contractor

c) General Conditions of Contract

d) Special Conditions & PARTICULAR SPECIFICATIONS of Contract

e) Safety Code for Contract Work

f) Proforma of Schedule A, B, C

Volume- II: Special Conditions & PARTICULAR SPECIFICATIONS of Contract

& Tender Drawings

PART-II

Envelop II – (Financial bid)

Volume –III : Financial bid Schedule of quantity (BOQ).

17 Amendment of Bid Documents

17.1 Before the deadline for submission of bids, the IISER Tirupati may modify the bidding documents by issuing corrigendum.

17.2 Any corrigendum so issued shall be part of the bid documents as well as Contract document and shall be on uploaded website URL:https://eprocure.gov.in/eprocure/app and www.iisertirupati.ac.in Bidders should take note of the uploaded corrigendum and submit the tenders accordingly.

18 Bid Validity

18.1 The bid submitted shall become invalid if:

(i) The bidders is found ineligible.

(ii) The bidder does not deposit Online tender fee with IISER Tirupati before the date and time fixed for opening of the bids.

(iii) The bidders does not upload all the documents (including GST registration) as stipulated in the bid document.

(iv) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the lowest tenderer in the office of tender opening authority.

18.2 The bids submitted shall remain valid for acceptance for a period of 90 days from the date of opening of the technical bids.

19 Technical bid Bid Opening

19.1 Online bid documents submitted by intending bidders shall be opened only of those bidders, whose tender fee and EMD is deposited online with IISER Tirupati and scanned their scanned copies i/c tender documents scanned and uploaded are found in order.

19.2 Bidder will submit a list of their sub-vendors for specialists' trades like Architectural & structural designing firms, Electrical, Lifts, Fire protection system etc., conforming to the criteria set out in the tender document under clause 1.6, **Information and Instruction to Applicants** of NIT. If, however, the sub-vendors so selected by the Contractor are subsequently found not to meet the criteria IISER and Consultant reserve the right to reject this selection and nominate a panel of sub-Vendors from among whom the Contractor should select an agency and get the work executed from this agency only .

20 Technical Evaluation of the bids

20.1 The bidder qualifying initial criteria as set out in Para 2 & 3 and the details furnished by bidders in the Proforma 1 and **FORM A to Form H** enclosed as **Annexure-1** of Section II will be evaluated by the IISER Tirupati technical evaluation committee appointed by the competent authority. Performa's listed are elaborated below,

I) Initial bidding capacity Performa I,

II) Financial Information **FORM "A"**

a) Solvency certificates from a scheduled bank - **Form B**

b) Details of similar works -- **Form C**

c) Performance report of works referred to in **Form D**

d) Organization structure Personnel **Form E**

e) PROFORMA OF AFFIDAVIT FOR NON - BLACK LISTING- **Form F**

f) Willingness of the associated agency **Form G**

g) MOU between the main contractor and associated agency: **Form H**

h) Details of construction plant & equipment required to be arranged at site for execution of work **Annexure -II**

i) Site testing laboratory

j) Confidential report to be obtained by the IISER from the client on the work executed by the contractor during last five years certification if required

k) The bidders qualifying the initial eligibility criteria as set out in clause no 2 & 3 above will be evaluated based on the information submitted by bidders as per clause no 20.1 after due verification and selection will be made by IISER, TIRUPATI on the basis of the strength of individual applicants. Main consideration will be the ability of the Principal Contractor to fulfill technical, financial, contractual and legal obligations. Special emphasis will be laid on competence to do good quality works within specified time schedule and in close co-ordination with other agencies over and above the rate structure of the items.

l) IISER Tirupati reserves the right to waive off minor deviations in the eligibility, if the technical evaluation committee consider that they do not materially affect the capability of the bidder to perform the contract. IISER Tirupati decision in this regard shall be final and binding & conclusive.

20.2 TECHNICAL EVALUATION CRITERIA:

The bidders qualifying the initial eligibility criteria, as set out in Para 2 & 3 above, will be evaluated for following criteria by scoring method on the basis of details furnished by them and inspection by the technical committee.

(a)	Financial strength (Form "A"& B)	Maximum 20 Marks
(b)	Experience in similar nature of work during last seven years (Form "C")	Maximum 20 Marks
(c)	Performance on work (Form "E") -Time over run	Maximum 20 Marks
(d)	Performance on work (Form "E") – Quality	Maximum 40 Marks
		…….
	Gross Marks Total	**100 Marks**
		…….

	Attributes	Evaluation	
(a)	Financial strength **(20 Marks)** (i) Average annual turnover 16 marks (ii) Solvency certificate 4 marks	(i) 60% marks for minimum eligibility criteria (ii) 100% marks for twice the minimum eligibility criteria or more In between (i) & (ii)- on pro-rata basis	
(b)	Experience in similar Class of work **(20 marks)**	(i) 60% marks for minimum eligibility criteria (ii) 100% marks for twice the minimum eligibility criteria or more In between (i) & (ii)- on pro-rata basis	
(c)	Performance on works (time over run) (20 marks)		
	Parameter calculation for points	Score	Maximum Marks
	If TOR =	1.00 1.25 2.00 >3.50	20
	(i) without levy of compensation	20 15 10 10	
	(ii) with levy of compensation	20 5 0 -5	
	(iii) Levy of compensation not decided	20 10 0 0	
	TOR = AT/ST, where AT = Actual Time; ST = Stipulated Time. Note: Marks for value in between the stages indicated above is to be determined by straight line variation basis.		
(d)	Performance of Works (Quality) Maximum **(40 marks)**		

	Score:	
	(i) Outstanding	40
	(ii) Very Good	30
	(iii) Good	20
	(iv) Poor	0

To become eligible for short listing the bidder must secure at least Fifty percent marks in each attribute and Sixty percent marks in aggregate. The IISER Tirupati, however, reserves the right to restrict the list of short listed agencies out of technically qualified agencies to any number deemed suitable by it but minimum three in case the technically qualified bidders are more than three.

Note: The average value of works for time overrun & quality shall be taken on the basis of performance report of the eligible similar works.

20.3 Evaluation of performance: Evaluation of the performance of the bidders for eligibility shall be done by the committee constituted by the Director, IISER Tirupati. All the eligible similar works executed and submitted by the bidders may be got inspected by a committee which may consists client or any other authority as decided by the competent authority. The marks for the Performance of Works (Quality) shall be given based on this inspection, if inspection is carried out otherwise on the basis of the performance report given by the client department officer not below the rank of Executive Engineer.

20.4 Even though a bidder may satisfy the above requirements, he would be liable for dis-qualification if he has:

(a) Made misleading or false representation or deliberately suppressed the information in the forms, statements and enclosures required in the pre-qualification document.

(b) Records of poor performance such as abandoning work, not properly completing the contract, or financial failures / weaknesses etc.

PART II

21 Financial /Price bid

21.1 After technical evaluation of (part I) bids as per clause 2, 3 & 20 above only short listed agencies financial bids shall be opened at the notified date and time.

22. Clarification of Bids

22.1 To assist in the examination and comparison of Bids, the IISER, Tirupati may, at its discretion, ask any Bidder for clarification of his Bid, including breakdown of unit rates. The request for clarification and the response shall be in writing or by email / fax, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the IISER, Tirupati in the evaluation of the bids.

22.2 No, Bidder shall contact the IISER, Tirupati on any matter relating to his bid from the time of the bid opening to the time the contract is awarded.

22.3 Any effort by the Bidder to influence the IISER's bid evaluation, bid comparison or contract award decisions, may result in the rejection of his bid.

23. Indian Institute of Science Education and Research Tirupati, does not bind itself to accept the lowest or any other bid, and reserves the right to reject any or all of the tenders received without assigning any reasons. Bids in which any of the prescribed conditions are not fulfilled or any conditions including that of the conditional rebate put forth by the bidder shall be summarily rejected.

24 If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer-in-charge or his representative's estimate of the cost of work to be executed under the contract, the IISER, Tirupati may require the Bidder to produce detailed rate analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those rates with the implementation/construction methods and schedule proposed.

25 Award Criteria

25.1. IISER Tirupati reserves the right without being liable for any damages or obligation to inform the bidder to:

a) amend the scope and value of the contract to the bidder

b) Reject any or all applications without assigning any reasons

25.2 IISER, Tirupati shall award the contract to the Bidder whose evaluated offer / bid has been determined to be the technically suitable and financially lowest and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to execute the contract satisfactorily. The Board of Governors of IISER reserves the right to accept or reject any application and to annul the pre-qualification process and reject all applications at any time, without thereby incurring any liability to the affected applicants or specifying the grounds for the Employer's action

26 Contractor whose tender is accepted will be required to furnish Performance guarantee of 5% (Five Percent) of the tendered amount within the period specified in Schedule C. This guarantee shall be in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'C'. including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor and without prejudice to any other right or remedy. The Earnest Money deposited along with tender shall be returned after receiving the aforesaid performance guarantee. The earnest money deposited along with bid shall be returned after receiving the aforesaid performance guarantee.

The contractor whose bid is accepted will also be required to furnish either copy of the applicable licenses/registrations or proof of applying for obtaining labour licenses, registration with EPFO, ESIC, and BOCW Welfare Board i/c provident Fund Code No. if applicable and also ensure the compliance of aforesaid provisions by the sub-contractors, if any engaged by the contractor for the said work and programme chart (Time and Progress) within the period specified in Schedule C.

27 For execution of Architectural & structural, Electrical & Mechanical (E&M), firefighting & HVAC components of works, the main agency has to associate with specialised agency as per the laid down minimum eligibility criteria in tender document and submit the details of MOU of such agencies to Engineer in charge.

27.1 Entire work under the scope of Composite bid including Architectural & structural, Electrical & Mechanical (E&M), firefighting & HVAC shall be executed under one agreement. The main contractor has to enter into MoU in **Form 'H'** with his associate agency(s) for Architectural, E & M component conforming to eligibility criteria as defined in the bid document and has to submit details such agency(s) to Engineer-in-charge of minor component(s) within prescribed time. Name of the agency(s) to be associated shall be approved by Engineer- in-charge.

27.2 If the main contractor fails to associate agency/agencies for execution of for Architectural & structural, Electrical & Mechanical (E&M), firefighting & HVAC Component of work within prescribed time or furnishes incomplete details or furnishes details of ineligible agencies even after the tenderer is given due opportunity, the entire scope of such component of works shall be withdrawn from the tender and the same shall be got executed by the Engineer-in-Charge at the risk and cost of the main contractor.

27.3 In case the main contractor intends to change any of the above agency/agencies during the operation of the contract, he shall obtain prior approval of Engineer-in-charge. The new agency/agencies shall also have to satisfy the laid down eligibility criteria. In case Engineer-in-charge is not satisfied with the performance of any agency, he can direct the contractor to change the agency executing such items of work and this shall be binding on the contractor.

27.4 Running payment for the work shall be made to the main contractor. In case main contractor fails to make the payment to the contractor associated by him within 15 days of receipt of each running account payment then on the written complaint of contractor associated Engineer-

in-charge shall serve the show cause to main contractor and after considering the reply of the same he may make the payment directly to the contractor associated as per the terms & conditions of the agreement drawn between main contractor and associate contractor fixed by him, if reply of main contractor either not received or found unsatisfactory. Such payment made to the associate contractor shall be recovered by the Engineer in charge from the next RA/final bill due to main contractor as the case may be.

27.5 The Composite work shall be treated as complete when all the components of the work are complete.

28 Bidder shall quote rates for all items in the BOQ (i.e. Civil, Electrical, HVAC, firefighting) of work in the financial bid document. It will be obligatory on the part of the tenderer to sign the tender document for all the components (The schedule of quantities, conditions and special conditions etc.)

29 **Disclosures**

Any change in the constitution of the contractor's firm, where it is a partnership firm, as declared in the prequalification documents submitted by the bidders at the time of submission of prequalification documents, should be disclosed to the IISER, Tirupati, at any time between the submission of bids and the signing of the contract.

IISER Tirupati

SECTION I

ii) ADDITIONAL INFORMATION AND INSTRUCTION TO APPLICANTS

1.0. GENERAL

1.1 **STATEMENT OF OBJECTIVES, BRIEF SCOPE & PARTICULARS OF THE WORK**

The entire Project will be executed under a Single Point Responsibility system. Total plinth area of the building is estimated to be about 3600 sqm. The building shall be RCC framed structure.

- Construction of UG BLOCK with Labs , Instrumentation rooms, Tutorial rooms and Services as per the schedule of quantities. The Drawings are indicative.
- Concept floor plans of the proposed building are attached with the tender document. In general Work shall be executed according to Conditions of Contract, Specifications, BOQ and Drawings
- Work shall in general be executed as per, general conditions of the contract, particular Technical Specifications, CPWD Specifications available separately at printer's outlets (the bidder may obtain the address of the outlets from any CPWD office/IISER Tirupati), National Building code of India, relevant Indian Standard (IS) Codes, etc
- As these buildings will have green building features, Contractors are expected to provide adequate and complete documentation, towards obtaining certification from GRIHA
- Particulars given above are provisional and liable to change and must be considered only as advance information to assist the bidder.

1.2. Letter of transmittal and other forms for pre-qualification are attached (Annexure I)

1.3. All information called for in the enclosed forms should be furnished against the respective columns in the forms. If information is furnished in a separate document, reference to the same should be given against respective columns. Such separate documents shall be chronologically placed at the end of the prescribed application. If information is 'nil' it should also be mentioned as 'nil' or 'no such case'. If, any particulars/query is not applicable in case of the applicant, it should be stated as 'not applicable'. However, the applicants are cautioned that not giving complete information called for in the application forms required, not giving it in clear terms or making change in the prescribed forms or deliberately suppressing the information

may result in the applicant being summarily disqualified. Applications made by Fax and those received late will not be entertained.

1.4. References, information and certificates from the respective clients certifying suitability, technical know-how or capability of the applicant should be signed by an officer not below the rank of Superintending Engineer/Chief Project Manager or equivalent.

1.5 The Tenderer is advised to attach any additional information which he thinks is necessary in regard to his capabilities to establish that the applicant is capable in all respects to successfully complete the envisaged work. He is however, advised not to attach superfluous information. No further information will be entertained after pre-qualification document is submitted, unless it is called for by Employer.

1.6 The applicant may engage sub vendors for execution of Electrical, HVAC, FPS as mentioned below, or may execute the same on their own. In either case, the eligibility criteria given below shall be satisfied.

The applicant Principal Contractor shall associate (Association through MOU / Subsisting agreement) with contractors for Electrical/Fire Fighting/Fire Detection / HVAC who shall satisfy the eligibility criteria/ given below for each type of specialized Electrical Mechanical agency. For this purposes, the applicant principal contractor shall give at least 2 (Two) names for each category of associates. IISER will approve associates after verifying their credentials and experience. However, responsibility of getting the work done efficiently will rest with the Principal contractor. The consent letter from different associates shall also be enclosed along with tender. The associate contractors meet the eligibility criteria, given below. In case, the applicant himself has executed specialized works as given below in his own name, he will be considered for qualifying for E&M works. He should support his claim with full details as required below:

The Principal contractor or Associates shall be required to possess valid license for respective trade for executing the specialized services.

CRITERIA FOR ELGIBILITY OF Associated Agencies:

The contractor shall give the list of Associated Agencies and their credentials in the **Form H** as per eligibility criteria detailed below :

A Electrical Installations works

i. The work involves providing EI & Fans, power wiring, distribution boards, rising mains, P/F lighting luminaries, floor trunking etc.

ii. Contractors who are enlisted in the Class-I category or Specialized firms who have carried out at least 3 (Three) works of similar nature in their own name in a sophisticated building during the last 7 (seven) years ending previous day of the last date of submission of tenders. The works execution aggregate turnover shall not be less than Rs 1 **crores** in the past 5 (Five) years

C). HVAC

i. The work involves supply, installations, testing and commissioning of HVAC units as per the details given in the specification.

ii. The specialized agencies who have satisfactorily completed at least 2 **Projects** in their own name during the last 7(Seven) years ending previous day of the last date of submission of tenders

iii. The works execution aggregate turnover shall not be less than 1**.00 crores** in the past 5 (Five) years.

D). FIRE FIGHTINGSYSTEM

i. The work involves supply, installations, testing and commissioning of wet riser system, yard hydrant and sprinklers system, automatic fire detection system, fire alarm system etc.

ii. The specialized agencies who have satisfactorily completed at least FIVE **works of similar nature** in their own name in a **sophisticated** buildings during the last 7 (Seven) years ending previous day of the last date of submission of tenders.

1.7 LETTER OF TRANSMITTAL

The applicant should submit the letter of transmittal attached with tender document duly signed by the agency.

1.8 INTEGRITY AGREEMENT duly signed by the agency along with letter is required to be submitted by the agency.

LETTER OF TRANSMITTAL

From

To
THE DIRECTOR
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER)
Transit Campus at Sree Rama Engineering
College Building, Karakambadi Road,
Mangalam (B.O), Tirupati - 517 507

Sub: SUBMISSION OF TENDER DOCUMENTS FOR THE WORK OF

Name of work & Location : Construction of UG BLock with associated services at IISER Tirupati, Andhra Pradesh.

NIT NUMBER : 2/ IISER/TIRUPATI/2018-19

Having examined the details given in press notification and the tender document for the above work, I/we hereby submit the tender documents and other relevant information. I/we agree with all the terms and conditions given in the bid document.

1. I/We hereby certify that all the statements made and information supplied in the enclosed forms and accompanying statements are true and correct.

2. I/We have furnished all information and details necessary for eligibility criteria and have no further pertinent information to supply. We understand and agree that financial bids of the only short listed agencies selected by IISER Tirupati out of the top ranked technically qualified agencies evaluated and found eligible under clause 20 of the NIT, shall only be opened.

3. I/We submit the requisite certified solvency certificate and authorize the Director, IISER, Tirupati to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/We also authorize Superintending Engineer, Tirupati to approach individuals, employers, firms and corporation to verify our competence and general reputation.

4. I/We submit the following certificates in support of our suitability, technical know-how & capability for having successfully completed the following works.

Name of Work:	Certificate from
1.	1.
2.	2.
3.	3.

Enclosures:

Seal of applicant
Date of submission

Signature(s) of applicant(s)

Undertaking to sign the integrity Agreement

To,

……..,
……..,
……..

Sub: SUBMISSION OF TENDER DOCUMENTS FOR THE WORK OF

Name of work &Location	:	Construction of UG Block with associated services at IISER Tirupati, Andhra Pradesh.
NIT NUMBER	:	2/ IISER/TIRUPATI/2018-19

Dear Sir,

It is here by declared that IISER 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 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 IISER.

Yours faithfully

Sd/-

Registrar

Forwarding letter for Integrity Agreement

To

INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Transit Campus at Sree Rama Engineering
College Building, Karakambadi Road,
Mangalam (B.O), Tirupati - 517 507

Sub: SUBMISSION OF TENDER DOCUMENTS FOR THE WORK OF

Name of work &Location : Construction of UG Block with associated services at IISER Tirupati, Andhra Pradesh.

NIT NUMBER : 2/ IISER/TIRUPATI/2018-19

Dear Sir,

I/We acknowledge that IISER 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, failing 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 IISER. 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 acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, IISER 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)

To be signed by the bidder and the signatory competent / authorised to sign the relevant contract on behalf of IISER

INTEGRITY AGREEMENT

This Integrity Agreement is made at ..... on this ..... day of ..... 20.....

BETWEEN

IISER represented through its Registrar, (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 for .....
(Name of work)
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 endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

2) 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, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its 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 measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

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)/Contract(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/representatives, 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 participates 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 or 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 of 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 rights 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 of 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 14 days notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. 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/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 or 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, Performance Guarantee and Security Deposit of the Bidder/Contractor.

3) **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.

4) 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/Contractors/Subcontractors

1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors 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 Subcontractors/ 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.

Article 7- Other Provisions

1) This Pact is subject to Indian Law, place of performance and jurisdiction is the **Headquarters of the** Principal/Owner, who has floated the Tender.

2) Changes and supplements need to be made in writing. Side agreements have not been made.

3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

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:

Dated :

ANNEXURE 1

PERFORMA '1'

INFORMATION REGARDING INITIAL BIDDING CAPACITY

The information to be filled in by the Bidder in the following pages will be used for purposes of Pre-qualification as provided above.

1. For Individual Bidders

1.1 Constitution or legal status of Bidder (Attach Copy)

Place of registration:

Principal place of business:

(Power of attorney of signatory of Bid)

1.2 (A) Value of work Completed during the last five years (in Rs. Lakh)

Particular	***Year***	***Value***
Total value of Work Executed in the last five years**	2013-14	
	2014-15	
	2015-16	
	2016-17	
	2017-18	

** Immediately preceding the financial year in which bids are received. Attach certificate from Chartered accountant.

(B) Existing commitments and on-going works: (format for **clause 3.7)**

Description Of work	***Place & state***	***Contract No.& Date***	***Name & Address of Client***	***Value of Contact (Rs. Lacs)***	***Stipulated period of completion***	***Value of work remaining to be completed***	***Anticipated date of completion (Rs.)***	***Remarks*** **Information regarding the litigation if any**

FORM 'A'

FINANCIAL INFORMATION

I. **F**inancial Analysis-Details to be furnished duly supported by figures in balance sheet/profit & loss account for the last five years duly certified by the Chartered Accountant, as submitted by the applicant to the Income tax Department (Copies to be attached.)

Years

Year	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**
Gross annual turn over					
Profit/ Loss					

II. **F**inancial arrangements for carrying out the proposed work.

III. Solvency Certificate from Bankers of the bidder in the prescribed Form"I".

Signature of Chartered Accountant with Seal Signature of Bidder(s)

Form B

FORM OF BANKERS' CERTIFICATE FROM A SCHEDULED BANK

This is to certify that to the best of our knowledge and information that;

_____

(Name of the individual or the firm)

_____

(Name of the proprietor in case of a sole proprietorship concern or names of partners in case of partnership concern as per bank's record, be indicated)

_____

(Address of the customer as per bank record)

is a / are customer(s) of our bank, is/are respectable and can be treated as good for any engagement up to a limit of Rs. _____
(Rupees_____only)

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

Signature of the Manager

Seal of Bank

Note : This certificate should be issued on the letter head and addressed to the DIRECTOR , Main Building, IISER TIRUPATI – 517507 in a Sealed Cover

FORM 'C'

DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING THE LAST 7 (Seven) YEARS ENDING PREVIOUS DAY OF THE DATE OF SUBMISSION OF TENDER

S. No.	*Name of work/ project and location*	*Owner or Sponsori-ng organizat-ion*	*Cost of work in crores of Rupees*	*Date of commen-cement As per contract*	*Stipulat-ed date of comple-tion*	*Actual date of compl-etion*	*Litigation/ar bitration cases pending/in progress with details*	*Name and address/te leph-one number of officer to whom referen-ce may be made*	*Remar-ks*
1	2	3	4	5	6	7	8	9	10

- Indicate gross amount claimed and amount awarded by the Arbitrator.

SIGNATURE OF BIDDER(S)

FORM D

PERFORMANCE REPORT OF WORKS REFERRED TO IN PROFORMA 'C''

1. Name of the work/
   Project & Location.

2. Agreement No.

3. Estimated Cost

4. Tendered Cost

5. Date of Start

6. Date of completion

   (a) Stipulated date of completion.

   (b) Actual date of completion.

7. a) Whether case of levy of compensation for
   Delay has been decided or not ? Yes / No

   d) If decided, amount of compensation levied for
   Delayed completion if any ?

8. Amount of reduced rate items, if any

9. Performance report

   i) Quality of Work : Outstanding/Very Good / Good / Poor

   ii) Financial soundness : Outstanding/Very Good / Good/ Poor

   iii) Technical Proficiency : Outstanding/Very Good / Good / Poor

   iv) Resourcefulness : Outstanding/Very Good / Good / Poor

   v) General Behaviour : Outstanding/Very Good / Good / Poor

DATED: **Executive Engineer or Equivalent**

FORM 'E'

STRUCTURE AND ORGANISATION

1. Name and address of the applicant

2. Telephone No./Telex No./Fax No.

3. Legal Status (attach copies of original Document defining the legal status)
   (a) An Individual
   (b) A proprietary Firm
   (c) A Firm in partnership
   (d) A limited Company or Corporation.

4. Particulars of registration with various Government bodies (Attach attested photo-copy)

   a) Registration Number.

   b) Organization / Place of registration

5. Names and Titles of Directors and officers with designation to be concerned with this work.

6. Designation of individuals authorized to act for the organization.

7. Has the bidder, or any constituent partner in case of partnership firm Limited Company/Joint Venture, ever been convicted by the court of law? ? If so, give the details.

8. In which field of Civil Engineering Construction, the bidder has specialization and interest ?

9 Any other information considered necessary but not included above.

SIGNATURE OF BIDDER(S)

(FORM-F)

PROFORMA OF AFFIDAVIT FOR NON - BLACK LISTING

I/we undertake and confirm that our firm/partnership firm has not been blacklisted by any state/Central Departments/PSUs/Autonomous bodies during the last 7 years of its operations. Further that, if such information comes to the notice of the IISER Tirupati then I/we shall be debarred for bidding in IISER TIRUPATI in future forever. Also, if such an information comes to the notice of department on any day before date of start of work, the Engineer-in-charge shall be free to cancel the agreement and to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee (Scanned copy of this notarized affidavit to be uploaded at the time of submission of bid)

Signature of Bidder(s) or an authorized
Officer of the firm with stamp

Signature of Notary with seal

Note:1. The affidavit shall be made in current date after the date of invitation of the tender.
Affidavit shall be furnished on a 'Non-Judicial' stamp paper worth Rs.100/-otherwise the tender shall be rejected

Form ”G “

WILLINGNESS CERTIFICATE OF ASSOCIATED AGENCY

*Name of work:- “*Construction of UG Block with associated Services” at IISER Tirupati, Andhra Pradesh**.**

I hereby give my willingness to work as Associated Agency for Architectural/E&M works for the above mentioned work.

I will execute the work as per specifications and terms and conditions for the agreement & as per direction of the Engineer-in-Charge. Also I will employ full time technically qualified Staff for the works. I will attend inspection of officers of the IISER Tirupati as and when required.

Dated:

Signature of the Associated Agency

Form ”H “

MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN

1]M/S [Name of the firm with full address]

[Henceforth called the main contractor]

And

2]M/S [Name of the firm with full address]

[Henceforth, called Associated Agency]

We state that M.O.U between us will be treated as an agreement and has legality as per Indian Contract Act [amended up to date] and the IISER Tirupati can enforce all the terms and conditions of the agreement for execution of the above work. Both of us shall be responsible for the execution of work as per the agreement to the extent this MOU allows. Both the parties shall be paid consequent to the execution as per agreement to the extent this MOU permits.
In case of any dispute, either of us will go for mediation/arbitration by the Engineer in charge. Any of us may appeal against the mediation/arbitration to the Director, IISER Tirupati. His decision shall be final and binding on both of us.

We have agreed as under:
1] The Associated contractor will execute all electrical works in the wholesome manner as per terms and conditions of the agreement. .

2] The Associated contractor shall be liable for disciplinary action if he fails to discharge the action[s] and other legal action as per agreement

3 All the machinery and equipment, tools and tackles required for execution of the electrical works, as per agreement, shall be the responsibility of the Associated contractor.

4] The site staff required for the electrical work shall be arranged by the Associated contractor as per terms and conditions of the agreement.

5] Site order book maintained for the said work shall be signed by the main contractor as well as by the Engineer of the Associated Contractor and by Associated Contractor himself.

6] All the correspondence regarding execution of the Architectural, E&M works shall be done by the Engineer in charge with the Associated Contractor with a copy to the main contractor. In case of non-compliance of the provisions of agreement, the main contractor, as well as the associated contractor shall be responsible. The action under clauses 2 and 3 shall be initiated and taken against the main contractor.

SIGNATURE OF MAIN CONTRACTOR :

SIGNATURE OF ASSOCIATED AGENCY:

Date: Date

Place:

COUNTERSIGNED

Engineer in Charge

IISER Tirupati

Annexure-II

DETAILS OF CONSTRUCTION PLANT AND EQUIPMENT

ANNEXURE-II: PLANT AND EQUIPMENT REQUIRED TO BE OWNED / TAKEN ON LEASE BY THE CONTRACTOR AND REQUIRED TO DEPLOYED AT SITE FOR SPEEDY CONSTRUCTION WITHIN GIVEN TIME FRAME

S. No.	Machinery	Minimum numbers to be deployed at site	TIME FRAME: Days from date of start machinery to be brought at site.
1.	Excavator cum loader (JCB 3 D Model or equivalent)	2	5
2.	Concrete pump(Minimum capacity 30 Cum Per hour and Head 90 M)	2	10
3.	Needle vibrators/surface vibrators	6	10
4.	Transit Mixers	4	10
5.	Automatic Concrete Batching plants with silo electrically operated with DG Backup, Automatic Load Cell Weigh batching system (Minimum Capacity 30 Cu. M. per hour)	1	10
6.	Earth Compactors	2	10
7.	Total Stations/Auto levels	2	10
8.	Electric pump/Centrifugal mono block water pump for curing and dewatering	As required on site	As required on site
9.	Dumpers	4	5
10.	Bar bending machine	5	10
11.	Bar cutting machine	5	10
12.	Mortar Mixers	3	10
13.	Electronic total out station	1	5

14	Leveling instruments etc	2	5
15	shuttering material, beam sides, column sides, water proof plywood for shuttering of sides/supporting steel props /H frames/ couplers etc required for **supporting complete**.	1000 sqm	within 25 days

Note:

1) Required centering shuttering/machinery and other connected materials are to be made available as per schedule given above failing which recovery for non-deployment for each item shall be made @ Rs. 2000/- per day till the equipment/ machinery/required centering & shuttering is made available at site to the satisfaction of the Engineer in charge.
2) Recovery will be affected in the bill itself. Machinery/equipment so brought to site shall not be removed from the site of work, unless connected works are completed and approval of the Engineer in charge is obtained. The decision of the Engineer in charge regarding applicability of recovery date shall be final and binding upon the contractor.
3) Bidders are requested to quote their rates considering the above compliances and nothing extra shall be paid over quoted rates.

Signature of Bidder(s)

ANNEXURE-III

EQUIPMENT FOR TESTING OF MATERIALS & CONCRETE AT SITE LABORATORY

All necessary equipment for conducting all necessary tests shall be provided at the site in the well-furnished site laboratory by the contractor at his own cost. The site lab shall be sufficient to conduct all the tests at site as required as per mandatory requirement mentioned in the CPWD specification. It may include but not limited to the following:

Sl. No.	Equipment	Numbers (Minimum)
1.	100MT compression testing machine, electrical-cum-manually operated)	1
2.	Slump cone, steel plate, tamping rod, steel scale, scoop	2
3.	Vicats apparatus with Desk pot	1
4.	Megger & earth resistance tester	1
5.	Pumps and pressure gauges for hydraulic testing of pipes	1
6.	Weighing scale platform type 300 Kg capacity	1
7.	Graduated glass measuring cylinder	As per requirement
8.	Sets of sieves of 450mm internal dia for coarse aggregate [100mm, 80mm, 40mm; 20mm; 12.5mm, 10mm; 4.75mm complete with lid and pan]	2
9.	Sets of sieves of 200mm internal dia for fine aggregate [4.75mm; 2.36mm; 1.18mm; 600 microns; 300 microns & 150 micron , with lid and pan]	2
10.	Sieve Brushes and sieve shaker capable of 200mm and 300mm dia sieves , manually operated with timing switch assembly	1
11.	Cube moulds size 70mmx70mmx70mm	3
12.	Cube moulds size 150mmx150mmx150mm	30
13.	Electronic balance 600gx0.1g., 10kg and 50 kg	1
14.	Physical balance weight upto 5 kg	1
15.	Digital thermometer upto 150oc	2

Sl. No.	Equipment	Numbers (Minimum)
16.	Measuring jars 100ml, 200ml, 500ml	3 nos each size
17.	Gauging trowels 100mm & 200mm with wooden handle	2
18.	Spatula 100mm & 200mm with long blade wooden Handle	2
19.	Vernier calipers 12" & 6" size	2 each
20.	Digital PH meter least count 0.01mm	1each
21.	Digital Micrometer least count. 0.01mm	1 each
22.	Digital paint thickness meter for steel 500 micron range	2
23.	GI tray 600x450x50mm, 450x300x40mm,300x250x40mm	2 nos each
24.	Electric Motor mixer 0.25 cum capacity	2
25.	Rebound hammer test digital rebound hammer	2
26.	Screw gauge 0.1mm-10mm, least count 0.05	4
27.	Water testing kit	2
28.	Motorized sieve shaker	1
29.	Pruning Rods 2 Kg weight length 40 cm and ramming face 25 mm2	2
30.	Dial type spring balance preferable with zero correction knob capacity 100 kgs reading to ½ kg.	1
31.	Counter scale capacity 1 kg and 10 kg	1
32.a	Iron Weight of 5 kg, 2 kg, 1 kg, 500 gm, 200 gm, 100 gm	1 each
32 .b	Standard Weights up to 2000 kg for calibration of Batching Plant at site	1 Set
33.	Brass Weight of 50 gm, 20 gm, 10 gm, 5 gm, 2 gm, 1 gm	1 each
34.	Measuring cylinder TPX or Poly propylene capacity 100 ml, 500 ml, 250 ml, 100 ml	1 each
35.	Pyrex, corning or Borosil beakers with cover capacity 500 ml, 200 ml, 50 ml	2 each

Sl. No.	Equipment	Numbers (Minimum)
36.	Wash Bottles capacity 500 ml	3
37.	Thermometers 1-100 degree centigrade/ max. and Min/ Dry and wet with table	3
38.	Set of box spanner ratchet	2
39.	Hammer 1lb& 2lb	2 each
40.	Rubber Hammer	2
41.	Hacksaw with 6 blades	2
42.	Measuring tape 3 mtrs, 5 Mtrs, 15 Mtrs, 30 Mtrs	5 Nos Each
43.	Depth gauge 20cm	3
44.	Shovels& Spade	3
45	Steel plates 5 mm thick 75x75 cm	4
46.	Plastic or G.I. Buckets 15 ltr, 10 ltr, 5 ltr	1 each
47.	Wheel Barrow	3
48.	Floor Brushes, hair dusters, scrappers, wire brush, paint brushes, shutter steel plat oil, kerosene with stove etc.	5 each
49.	Any other equipment for site tests as outlined in BIS codes and as directed by the Engineer-in-charge.	
50.	Equipment for testing of soil compaction by Sand Replacement and Core Cutting Method.	1 set each

Note : The above list is only indicative and not exhaustive**.** The contractor is required to establish necessary testing facility for achieving the progress as per Milestone Schedule given in Schedule C Clause 5 and the completion of Entire Work **within 6 Months' time from** the date of start of work. These testing facilities shall be brought at site in advance as directed by the engineer in charge.

CHECK LIST: Details of Enclosures/documents required to be uploaded on website https://eprocure.gov.in/eprocure/app through the E-procurement portal up to the last date and time of submission of tender.

Sl.No	Description of item	Scanned copies Uploaded on website	Not uploaded
1.	Pre-Qualification Documents as per Annexure 1 **Pro forma A , Form A to Form H**		
2.	Power of attorney as required		
3.	Certificate of Registration as required		
4.	Memorandum of Articles of association as required		
5.	C A certificate for Audited Balance Sheet and Profit & Loss statement for the past five financial years		
6.	Consent letter from associates if Architectural, Electro-Mechanical services are proposed to be done through Associates, under reference to Para 1.6 A to D under Section-II. Information and Instructions to applicants		
7.	Supporting certificates for technical and financial capability from relevant authorities.		
8	Organization Chart with responsibilities, Curriculum Vitae of personnel proposed for this project.		
9	INTEGRITY AGREEMENT duly signed by the agency along with **letter of Transmittal**		
10	Any other important information.		
11	Scan copies of net banking receipt towards payment of Tender fee		
12	Letter of transmittal duly signed by the bidder.		
13	Uploading of the tender document Vol-I, Vol-II, Vol-III and financial bids		
14	Any other relevant document required to be uploaded on website as per tender conditions.		

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH – IISER TIRUPATI.

Name of work &Location	:	Construction of UG Block with associated services at IISER Tirupati, Andhra Pradesh.
NIT NUMBER	:	2/ IISER/TIRUPATI/2018-19

SECTION – II

PERCENTAGE RATE TENDER & CONTRACT FOR WORKS

SECTION- II

Tender Form

Percentage Rate Tender & Contract for Works

Name of work &Location	:	Construction of UG Block with associated services at IISER Tirupati, Andhra Pradesh.
NIT NUMBER	:	2/ IISER/TIRUPATI/2018-19

(a). Tender(s) to be submitted online by (time) **15.00 hours on 16-02-2019** (URL:https://eprocure.gov.in/eprocure/app

(b). Tender(s) to be opened in presence of tenderers who may be present at 15.30 **hours on 18 02 201**9 in the office of the Superintending Engineer, Indian Institute of Science Education and Research, Tirupati

TENDER

I/We have read and examined the notice Inviting Tender, Schedule, Specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, special conditions & other document and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Director Of Indian Institute of Science Education and Research Tirupati (IISER-Tirupati) within the time specified in Schedule **20 months viz**, schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to the Conditions of contract and with such materials as are provided for and in respects in accordance with such conditions so far as applicable.

We agree to keep the tender valid for (90) ninety days from the due date of its opening and not to make any modifications in its terms and conditions.

A sum of Rs (figure)----------(in words) ----------

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has been deposited in Deposit at call Receipt of a Schedule bank/demand draft of a scheduled bank/bank guarantee issued by a Schedule Bank as earnest money. If I/we, fail to furnished the prescribed performance guarantee within prescribed period, I/we agree that the said

Director Of Indian Institute of Science Education and Research Tirupati (IISER-Tirupati) or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely, if I/we fail to commence work as specified, I/we agree that Director Of Indian Institute of Science Education and Research Tirupati(IISER-TIRUPATI) or his successors in office shell without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely.

The said Performance Guarantee shall be a guarantee to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I/We hereby declare that I/we shall treat the tender documents drawings and other records connected with the work as secret/ confidential documents and shall not communicate information / derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the state or IISER Tirupati.

Dated ……. Signature of Contractor

Seal

Postal Address

Witness :

Address:

Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on the Director IISER, Tirupati for sum of

Rs……(Rupees……
……..).

The letters referred to below shall form part of this contract Agreement:-

(a)

(b)

(c)

For & on behalf of the Director, IISER Tirupati

Signature……..

Dated…….. Designation……

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH – IISER TIRUPATI.

Name of work &Location : Construction of UG Block with associated Services at IISER Tirupati, Andhra Pradesh.

NIT NUMBER : 2/ IISER/TIRUPATI/2018-19

GENERAL CONDITIONS OF CONTRACT

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH TIRUPATI

(i) General Rules & Directions

1. All work proposed for execution by contract will be notified in a form of invitation to tender prominently displayed in public places and signed by the officer inviting tender or by publication in Newspapers as the case may be.

   This form will state the work to be carried out, as well as the date for submitting and opening tenders and the time allowed for carrying out the work, also the amount of earnest money to be deposited with the application, and the amount of the security deposit and performance guarantee to be deposited by successful tenderer and the percentage, if any, to be deducted from bills. Copies of specification, designs and drawings and any other documents required in connection with the work signed for the purpose of identification by the officer inviting tender shall also be open for inspection by the contractor at the office of officer inviting tender during office hours.

2. In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act' 1952.

3. Receipts for payment made on account of work, when executed by a firm, must also be signed by all the partners, except where contractors are described in their tender as a firm in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having due authority to give effectual receipts for the firm.

4. Applicable for Item Rate Tender only
   Any person who submits a tender shall fill up the usual printed form, stating at what rate he is willing to undertake each item of the work. Tenders, which propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other conditions of any sort, including conditional rebates will be summarily rejected. No single tender shall include more than one work, but contractors who wish to tender for two or more works shall submit separate tender for each. Tender shall have the name and number of the works to which they refer, written on the envelopes.(Applicable for Item Rate Tender only)

   The rate(s) must be quoted in decimal coinage. Amounts must be quoted in full rupees by ignoring fifty paise and considering more than fifty paise as rupee one.

   In case the lowest tendered amount (worked out on the basis of quoted rate of Individual items) of two or more contractors is same, the such lowest contractors may be asked to submit sealed revised offer quoting rate of each item of the schedule of quantity for all sub sections/sub heads as the case may be, but the revised quoted rate of each item of schedule of quantity for all sub sections/sub heads should not be higher than their respective origin original rate quoted already at the time of submission of tender. The lowest tender shall be decided on the basis of revised offer.

If the revised tetendered amount (worked out on the basis of quote rate of individual items) of two or more contractors received in revised offer is again found to be equal, then the lowest tenderer, among such contractors, shall be decided by draw of lots in the presence of Registrar IISER Tirupati, Engineer in charge lowest contractors those have quoted equal amount of their tenders.

In case of any such lowest contractor in his revised offer quotes rate of any item more than their respective original rate quoted already at the time of submission of tender, then such revised offer shall be treated invalid. Such case of revised offer of the lowest contractor or case of refusal to submit revised offer by the lowest contractor shall be treated as withdrawal of his tender before acceptance and 50% of his earnest money shall be forfeited.

In case all the lowest contractors those have same tendered amount (as a result of their quoted rate of individual items), refuse to submit revised offers, then tenders are to be recalled after forfeiting 50% of EMD of each lowest contractors.

Contractor, whose earnest money is forfeited because of non-submission of revised offer, or quoting higher revised rate(s) of any item(s) than their respective original rate quoted already at the time of submission of his bid shall not be allowed to participate in the re-tendering process of the work.

4 A. Applicable for Percentage Rate Tender only

In case of Percentage Rate Tenders, contractor shall fill up the usual printed form, stating at what percentage below/above (in figures as well as in words) the total estimated cost given in Schedule of Quantities at Schedule-A, he will be willing to execute the work. The tender submitted shall be treated as invalid if :

1 The contractor does not quote percentage above/below on the total amount of tender or any section/sub head of the tender.

2 The percentage above/below is not quoted in figures & words both on the total amount of tender or any section/sub head of the tender.

3 The percentage quoted above/below is different in figures & words on the total amount of tender or any section/sub head of the tender.

Tenders, which propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other conditions of any sort including conditional rebates, will be summarily rejected. No single tender shall include more than one work, but contractors who wish to tender for two or more works shall submit separate tender for each. Tender shall have the name and number of the works to which they refer, written on the envelopes.

4B. In case the lowest tendered amount (estimated cost + amount worked on the basis of

percentage above/below) of two or more contractors is same, such lowest contractors will be asked to submit sealed revised offer in the form of letter mentioning percentage above/below on estimated cost of tender including all sub sections/sub heads as the case may be, but the revised percentage quoted above/below on tendered cost or on each sub section/sub head should not be higher than the percentage quoted at the time of submission of tender. The lowest tender shall be decided on the basis of revised offers.

In case any of such contractor refuses to submit revised offer, then it shall be treated as withdrawal of his tender before acceptance and 50% of earnest money shall be forfeited.

If the revised tendered amount of two more contractors received in revised offer is again found to be equal , the lowest tender, among such contractors, shall be decided by draw of lots in the presence of Registrar, IISER, Tirupati, Superintending Engineer, Dy. Registrar(F&A) & the lowest contractors those have quoted equal amount of their tenders.

In case all the lowest contractors those have quoted same tendered amount, refuse to submit revised offers, then tenders are to be recalled after forfeiting 50% of EMD of each contractor.

Contractor(s), whose earnest money is forfeited because of non-submission of revised offer, shall not be allowed to participate in the re-tendering process of the work.

5. The officer inviting tender or his duly authorized representative will open tenders in the presence of any intending contractors who may be present at the time, and will enter the amounts of the several tenders in a comparative statement in a suitable form. In the event of a tender being accepted, a receipt for the earnest money shall thereupon be given to the contractor who shall thereupon for the purpose of identification sign copies of the specifications and other documents mentioned in Rule-I. The earnest money of all unsuccessful bidders shall thereupon be returned to the contractor remitting the same, without any interest.

6. The officer inviting tenders shall have the right of rejecting all or any of the tenders and will not be bound to accept the lowest or any other tender.

7. The receipt of an accountant or clerk for any money paid by the contractor will not be considered as any acknowledgement of payment to the officer inviting tender and the contractors shall be responsible for ensuring that he procures a receipt signed by the officer inviting tender or a duly authorized cashier/accounts officer.

8. The memorandum of work tendered for and the schedule of materials to be supplied by the department and their issue-rates, shall be filled and completed in the office of the officer inviting tender before the tender form is issued. If a form is issued to an intending tenderer without having been so filled in and incomplete, he shall request the officer to have this done before he completes and delivers his tender.

9. The tenderers shall sign a declaration under the officials Secret Act 1923, for maintaining secrecy of the tender documents drawings or other records connected with the work given to them. The unsuccessful tenderers shall return all the drawings given to them.

9A. Use of correcting fluid, anywhere in tender documents is not generally permitted. Such Tender is liable for rejection.

10. In the case of Item Rate Tenders, only rates quoted shall be considered. Any tender containing percentage below / above the rates quoted is liable to be rejected. Rates

quoted by the contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, if a discrepancy is found, the rates which correspond with the amount worked out by the contractor shall unless otherwise proved be taken as correct. If the amount of an item is not worked out by the contractor or it does not correspond with the rates written either in figures or in words, then the rates quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally, but the amount is not worked out correctly, the rates quoted by the contractor will unless otherwise proved be taken as correct and not the amount.
In event no rate has been quoted for any item(s), leaving space both in figure(s), word(s), and amount blank, it will be presumed that the contractor has included the cost of this/these item(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly.

10A In case of Percentage Rate Tenders only percentage quoted shall be considered. Any tender for Item containing item rates is liable to be rejected. Percentage quoted by the contractor in Rate percentage rate tender shall be accurately filled in figures and words, so that there is no Tender only discrepancy.

11. In the case of any tender where unit rate of any item/items appear unrealistic, such tender will be considered as unbalanced and in case the tenderer in unable to provide satisfactory explanation, such a tender is liable to disqualified and rejected.

12. All rates shall be quoted on the tender form. The amount for each item should be worked out and requisite totals given. Special care should be taken to write the rates in figures as well as in words and the amount in figures only, in such a way that interpolation is not possible. The total amount should be written both in figures and in words. In case of figures, the word `Rs' should be written before the figure of rupees and word `P' after the decimal figures, e.g. Rs. 2.15 P and in case of words, the word `Rupees' should precede and the word `Paise' should be written at the end. Unless the rate is in whole rupees and followed by the word `only' it should invariably be up to two decimal places. While quoting the rate in schedule of quantities, the word `only' should be written closely following the amount and it should not be written in the next line.

12A In Percentage Rate Tender, the tenderer shall quote percentage below /above (in figure as well as in words) at which he will be willing to execute the work. He shall also work out the total amount of his offer and same should be written in the figures as well as in Words in such a way that no interpolation is possible. In case of figures, the word 'Rs' should be written before the figure of rupees and word 'P' after the decimal figures e.g. 'Rs 2.15P' and in case of words, the word 'Rupees' should be precede and the word 'Paise' should be written at the end.

13. (i) The Contractor, whose tender is accepted, will be required to furnish performance guarantee of 5% (Five Percent) of the tendered amount within the period specified in scheduled C. This guarantee shall be in the form of Deposit at call receipt of any scheduled bank/ banker's cheque of any scheduled bank/Demand draft of any scheduled bank /Pay order of any scheduled bank or Government Securities or Fixed Deposit Receipt or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form.

(ii) The Contractor, whose tender is accepted, will also be required to furnish by way of Security Deposit for the fulfillment of his contract, an amount equal to 2.50 % of the tendered/accepted value of the work. The Security Deposit will be collected by deductions from the running bills of the contractor at the rates mentioned above and the earnest money deposited at the time of tenders, will be treated as a part of the Security Deposit. The security amount will also be accepted in the shape of Government Securities. Fixed Deposit Receipt and Guarantee Bonds of a Scheduled Bank or State Bank of India will also be accepted for this purpose provided confirmatory advice is enclosed.

14. On acceptance of the tender, the name of the accredited representative(s) of the contractor who would be responsible for taking instructions from the Engineer-in-Charge shall be communicated in writing to the Engineer-in-Charge.

15. GST or any other tax on material in respect of this contract shall be payable by the contractor and IISER Tirupati will not entertain any claim whatsoever in respect of the same.

16. The contractor shall give a list of IISER employees, if any, related to him.

17. The tender for the work shall not be witnessed by a contractor or Contractors who himself/ themselves has/ have tendered or who may and has/ have tendered for the same work. Failure to observe this condition would render, tenders of the contractors tendering, as well as witnessing the tender, liable to summary rejection.

18. The tender for composite works includes, in addition to building work, all other works such as providing architectural & structural designing services, sanitary and water supply installations, drainage installation, External Façade, Electrical works, Heating ventilation and air conditioning system, Integrated Building Management system, Lifts, roads and path etc. The tenderer apart from being a registered contractor (B&R) of appropriate class, must associate himself with agencies of appropriate class which are eligible to tender for sanitary and water supply drainage, electrical Heating ventilation and Air conditioning system, Integrated Building Management system, Solar Water Heating system works in the composite tender.

19. The contractor shall submit list of works which are in hand (progress) in the following form:

Name of work	Name of client & particulars of works being executed	Value of work In Rs.	Position of works in progress	Remarks

19. The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure

will be a breach of the contract and the Engineer in charge may at his discretion without prejudice to any other right or remedy available in law cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

20. Bidder shall have valid Provident Fund Code Number, GST registration No and bidder shall also ensure compliance of the EPF & MP Act, 1952 by the sub-contractors, if any engaged by the contractor for the said work.

21. The standard publications like General Conditions of Contract, Delhi schedule of rates 2016 (for civil and electrical), Specifications for Civil and Electrical works and Delhi analysis of rates 2016 (for civil) and Delhi analysis of rates 2016 (for electrical) with amendments / correction slips up to the last date of submission of tender can be seen free of cost from the website www.cpwd.gov.in. orwww.eprocure.gov.in

22. **A)** Contractor must ensure to quote percentage rate of in the financial bid.
B) Tenderer shall quote the percentage rate above or below two places of decimals only.
C) The tenderer shall quote only one over all percentage rate above or below on the designated place, which shall be applicable on both Civil and E&M components.

23. If a tenderer quotes nil rates against each item in item rate tender or does not Quote any percentage above/below on the total amount of the tender or any section/subhead in percentage rate tender, the tender shall be treated as invalid and will not be entertained as lowest tenderer.

23. Contractor shall not divert any advance payments or part thereof for any other purpose other than needed for completion of the contracted work. All advance payments received as per terms of the contract (i.e. mobilization, secured against materials brought at site, secured against plant & machinery and / or for work done during interim stages, etc.) are required to be re-invested in the contracted work to ensure advance availability resources in terms of materials, labour, plant & machinery needed for required pace of progress for timely completion of work.

(ii) CONDITIONS OF CONTRACT

Definitions:

1 The **contract** means the documents forming the tender and acceptance thereof and the formal agreement executed between the competent authority on behalf of the Director, Indian Institute Of Science Education and Research Tirupati and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

2 In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them :-

i). The expression **works** or **work** shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.

ii). The **Site** shall mean the land/ or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.

iii). The **Contractor** shall mean the individual, firm or company, whether incorporated or not, undertaking the works shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

iv). The **Director**, Indian Institute of Science Education and Research Tirupati means his successors also.

v) The **Engineer-in-Charge** means Engineer/Officer either from IISER, Tirupati or consultant notified by The Director (IISER, Tirupati) who shall supervise and be in-charge of work and who shall act on behalf of the Director, IISER for execution of contract.

vi) **IISER** means Indian Institute of Science Education and Research Tirupati, or his authorized representative.

vii) **Accepting Authority** shall mean the authority mentioned in Schedule 'C'.

viii) **Excepted Risk** are risks due to riots (other than those on account of contractor's employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by IISER Tirupati of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to IISER-Tirupati's faulty design of works.

ix). **Market Rate** shall be the rate as decided by the Engineer-in-Charge on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule `C' to cover, all overheads and profits. Provided that no extra overheads and profits shall be payable on the part(s) of the work assigned to other agency(s) by the contractor as per terms of contract.

x). **Schedule(s)** referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the standard Schedule of Rates of the CPWD Delhi schedule of rates mentioned in Schedule `C' hereunder, with the amendments thereto issued up to the date of receipt of the tender.

xi). **Department** means Indian Institute of Science Education and Research Tirupati. (IISER Tirupati)

xii). **Specifications** means the specifications contained in tender documents, CPWD specifications 2009 Vol I & II with up to date correction slips, CPWD specifications for internal Electrical works – 2013, external electrical services-2007, DG set & Wet riser, sprinkler specification-2006, Substation works Part IV 2013, Indian standard specification, technical specifications as applicable.

xiii). **Tendered Value** means the value of the entire work as stipulated in the letter of award.

xiv). **Consultant** means Consultant appointed by the Indian Institute of Science Education and Research Tirupati.

xv) **Date of commencement of work: The date** of commencement of work shall be the date of start as specified in **schedule "C"** or the first date of handling over the site, whichever is later, in accordance with the phasing if any, as indicated in the tender documents.

3 Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.

4 Headings and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

5 The contractor shall be furnished, free of cost one certified copy of the contract documents except standard specifications. Schedule of Rates and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract

6 The work to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The descriptions given in the Schedule of quantities shall, unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labours necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.

7. The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

8. The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General conditions.

8.1. In the case of discrepancy between the schedules of quantities, the specifications and or the drawings, the following order of preference shall be observed.

(i) Description of items as given in Schedule of Quantities.

(ii) Particular Specifications, Special Conditions and Additional conditions, if any.

(iii) Drawings.

(iv) CPWD Specifications.

(v) General conditions of contract for CPWD works.

(vi) Indian Standard Specifications of B.I.S.

(vii) Manufacturers' specifications & as decided by Engineer-in-charge.

(viii) Sound Engineering practices.

8.2 If there are varying or conflicting provision made in any one document forming part of the contract, the Accepting Authority shall be deciding authority with regard to the intention of the documents and his decision shall be final and binding on the contractor.

8.3 Any error in the description, quantity or rate in Schedule of Quantities or any omission there from shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.

9. The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority, shall within one month from the stipulated date of start of the work, sign the contract consisting of:-

(i) The notice inviting tender, all the documents including drawings if any, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

(ii) Standard Form Consisting of followings

- (a) NIT, Work order
- (b) Item rate tender form & Contract for worker.
- (c) General Rules and Directions
- (d) Condition of contracts
- (e) Clauses of contracts
- (f) Safety code
- (g) Model rules for the protection of health, sanitary arrangements for workers employed by IISER or its Contractors.
- (h) Contractors labour regulations
- (i) Proforma of agreement
- (j) Proforma of Schedule A to C
- (k) Special Condition of contracts
- (l) Technical specifications
- (m) Tender drawings
- (n) Priced Schedule of quantities.
- (o) All correspondence between the parties till award of contract

(iii) Till such time contract agreement is signed between the parties, all the documents mentioned Sr. 9 (i), 9 (ii)- (a to o) above shall be binding on the contractor.

(iv) No payment for the work done will be made unless contract is signed by the contractor.

(iii) CLAUSES OF CONTRACT

CLAUSE – I

Performance Guarantee

(i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in Schedule 'C' from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in schedule 'C' on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in the form of Deposit at call receipt of any Schedule Bank/Banker's Cheque of any Schedule Bank/Demand Draft of any Scheduled Bank/Pay Order of any Scheduled Bank or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the form annexed hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to the IISER Tirupati as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the IISER Tirupati to make good the deficit.

(ii) The Performance Guarantee shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets extended, the contractor shall get the validity of Performance Guarantee extended to cover such extended time for completion of work. After recording of the completion certificate for the work by the competent authority, the Performance Guarantee shall be returned to the contractor, without any interest. However, in case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

(iii) The Engineer-in-Charge shall not make a claim under the Performance Guarantee except for amounts to which the Director IISER Tirupati is entitled under the contract (not withstanding and / or without prejudice to any other provisions in the contract agreement) in the event of:-

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.

(b) Failure by the contractor to pay Director IISER Tirupati any amount due, either as agreed by the contractor or determined under any of the

Clauses/Conditions of the agreement, within 30 days of the serving of notice to this effect by Engineer-in-Charge.

(iv) In the event of the contract being determined or rescinded under provision of any of the Clause / Condition of the agreement, the Performance Guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Director IISER Tirupati.

CLAUSE – I A

Recovery of Security Deposit :-

The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 2.5% of the gross amount of each running and final bill till the sum deducted will amount to security deposit of 2.5% of the tendered value of the work. Such deductions will be made and held by Government by way of Security Deposit unless he/they has/have deposited the amount of Security at the rate mentioned above in cash or in the form of Government Securities or fixed deposit receipts. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the security deposit and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit

All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due to or may become due to the contractor by IISER Tirupati on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by Scheduled Banks or Government Securities (if deposited for more than 12 months) endorsed in favour of the Director IISER Tirupati, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof.

The security deposit as deducted above can be released against bank guarantee issued by a Scheduled Bank, on its accumulations to a minimum of Rs.5 lakh subject to the condition that amount of such bank guarantee, except last one, shall not be less than Rs.5 lakh. Provided further that the validity of bank guarantee shall be in conformity with provisions contained in clause 17 which shall be extended from time to time depending upon extension of contract granted under provisions of clause 2 and clause 5.

In case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

Note – 1: Government papers tendered as security will be taken at 5% (five percent) below its market price or at its face value, whichever is less. The market price of Government paper would be ascertained by the Director IISER Tirupati at the time of collection of interest and the amount of interest to the extent of deficiency in value of the Government paper will be withheld if necessary.

Note – 2: Government Securities will include all forms of Securities mentioned in Rule No. 274 of the G.F Rules except fidelity bond. This will be subject to the observance of the condition mentioned under the rule against each form of security.

Note – 3: Note 1 & 2 above shall be applicable for both clause 1 and 1A.

CLAUSE -2 - Compensation for Delay :-

If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or justified extended date of completion as per clause 5 (excluding any extension under Clause 5.5) as well as any extension granted under Clause 12 and 15, he shall, without prejudice to any other right or remedy available under the law to the IISER Tirupati on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority specified in schedule 'C' (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified.

(i)	Compensation for Delay of work	@1.0% per month of delay to be computed on per day basis.

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10 % of the Tendered Value of work or of the Tendered Value of the Sectional part of work as mentioned in Schedule C for which a separate period of completion is originally given.

In case no compensation has been decided by the authority in Schedule C during the progress of work, this shall be no waiver of right to levy compensation by the said authority if the work remains incomplete on final justified extended date of completion. If the Engineer in Charge decides to give further extension of time allowing performance of work beyond the justified extended date, the contractor shall be liable to pay compensation for such extended period. If any variation in amount of contract takes place during such extended period beyond justified extended date and the contractor becomes entitled to additional time under clause 12, the net period for such variation shall be accounted for while deciding the period for levy of compensation. However, during such further extended period beyond the justified extended

period, if any delay occurs by events under sub clause 5.2, the contractor shall be liable to pay compensation for such delay.

Provided that compensation during the progress of work before the justified extended date of completion for delay under this clause shall be for non-achievement of sectional completion or part handing over of work on stipulated/justified extended date for such part work or if delay affects any other works/services. This is without prejudice to right of action by the Engineer in Charge under clause 3 for delay in performance and claim of compensation under that clause.

In case action under clause 2 has not been finalized and the work has been determined under clause 3, the right of action under this clause shall remain post determination of contract but levy of compensation shall be for days the progress is behind the schedule on date of determination, as assessed by the authority in Schedule C, after due consideration of justified extension. The compensation for delay, if not decided before the determination of contract, shall be decided after of determination of contract.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case, the contractor does not achieve a particular milestone mentioned in schedule C, or the re-scheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied as above. With-holding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

CLAUSE– 2A - Incentive for Early Completion:-

In case, the contractor completes the work ahead of stipulated date of completion or justified extended date of completion as determined under clauses 5.3, 12 & 15, a bonus @ 1% (one per cent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five per cent) of the tendered value. Provided that justified time for extra work shall be calculated on pro-rata basis as cost of extra work X stipulated period /tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in 'Schedule C'.

CLAUSE– 3 - When Contract can be Determined:-

Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/ or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

i). If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.

ii). If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence and continues to do so after a notice in writing of seven days from the Engineer-in-Charge.

iii). If the contractor fails to complete the work or section of work with individual date of completion on or before the stipulated or justified extended date, on or before such date of completion; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the opinion of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified.

iv). If the contractor persistently neglects to carry out his obligations under the contract and / or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.

v). If the contractor shall offer or give or agree to give to any person in IISER Tirupati service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for IISER Tirupati.

vi). If the contractor shall enter into a contract with IISER Tirupati in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-in-Charge.

vii) If the contractor had secured the contract with IISER Tirupati as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of Integrity Agreement.

viii) If the contractor being an individual or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceeding for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or compositions or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.

ix) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the

creditor to appoint a receiver or a manager or which entitle to make the court to make winding up order.

x) If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.

xi) If the contractor assigns (excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Engineer -in-Charge. When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the President of India shall have powers:

(a) To determine the contract as aforesaid so far as performance of work by the Contractor is concerned (of which determination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the Government

(b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work. In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE–3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is higher, either party may close the contract by giving notice to the other party stating the reasons. In such eventuality, the Performance Guarantee of the contractor shall be refunded within following time limits :

(i) If the Tendered value of work is up to Rs. 45 lac : 15 days.

(ii) If the Tendered value of work is more than 45 lac and up to Rs. 2.5 Crore : 21 days.

(iii) If the Tendered value of work exceeds Rs. 2.5 Crore : 30 days.

Neither party shall claim any compensation for such eventuality. This clause is not applicable for any breach of the contract by either party.

CLAUSE– 4

Contractor liable to pay compensation even if action not taken under clause 3:-

In any case in which any of the powers conferred upon the Engineer-in-Charge by Clause–3 thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work/or any part thereof, paying or allowing for the same in account at the contract rates or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final, and binding on the contractor, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the contractor.

CLAUSE– 5

Time and Extension for Delay :-

The time allowed for execution of the Works as specified in the Schedule 'C' or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the work shall commence from such time period as mentioned in schedule 'C' or from the date of handing over of the site, notified by the Engineer-in-Charge, whichever is later. However, the handing over of site by the Engineer in Charge, in full or in part (if so provided in contract), shall be completed within two months from issue of acceptance letter. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer in Charge and shall be absolutely at the disposal of the Government without prejudice to any other right or remedy available in law.

5.1 As soon as possible but within twenty one days of award of work and in consideration of

a) Schedule of handing over of site as specified in the Schedule 'C'

b) Schedule of issue of designs as specified in the Schedule 'C'

(i) the Contractor shall submit a Time and Progress Chart for each mile stone. The Engineer-in-Charge may within 30 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given in Schedule 'C'.

(ii) In case of non submission of construction programme by the contractor the program

approved by the Engineer-in-Charge shall be deemed to be final.

(iii) The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligations under the contract.

(iv) The contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by Engineer-in-Charge for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 2500/ - (for works costing upto Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per week or part basis in case of d delay in submission of the monthly progress report.

5.2 If the work(s) be delayed by :-

(i) force majeure, or

(ii) abnormally bad weather, or

(iii) serious loss or damage by fire, or

(v) civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or

(vi) delay on the part of other contractors or tradesmen engaged by Engineer-in- Charge in executing work not forming part of the Contract, or

(vii) (vi) non-availability of stores, which are the responsibility of Government to supply or

(viii) (vii) non-availability or break down of tools and Plant to be supplied or supplied by Government or

(ix) (viii) any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control.

(x) then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge for entry in the hindrance register (physical or web-based as prescribed in schedule C) but shall nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

(xi) The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in sub clause 5.2.

5.3 In case the work is hindered by any reasons, in the opinion of the contractor, by the

Department or for someone for whose action the Department is responsible, the contractor may immediately give notice thereof in writing to the Engineer-in-Charge in the same manner as prescribed under sub Clause 5.2 seeking extension of time or rescheduling of milestone/s. The authority as indicated in Schedule 'C' shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work after due consideration of the same within 30 days of receipt of such request. In event of non application by the contractor for extension of time E-in-C after affording opportunity to the contractor may give, supported with a programme, a fair and reasonable extension within a reasonable period of occurrence of the event.

Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 5.2 to the extent the delay is covered under sub clause 5.2 the contractor shall be entitled to only extension of time and no damages.

5.4 Request for rescheduling of Mile stones or extension of time, to be eligible for

consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed forms i.e. Form of application by the contractor for seeking rescheduling of milestones or Form of application by the contractor for seeking extension of time respectively to the authority as indicated in Schedule 'C'. The Contractor shall indicate in such a request the period by which rescheduling of milestone/s or extension of time is desired. With every request for rescheduling of milestones, or if at any time the actual progress of work falls behind the approved programme by more than 10% of the stipulated period of completion of contract, the contractor shall produce a revised programme which shall include all details of pending drawings and decisions required to complete the contract and also the target dates by which these details should be available without causing any delay in execution of the work. A recovery as specified in Schedule 'C' shall be made on per day basis in case of delay in submission of the revised programme.

5.4.1 In any such case the authority as indicated in Schedule 'C' may give a fair and reasonable extension of time for completion of work or reschedule the mile stones. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Schedule 'C' in writing, within 30 days of the date of receipt of such request from the Contractor in prescribed form. In event of non application by the contractor for extension of time E-in-C after affording opportunity to the contractor, may give, supported with a programme (as specified under 5.4 above), a fair and reasonable extension within a reasonable period of occurrence of the event.

5.5 In case the work is delayed by any reasons, in the opinion of the Engineer-in-Charge, by the contractor for reasons beyond the events mentioned in clause 5.2 or clause 5.3 or clause 5.4 and beyond the justified extended date; without prejudice to right to take action under Clause 3, the Engineer-in-Charge may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.

CLAUSE– 6

Measurements of Work Done :-

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done.

All measurement of all items having financial value shall be entered in Measurement Book and/ or level field book so that a complete record is obtained of all works performed under the contract.

All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and the IISER Tirupati shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, then a mutually agreed method shall be followed.

The contractor shall give, not less than seven days notice to the Engineer-in-Charge or his authorized representative in charge of the work, before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the IISER Tirupati to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that recording of measurements of any item of work in the measurement book and/ or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

CLAUSE– 6A

Computerized Measurement Book :-

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract.

All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per format of the IISER Tirupati so that a complete record is obtained of all the items of works performed under the contract.

All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance.

Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked / test checked from the Engineer-in-Charge and / or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks / test checks in his draft computerized measurements, and submit to the IISER Tirupati a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and / or his authorized representative would thereafter checks this MB, and record the necessary certificates for their checks / test checks.

The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by the IISER Tirupati. Thereafter, the MB shall be taken in the IISER Tirupati Office records, and allotted a number as per the Register of Computerized MB's. This should be done before the corresponding bill is submitted to the IISER Tirupati Office for payment. The contractor shall submit two spare copies of such computerized MB's for the purpose of reference and record by the various officers of the IISER Tirupati.

The contractor shall also submit to the IISER Tirupati separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages machine numbered along with two spare copies of the "bill. Thereafter, this bill will be processed by the IISER Tirupati Office and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements / levels by the Engineer-in-Charge or his representative.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The contractor shall give, not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work, before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent

being obtained in writing, the same shall be uncovered at the contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the IISER Tirupati to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/ or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

CLAUSE– 7 - Payment on Intermediate Certificate to be Regarded as Advances: -

No payment shall be made for work, estimated to cost Rs. One lac or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs. One lac, the interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of the IISER Tirupati in triplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment/ adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Schedule 'C', in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work.

In the event of the failure of the contractor to submit the bills, no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer-in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The amount admissible shall be paid by 10th working day after the day of presentation of the bill by the Contractor to the Engineer-in-Charge or his Project Management Consultant (PMC)/IISER Engineers together with the account of the material issued by the IISER Tirupati, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer- in-Charge, the period of ten working days will be extended to fifteen working days. In case of delay in payment of intermediate bills after 45 days of submission of bill by the contractor provided the bill submitted by the contractor found to be in order, a simple interest @ 10% per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis.

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate (s) or by the

final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/ are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.

Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided, without prejudice to the right of the IISER Tirupati to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.

The Engineer-in-Charge in his sole discretion on the basis of a certificate from the IISER Tirupati/PMC Engineer to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) up to lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill to be submitted by the contractor within 10 days of the interim payment. In case of delay in submission of bill by the contractor a simple interest @ 10% per annum shall be paid to the IISER Tirupati from the date of expiry of prescribed time limit which will be compounded on yearly basis.

In case of composite contract if main contractor fails to make the payment to the contractor associated by him within 15 days of receipt of each running account payment, then on the written complaint of contractor associated for such work , Engineer in charge of work shall serve the show cause to the main contractor and if reply of main contractor either not received or found unsatisfactory, Engineer in charge may make the payment directly to the contractor associated for such work as per term & condition of the agreement drawn between main contractor & associate contractor fixed by main contractor. Such payment made to associated contractor shall be recovered by Engineer-in-charge of work from the next R/A bill due to main contractor as the case may be.

CLAUSE– 8 - Completion Certificate and Completion Plans :-

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work and if there is no defect in the work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or(b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/ their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution; thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this Clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning of dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding surplus materials and rubbish etc. and dispose of

the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

CLAUSE- 8A

Contractor to Keep Site Clean :-

When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc., on walls, floor, windows etc shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done without waiting for the actual completion of all the other items of work in the contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in-Charge shall have the right to get this work done at the cost of the contractor either departmentally or through any other agency. Before taking such action, the Engineer-in-Charge shall give ten days notice in writing to the contractor.

CLAUSE- 8B - Completion Plans (as built drawing) to be Submitted by the Contractor :-

The contractor shall submit completion plan as required vide General Specifications for Electrical works (Part-I Internal) 2005 and (Part-II External)1994 as applicable within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum of 0.1 % of Tendered Value or limit prescribed in Schedule C whichever is more as may be fixed by the Engineer in charge and in this respect the decision of the Engineer in charge shall be final and binding on the contractor.

The contractor shall submit completion plans for Internal and External Civil, Electrical and Mechanical Services within thirty days of the completion of the work, provided that the service plans having been issued for execution by the Engineer-in-Charge, unless the contractor, by virtue of any other provision in the contract, is required to prepare such plans.

CLAUSE- 9

Payment of Final Bill :-

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within the period specified herein under, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his authorized IISER Engineer/Representative, complete with account of materials issued by the IISER Tirupati and dismantled materials.

(i) If the Tendered value of work is up to Rs. 45 lac : 2 months

(ii) If the Tendered value of work is more than 45 Lac and up to Rs. 2.5 Crore : 3 months

(iii) If the Tendered value of work exceeds Rs. 2.5 Crore : 6 months

In case of delay in payment of final bills after prescribed time limit, a simple interest @ 10% per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis, provided the final bill submitted by the contractor found to be in order.

CLAUSE- 9A - Payment of Contractor's Bills to Banks :-

Payments due to the contractor may, if so desired by him, be made to his bank, registered financial, co-operative or thrift societies or recognized financial institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank, registered financial, co-operative or thrift societies or recognized financial institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by IISER Tirupati or his signatures on the bill or other claim preferred against IISER Tirupati before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, co-operative or thrift societies or recognized financial institutions. While the receipt is given by such banks; registered financial, co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall wherever possible present his bills duly receipted and discharged through his bank, registered financial, co-operative or thrift societies or recognized financial institutions.

Nothing herein contained shall operate to create in favour of the bank; registered financial, co-operative or thrift societies or recognized financial institutions any rights or equities vis-à-vis the Director IISER Tirupati.

CLAUSE- 10 - Materials to be Provided by the Contractor :-

The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the IISER Tirupati.

The contractor shall, at his own expense and without delay; supply to the Engineer-in-Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall within thirty days of supply of samples or within such further period as he may require intimate to the contractor in writing whether samples are

approved by him or not. If samples are not approved, the contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specification, approval of the Engineer-in-Charge shall be issued after the test results are received.

The contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles, or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substitute thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the contractor.

The contractor shall at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped with the all necessary testing equipment as specified in schedule "C".

CLAUSE- 10 A - Secured Advance on Non-Perishable Materials: -

The contractor, on signing an indenture in the form in **Annexure XVIII** by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to 75% of the assessed value of any materials which are in the opinion of the Engineer-in- Charge non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such

advance shall be recovered/deducted from the next payment made under any of the clause or clauses of this contract.

Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

CLAUSE-10B - <u>Mobilization Advances :-</u>

(i) Mobilization Advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be paid in two or more installments to be determined by the Engineer-in-Charge at his sole discretion. The first installment of such advance shall be released by the Engineer-in-Charge to the contractor on a request made by the contractor to the Engineer-in-Charge in this behalf. The second and subsequent installments shall be released by the Engineer-in-Charge only after the contractor furnishes a proof of the satisfactory utilization of the earlier installment to the entire satisfaction of the Engineer-in-Charge.

Before any installment of advance is released, the contractor shall execute a Bank Guarantee Bond from Scheduled Bank for the amount equal to 110% of the amount of advance and valid for the contract period. This (Bank Guarantee from Scheduled Bank for the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery.

Provided always that provision of Clause 10 B shall be applicable only when so provided in 'Schedule C'.

<u>Plant Machinery & Shuttering Material Advance:-</u>

(ii) An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery, which in the opinion of the Engineer-in-Charge will add to the expeditious execution of work and improve the quality of work. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence, satisfactory to the Engineer-in-Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer-in-Charge. The contractor shall, if so required by the Engineer-in-Charge, submit the statement of value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income-Tax Act, 1961. No such advance shall be paid on any

plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/- Seventy five per cent of such amounts of advance shall be paid after the plant and equipment is brought to site and balance twenty five per cent on successfully commissioning the same. However, total amount of advance for plant machinery and shuttering material shall be limited to 5% of the tendered value for the work.

Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:-

1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
2. Engineer-in-Charge, and
3. The contractor

This advance shall further be subject to the condition that such plant and equipment (a) are considered by the Engineer-in-Charge to be necessary for the works; (b) and are in working order and are maintained in working order; (c) hypothecated to the IISER Tirupati as specified by the Engineer-in-Charge before the payment of advance is released. The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Engineer-in-Charge. The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period of hypothecation failing which such advance shall be entirely recovered in lump sum. For this purpose, steel scaffolding and form work shall be treated as plant and equipment.

The contractor shall insure the plant and machinery for which mobilization advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.

Interest and Recovery:-

(iii)The mobilization advance and plant and machinery advance in (i) & (ii) above bear simple interest at the rate of 10 per cent per annum and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractors bills commencing after first ten per cent of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of recovery of the installment.

(iv) If the circumstances are considered reasonable by the Engineer-in-charge, the period Mentioned in (ii) and (iii) for request by the contractor in writing for grant of mobilization

advance and plant and equipment advance may be extended in the discretion of Engineer-in-charge.

CLAUSE10-C - Payment on Account of Increase in Prices / Wages due to Statutory Order(s) :-

If after submission of the tender, if the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any variation of rates in GST applicable on such material(s) being considered under this clause) beyond the prices/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied.

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes of rate in sales tax/VAT, Central/State Excise/Custom Duty), Government shall in respect of materials incorporated in the works (excluding the materials covered under Clause 10CA and not being material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order. This will be applicable for the contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

Engineer-in-Charge shall call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages.

The contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and/or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.

For this purpose, the labour component of 85% of the value of the work executed during period under consideration shall not exceed the percentage as specified in Schedule C, and the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled mazdoor, fixed under any law, statutory rule or order.

CLAUSE– 10-CA

Payment due to Variation in Prices of Materials after receipt of tender :-

If after submission of the tender, the price of materials specified in Schedule C increases/decreases beyond the base price(s) as indicated in Schedule C for the work, then the

amount of the contract shall accordingly be varied and provided further that any such variations shall be effected for stipulated period of Contract including the justified period extended under the provisions of Clause 5 of the Contract without any action under Clause 2.

However for work done/during the justified period extended as above, it will be limited to indices prevailing at the time of updated stipulated date of completion considering the effect of extra work (to be calculated on pro-rata basis as cost of extra work x stipulated period/tendered cost).

The increase/decrease in prices of cement, steel reinforcement and structural steel shall be determined by the Price indices issued by the Director General, CPWD. For other items provided in the Schedule 'C', this shall be determined by the All India Wholesale Price Indices of materials as published by Economic Advisor to Government of India, Ministry of Commerce and Industry. Base price for cement, steel reinforcement and structural steel shall be as issued under the authority of Director General CPWD applicable for Delhi including Noida, Gurgaon, Faridabad & Ghaziabad and for other places as issued under the authority of Zonal Chief Engineer, CPWD and base price of other materials issued by concerned Zonal chief Engineer and as indicated in Schedule 'C'. In case, price index of a particular material is not issued by Ministry of Commerce and Industry, then the price index of nearest similar material as indicated in Schedule 'C' shall be followed.

The amount of the contract shall accordingly be varied for all such materials and will be worked out as per the formula given below for individual material:

Adjustment for component of individual material

$$V = P \times Q \times \frac{CI - CIo}{CIo}$$

where

V = Variation in material cost i.e. increase or decrease in the amount of rupees to be paid

P = Base Price of material as issued under authority of DG, CPWD or concerned Zonal Chief Engineer and as indicated in Schedule "F".

For Projects and Original Works

Q = Quantity of material brought at site for bonafide use in the works since previous bill excluding any such quantity consumed in the deviated quantity of items beyond deviation limit and extra /substituted item, paid/to be paid at rates derived on the basis of market rate under clause 12.2.

For Maintenance Works

Q = Quantity of material brought at site for bonafide use in the works since previous bill including any such quantity consumed in the deviated quantity of items beyond deviation limit paid at agreement rate and extra /substituted item being scheduled items, but excluding non-schedule extra /substituted item paid/to be paid at market rate under clause 12.2.

Note:

(i) The date wise record of ready mix concrete shall be kept in a register and the cement consumption for the same shall be calculated accordingly.

(ii) If built-up steel items are brought at site from workshop, then the variation shall be paid for the structural steel up to the period when the built up item/finished product is brought at site.

Clo = Price index for cement, steel reinforcement bars and structural steel as issued by the

DG, CPWD and corresponding to the time of base price of respective material indicated in Schedule 'C'. For other items, if any, provided in Schedule 'C', All India Wholesale Price Index for the material as published by the Economic Advisor to Government of India, Ministry of Industry and Commerce and corresponding to the time of base price of respective material indicated in Schedule 'C'.

Cl = Price index for cement, steel reinforcement bars and structural steel as issued under the authority of DG, CPWD for period under consideration. For other items, if any, provided in Schedule 'C', All India Wholesale Price Index for the material for period under consideration as published by Economic Advisor to Government of India, Ministry of Industry and Commerce.

Note: (i) In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.

Provided always that provisions of the preceding Clause 10 C shall not be applicable in respect of Materials covered in this Clause

(ii) If during progress of work or at the time of completion of work, it is noticed that any material brought at site is in excess of requirement, then amount of escalation if paid earlier on such excess quantity of material shall be recovered on the basis of cost indices as applied at the time of payment of escalation or as prevailing at the time of effecting recovery, whichever is higher.

(iii) Cement mentioned wherever in this clause includes Cement component used in RMC brought at site from outside approved RMC plants, if any

CLAUSE– 10 CC

Payment due to Increase / Decrease in Prices / Wages after Receipt of Tender for Works

If the prices of materials (not being materials supplied or services rendered at fixed prices by the department in accordance with clause 10 & 34 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2. No such compensation shall be payable for a work for which the stipulated

period of completion is equal to or less than the time as specified in Schedule F. Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the following provisions:-

(i) The base date for working out such escalation shall be the last stipulated date of receipt of tenders including extensions, if any.
The cost of work on which escalation will be payable shall be reckoned as below :-

(a) Gross value of work done up to this quarter : (A)
(b) Gross value of work done up to the last quarter : (B)
(c) Gross value of work done since previous quarter(A-B) : (C)
(d) Full assessed value of Secured Advance (excluding materials Covered under Clause 10 CA) fresh paid in this quarter : (D)

(e) Full assessed value of Secured Advance (excluding materials Covered under Clause 10 CA) recovered in this quarter : (E)

(f) Full assessed value of Secured Advance for which escalation is payable In this quarter (D-E) : (F)

(g) Advance payment made during this quarter : (G)

(h) Advance payment recovered during this quarter : (H)

(i) Advance payment for which escalation is payable in this quarter (G-H) (I)

(j) Extra items/deviated quantities of items paid as per Clause 12 based of Prevailing market rates during this quarter : (J)

Then, M = C + F+ I - J

W= 0.85 M

(iii) Components for materials (except cement, reinforcement bars, structural steel or other materials covered under clause 10 CA) labour, P.O.L., etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in Schedule 'C'. The decision of the Engineer-in-Charge in working out such percentage shall be binding on the contractors.

(iv) The compensation for escalation for other materials (excluding cement, reinforcement bars, structural steel or other materials covered under clause 10 CA) and P.O.L. shall be worked as per the formula given below:

(a) Adjustment for civil component (except cement, structural steel, reinforcement bars and other materials covered under clause 10CA) / electrical component of construction '

Xm MI-MIo

$$Vm = W \times \frac{Xm}{100} \times \frac{Ml}{Mlo}$$

Vm = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Cost of work done worked out as indicated in sub-para (ii) of Clause 10CC.

Xm = Component of 'materials' (except cement, structural steel, reinforcement bars and other materials covered under clause10CA) expressed as percent of the total value of work.

Ml = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of All India Wholesale Price Index for Individual Commodities/ Group Items for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group Items. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

Mlo = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of All India Wholesale Price Index for Individual Commodities/Group Items valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group items.

*Note: relevant component only will be applicable.

(b) Adjustment for component of 'POL'

$$Vf = W \times \frac{Z}{100} \times \frac{FI-FIo}{FIo}$$

Vf = Variation in cost of Fuel, Oil & Lubricant i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Cost of Work done worked out as indicated in sub-para (ii) of Clause 10CC.

Z = Component of Fuel, Oil & Lubricant expressed as percent of the total value of work.

FI = All India Wholesale Price Index for Fuel, Oil & Lubricant for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce, New Delhi. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

FIo = All India Wholesale Price Index for Fuel, Oil & Lubricant valid on the last stipulated date of receipt of tender including extension, if any.

(v) The following principles shall be followed while working out the indices mentioned in para (iv) above.

(a) The compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter. The dates of preparation of bills as finally entered in the Measurement Book by the Assistant Engineer/ date of submission of bill finally by the contractor to the department in case of computerised measurement books shall be the guiding factor to decide the bills relevant to the quarterly interval. The first such payment shall be made at the end of three months after the month (excluding the month in which tender was accepted) and thereafter at three months' interval. At the time of completion of the work, the last period for payment might become less than 3 months, depending on the actual date of completion.

(b) The index (MI/FI etc.) relevant to any quarter/period for which such compensation is paid shall be the arithmetical average of the indices relevant to the three calendar months. If the period up to date of completion after the quarter covered by the last such installment of payment, is less than three months, the index Ml and Fl shall be the average of the indices for the months falling within that period.

(vi) The compensation for escalation for labour shall be worked out as per the formula given below:

$$VL = W \times \frac{Y}{100} \times \frac{LI - LIo}{LIo}$$

VL= Variation in labour cost i.e. amount of increase or decrease in rupees to be paid or recovered.

W= Value of work done, worked out as indicated in sub-para (ii) above.

Y= Component of labour expressed as a percentage of the total value of the work.

LI= Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration. (In respect of the justified period extended under the provisions of Clause 5 of the contract without any action under Clause 2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to stipulated date of completion of the minimum wage prevailing on the last date of the quarter previous to the one under consideration, whichever is less, shall be considered.)

LIo= Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last stipulated date of receipt of tender including extension, if any.

(vii) The following principles will be followed while working out the compensation as per subpara (vi) above.

(a) The minimum wage of an unskilled mazdoor mentioned in sub-para (vi) above shall be the higher of the wage notified by Government of India, Ministry of Labour and that notified by the local administration both relevant to the place of work and the period of reckoning.

(b) The escalation for labour also shall be paid at the same quarterly intervals when escalation due to increase in cost of materials and/or P.O.L. is paid under this clause. If such revision of minimum wages takes place during any such quarterly intervals, the escalation compensation shall be payable at revised rates only for work done in subsequent quarters.

(c) Irrespective of variations in minimum wages of any category of labour, for the purpose of this clause, the variation in the rate for an unskilled mazdoor alone shall form the basis for working out the escalation compensation payable on the labour component.

(viii) In the event the price of materials and/or wages of labour required for execution of the work decrease/s, there shall be a downward adjustment of the cost of work so that such price of materials and/or wages of labour shall be deductible from the cost of work under this contract and in this regard the formula herein before stated under this Clause 10CC shall mutatis mutandis apply, provided that :

(a) no such adjustment for the decrease in the price of materials and/or wages of labour aforementioned would be made in case of contract in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule 'C'.

(b) the Engineer-in-Charge shall otherwise be entitled to lay down the procedure by which the provision of this sub-clause shall be implemented from time to time and the decision of the Engineer-in-Charge in this behalf shall be final & binding on the contractor.

(ix) Provided always that:-

(a) Where provisions of clause 10CC are applicable, provisions of clause 10C will not be applicable but provisions of clause 10CA will be applicable.

(b) Where provisions of clause 10CC are not applicable, provisions of clause 10C and 10CA will become applicable.

CLAUSE- 10D

Dismantled material IISER-Tirupati Property :-

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc as IISER TIRUPATI's property and such materials shall be disposed off to the best advantage of IISER Tirupati according to the instructions in writing issued by the Engineer-in-Charge.

CLAUSE– 11

Work to be Executed in Accordance with Specifications, Drawings, Orders etc.:-

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications of Central Public Works Department specified in Schedule `C' or in any Bureau of Indian Standard or any other, published Standard or Code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

CLAUSE- 12 :

Deviations/Variations Extent and Pricing :-

The Engineer-in-Charge shall have power (i) to make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out of the works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

The completion cost of any agreement for Maintenance works including works of up gradation, aesthetic, special repair, addition/ alteration shall not exceed 1.25 times of Tendered amount.

12.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extended, if requested by the contractor, as follows :

(i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus

(ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

Deviation, Extra Item and pricing

12.2

A. For Project and original works:

In the case of extra item(s) (items that are completely new, and are in addition to the Pricing items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

B. For Maintenance works including works of up gradation, aesthetic, special repair, addition/ alteration:

In the case of Extra Item(s) being the schedule items (Delhi Schedule of Rates items), these shall be paid as per the schedule rate plus cost index (at the time of tender) plus/minus percentage above/ below quoted contract amount.

Payment of Extra items in case of non-schedule items (Non-DSR items) shall be made as per the prevailing market rate.

12.3

Deviation, Substituted items, pricing

A. For Project and original works:

Substituted In the case of substituted items (items that are taken up with partial substitution or in lieu of Items, items of work in the contract), the rate for the agreement item (to be substituted) and Pricing substituted item shall also be determined in the manner as mentioned in the following para

a) If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

(b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

B. For Maintenance works including works of up gradation, aesthetic, special repair, addition/ alteration:

- In the case of Substitute Item(s) being the schedule items (Delhi Schedule of Rates items), these shall be paid as per the schedule rate plus cost index (at the time of tender) plus/minus percentage above/ below quoted contract amount. Payment of Substitute in case of non-schedule items (Non-DSR items) shall be made as per the prevailing market rate.

Deviation, Deviated quantities, pricing:
A. For Project and original works:

In the case of contract items, substituted items, contract cum substituted items, which Quantities, exceed the limits laid down in schedule C, the contractor may within fifteen days of receipt of Pricing order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, the Engineer-in-Charge shall within prescribed time limit of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

B. For Maintenance works including works of up gradation, aesthetic, special repair, addition/ alteration:

In the case of contract items, which exceed the limits laid down in schedule C, the contractor shall be paid rates specified in the schedule of quantities.

The prescribed time limits for finalising rates for Extra Item(s), Substitute Item(s) and Deviated Quantities of contract items are as under:

(i) If the Tendered value of work is up to Rs. 45 lac : 30 days.

(ii) If the Tendered value of work is more than Rs. 45 Lac and up to Rs. 2.5 Crore : 45 days

(iii) If the Tendered value of work exceeds Rs. 2.5 Crore : 60 days.

12.3 A. For Project and original works:

The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in Schedule C, and the Engineer-in-Charge shall

after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

B. For Maintenance works including works of up gradation, aesthetic, special repair, addition/ alteration:

In case of decrease in the rates prevailing in the market of items for the work in excess of the limits laid down in Schedule C, the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

12.4 The contractor shall send to the Engineer-in-Charge once every three months, an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge which he has executed during the preceding quarter failing which

the contractor shall be deemed to have waived his right. However, the Director

IISER Tirupati may authorize consideration of such claims on merits.

12.5 For the purpose of operation of Schedule C, the following works shall be treated as

works relating to foundation :

(i) For buildings, compound walls, plinth level or 1.2 metres (4 feet) above ground level, whichever is lower excluding items of flooring and D.P.C. but including base concrete, below the floors.

(ii) For abutments, piers, retaining walls of culverts and bridges, walls of water reservoirs, the bed of floor level.

(iii) For retaining walls where floor level is not determinate, 1.2 metres above the average ground level or bed level.

(i) For the reservoirs/tank (other than overhead reservoir/tanks): All works up to 1.2 metres above the ground level.

(v) For Basement: All works up to 1.2m above ground level or up to floor 1 level whichever is lower.

(vi) For Roads, all items of excavation & filling treatment of sub – base.

12.6 Any operation incidental to or necessarily has to be in contemplation of tenderer while Filing, tender or necessary for proper execution of the item included in the Schedule of Quantities or in the Schedule of Rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said Schedule of Rates, as the case may be. Nothing extra shall be admissible for such operations.

CLAUSE- 13

Foreclosure of Contract due to Abandonment or Reduction in Scope of Work :-

If at any time after acceptance of the tender or during the progress of work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope the Engineer-in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates. full amount for works executed at site and in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilised on the work to the full extent in view of the foreclosure:-

i). Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office; storage accommodation and water storage tanks.

ii). IISER Tirupati shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided, however IISER Tirupati shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by IISER Tirupati, cost of such materials as detailed by Engineer-in-Charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.

iii). If any materials supplied by IISER Tirupati are rendered surplus, the same except normal wastage shall be returned by the contractor to IISER Tirupati at rates not exceeding those at which these were originally issued, less allowance for any deterioration or damage which may have been caused whilst the materials were in the custody of the contractor. In addition, cost of transporting such materials from site to IISER Tirupati stores, if so required by IISER Tirupati, shall be paid.

iv). Reasonable compensation for transfer of Tools & Plants from site to contractor's permanent stores or to his other works, whichever is less. If Tools & Plants are not transported to either of the said places, no cost of transportation shall be payable.

(v). Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Engineer-in-Charge, furnish to him books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this conditions.

The reasonable amount of items on (i), (iv) and (v) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor's materials at site taken over by the IISER Tirupati as per item (ii) above. Provided always that against any payments due to the contractor on this account or otherwise, the Engineer-in-Charge shall be entitled to recover or be credited with any outstanding balance due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the IISER Tirupati from the contractor under the terms of the contract.

In the event of action being taken under Clause 13 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.

CLAUSE- 14

Carrying out part work at risk & cost of contractor

If contractor:

(i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Engineer-in-Charge; or

(ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge; or

Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge.

The Engineer-in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to IISER Tirupati, by a notice in writing to take the part work / part incomplete work of any item(s) out of his hands and shall have powers to:

(a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or

(b) Carry out the part work / part incomplete work of any item(s) by any means at the risk and cost of the contractor.

The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by IISER Tirupati because of action under this clause shall not exceed 10% of the tendered value of the work.

In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the department are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.

Any excess expenditure incurred or to be incurred by IISER Tirupati in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by Government as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to IISER Tirupati in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

In the event of above course being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.

CLAUSE- 15

Suspension of work

i). The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons :-

a). On account of any default on the part of the contractor or

b). for proper execution of the works or part thereof for reasons other than the default of the contractor, or

c). for safety of the works or part thereof

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-Charge.

ii). If the suspension is ordered for reasons (b) and (c) in sub-para (i) above :-

a). The contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part and :

b). If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Engineer-in-Charge may consider reasonable in respect of salaries and/ or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within fifteen days of the expiry of the period of 30 days.

iii). If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than three months at a time, except when suspension is ordered for reason (a) in sub-para (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects

only a part of the works as an omission of such part by IISER Tirupati or where it affects whole of the works, as an abandonment of the works by IISER Tirupati, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by IISER Tirupati, he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/ or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provide the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3 months.

CLAUSE 15 A

The contractor shall not be entitled to claim any compensation from Government for the loss suffered by him on account of delay by Government in the supply of materials in schedule 'B' where such delay is covered by the difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of the Government.

This clause 15 A will not be applicable for works where no material is stipulated

CLAUSE- 16

Action in case Work not Done as per Specifications :-

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in-Charge, his authorized subordinates In charge of the work and all the superior officers, officer of the Quality Assurance Unit of the IISER Tirupati or any organization engaged by the IISER Tirupati for Quality Assurance and Chief Technical Examiner's Office of The Central Vigilance Commission of India, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-Charge or his authorised subordinates In charge of the work or to the in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the IISER Tirupati for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality interior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in case of the work costing Rs.10 Lac and below except road work) of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may

have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under Clause 2 of the contract (for non-completion of the work in time) for this default.

In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority **specified in Schedule 'C'** may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/ or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

CLAUSE– 17

Contractor Liable for Damages, Defects during Maintenance Period:-

If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever of if any defect, shrinkage or other faults appear in the work within twelve months (6 months in the case of any work costing Rs. 10,00,000/- and below except road work) after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by other workman and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later. Provided that in the case of road work if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient, to meet all liabilities of the contractor under this contract, half of the security deposit will be refundable after six months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.

In case of Maintenance and operation works of Electrical & Mechanical services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the maintenance contract whichever is earlier.

CLAUSE- 18

Contractor to Supply Tools & Plants etc. :-

The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & plants as specified in Schedule' C' In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specification or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or materials. Failing his so doing the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

CLAUSE- 18 A

Recovery of Compensation paid to Workmen :-

In every case in which by virtue of the provisions sub-section (1) of section 12, of the Workmen's Compensation Act, 1923, IISER Tirupati is obliged to pay compensation to a workman employed by the contractor, in execution of the works, IISER Tirupati will recover from the contractor, for the amount of the compensation so paid ; and, without prejudice to the rights of the IISER Tirupati under sub-section (2) of Section 12, of the said Act, IISER Tirupati shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by IISER Tirupati to the contractor whether under this contract or otherwise. IISER Tirupati shall not be bound to contest any claim made against it under Sub-Section (1) Section 12, of the said Act, except on the written request of the contractor and upon his giving to IISER Tirupati full security for all costs for which IISER Tirupati might become liable in consequence of contesting such claim.

CLAUSE- 18 B

Ensuring Payment and Amenities to Workers if Contractor fails :-

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, IISER Tirupati is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under Clause 19H or under the C.P.W.D. Contractor's Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by IISER Contractors, IISER Tirupati will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred, and without prejudice to the rights of the IISER Tirupati under sub-Section (2) of Section 20, and sub-Section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, IISER Tirupati shall be

at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by IISER Tirupati to the contractor whether under this contract or otherwise IISER Tirupati shall not be bound to contest any claim made against it under sub-Section (1) of Section 20, sub-Section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to the IISER Tirupati full security for all costs for which IISER Tirupati might become liable in contesting such claim.

CLAUSE- 19

Labour Laws to be Complied by the Contractor :-

The contractor shall obtain a valid license under the Contract Labour (Regulation & Abolition) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition & Regulation) Act, 1986.

The contractor shall also comply with the provisions of the building & other Construction Workers (Regulation and Conditions of Services) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

Any failure to fulfill these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.

CLAUSE- 19A

No labour below the age of fourteen years shall be employed on the work.

CLAUSE-19B

Payment of Wages :-

i). The contractor shall pay to labour employed by him either directly or through sub-contractors, wages not less than fair wages as defined in the C.P.W.D. Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

ii). The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

iii). In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the Central Public Works Department contractor's Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorisedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971 wherever applicable.

iv). a). The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.

b). Under the provision of Minimum Wages (Central) Rules, 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 days continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge concerned.

In the case of Union Territory of Delhi, however, as the all inclusive minimum daily wages fixed under Notification of the Delhi Administration No.F.12 (162) MWO / DAB / 43884-91, dated 31-12-1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.

v). The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made there under from time to time.

vi). The contractor shall indemnify and keep indemnified Government against payments to be made under and for the observance of the laws aforesaid and the C.P.W.D. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

vii). The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

viii). Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commissions or otherwise.

ix) The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

CLAUSE 19C

In respect of all labour directly or indirectly employed in the work for the performance of the Contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per C.P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs.200/- for each default and in addition, the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19D

The contractor shall submit by the 4th and 19th of every month, to the Engineer-in-Charge, a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively.

(1) the number of labourers employed by him on the work,

(2) their working hours,

(3) the wages paid to them.

(4) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and

(5) the number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.

Failing which the contractor shall be liable to pay to IISER Tirupati, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Engineer-in-Charge shall be final in deducting from any bill due to the contractor the amount levied as fine and be binding on the contractor.

CLAUSE 19 E

In respect of all labour directly or indirectly employed in the works for the performances of the contractor's part of this contract, the contractor shall comply with or cause to be complied with

all the rules framed by Government from time to time for the protection of health and sanitary arrangements for worker employed by Central Public Works Department and its contractors.

CLAUSE 19F

Leave and pay during leave shall be regulated as follows:

1. Leave:

(i) In the case of delivery- maternity leave not exceeding 8 weeks, 4 weeks up to and including the day of delivery and 4 weeks following that day.

(ii) In the case of miscarriage - up to 3 weeks from the date of miscarriage.

2. Pay:

(i) In the case of delivery - leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on total wages earned on the days when full time work was done during a period of three months immediately preceding the date on which she gives notice that she expects to be confined or at the rate of Rupee one only a day whichever is greater.

(ii) In the case of miscarriage- leave pay at the rate of average daily earnings calculated on the total wages earned on the days when full time wages was done during a period of three months immediately preceding the date of such miscarriage.

3. **Conditions for the grant of Maternity Leave**:

No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than six months immediately preceding the date on which she proceeds on leave.

4. The contractor shall maintain a register of Maternity (Benefit) in the Prescribed Form as shown in appendix – I and II, and the same shall be kept at the place of work.

CLAUSE 19 G

In the event of the contractor(s) committing a default or breach of any of the provisions of the Central Public Works Department, Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filling any statement under the provisions of the above Regulations and Rules which is materially incorrect, he/ they shall, without prejudice to any other liability, pay to the IISER Tirupati a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filling such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 percent of the estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the parties.

Should it appear to the Engineer-in-Charge that the contractor(s) is/are not properly observing and complying with the provisions of the C.P.W.D. Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R&A) Central Rules 1971, for the protection of health and sanitary arrangements for work-people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/ observe the said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities herein before mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/ their own expense and to approved standards all necessary huts and sanitary arrangements required for his/ their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodeled and/ or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

CLAUSE 19H

The contractor(s) shall at his/ their own cost provide his/ their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge.

I) a) The minimum height of each hut at the eaves level shall be 2.10m (7ft.) and the floor area to be provided will be at the rate of 2.7 sq. m. (30 sq. ft.) for each member of the worker's family staying with the labourer.

b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6' x 5') adjacent to the hut for each family.

c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.

d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

II) a) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be kutcha but plastered with mud gobri and shall be at least 15cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation, the roofs remain water-tight.

b) The contractor(s) shall provide each hut with proper ventilation.

c) All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.

d) There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.

III) **Water Supply** – The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purpose and three gallons of clean water per head per day for bathing and washing purpose. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/their own cost make arrangements for laying pipe lines for water supply to his/their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.

IV) The site selected for the camp shall be high ground, removed from jungle.

V) **Disposal of Excreta** – The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

Vi) **Drainage** – The contractor(s) shall provide efficient arrangements for draining away Sullage water so as to keep the camp neat and tidy.

VII) The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

VIII) **Sanitation** – The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

CLAUSE 19 I

The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractor's employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements.

CLAUSE 19 J

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorizedly during construction, and is handed over to the Engineer-

in-Charge with vacant possession of complete building. If such building though completed is occupied illegally then the Engineer-in-Charge shall have the option to refuse to accept the said building / buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy up to 5% of tendered value of work may be imposed by the Engineer-in-Charge whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However, the Engineer-in-Charge, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

CLAUSE 19 K
Employment of Skilled / Semi Skilled Workers –

The contractor shall, at all stages of work, deploy skilled/semi skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training Institute/National Institute of construction Management and Research (NICMAR) / National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/certified by State/Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi skilled workers required in such trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certified from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs.100 per such tradesmen per day. Decision of Engineer-in-Charge as to whether particular tradesmen possess requisite skill and amount of compensation in case of default shall be final and binding.

Provided always, that the provisions of this Clause shall not be applicable for works with estimated cost put to tender being less than Rs. 5 crores.

CLAUSE 19L

Registration with EPFO and ESIC

The ESI and EPF contributions on the part of employer in respect of this contract shall be paid by the contractor. These contributions on the part of the employer paid by the contractor shall be reimbursed by the Engineer-in-charge to the contractor on actual basis.

CLAUSE 20:
Minimum Wages Act to be complied with:

The Contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation & Abolition) Act, 1970, amended from time to time and rules framed there under and other labour laws affecting contract labour that may be brought into force from time to time.

CLAUSE 21 :
Work not to be sublet. Action in case of insolvency -

The Contract shall not be assigned or sublet without the written approval of the Engineer-in-Charge. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or persons in the employ of IISER Tirupati in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge on behalf of the Director IISER Tirupati shall have power to adopt the courses specified in Clause 3 hereof in the interest of IISER Tirupati and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue.

CLAUSE 22 :

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of IISER Tirupati without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

CLAUSE 23 :

Changes in Firm's Constitution to be Intimated -

Where the Contractor is a partnership firm, the previous approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21.

CLAUSE 24 :

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

CLAUSE 25 :

Settlement of Disputes & Arbitration -

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter :-

i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable, he shall promptly within 15 days request the Director, IISER, Tirupati in writing for written instruction or decision. Thereupon, the Director, IISER, Tirupati shall give his written instructions or decision within a period of one month from the receipt of the contractor's letter.

If the Director, IISER, Tirupati fails to give his instructions or decision in writing within the aforesaid period or if the contractor is dissatisfied with the instruction or decision of the Director, IISER, Tirupati, the contractor may, within 15 days of the receipt of Director, IISER, Tirupati decision, appeal to the Chairman Building & works Committee (BWC), IISER Tirupati who shall afford an opportunity to the contractor to be heard, if the latter so desires, and to offer evidence in support of his appeal. The Chairman BWC, IISER Tirupati shall give his decision within 30 days of receipt of contractor's appeal. If the contractor is dissatisfied with the decision Chairman BWC, IISER Tirupati, the contractor shall within a period of 30 days from receipt of the Chairman BWC, IISER Tirupati decision, appeal before the Dispute Redressal Committee (DRC) along with a list of disputes with amounts claimed in respect of each such dispute and giving reference to the rejection of his disputes by the Chairman BWC, IISER Tirupati. The Dispute Redressal Committee (DRC) shall give his decision within a period of 90 days from the receipt of Contractor's appeal. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule 'C'. If the Dispute Redressal Committee (DRC) fails to give his decision within the aforesaid period or any party is dissatisfied with the decision of Dispute Redressal Committee (DRC), then either party may within a period of 30 days from the receipt of the decision of Dispute Redressal Committee (DRC), give notice to the Chairman, Building and Works Committee, IISER, Tirupati for appointment of arbitrator on prescribed proforma as per Appendix XV, failing which the said decision shall be final binding and conclusive and not referable to adjudication by the arbitrator.

It is a term of contract that each party invoking arbitration must exhaust the aforesaid mechanism of settlement of claims/disputes prior to invoking arbitration.

ii) Except where the decision has become final, binding and conclusive in terms of Sub Para (i) above, disputes or difference shall be referred for adjudication through arbitration by a sole arbitrator appointed by the Chairman, Building and Works Committee, IISER Tirupati, If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever, another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the rejection by the Chairman, Building and Works Committee, IISER Tirupati of the appeal.

It is also a term of this contract that no person, other than a person appointed by such The Chairman, Building and Works Committee, IISER Tirupati or, as aforesaid, should act as arbitrator and if for any reason that is not possible, the matter shall not be referred to arbitration at all.

It is also a term of this contract that if the contractor does not make any demand for appointment of arbitrator in respect of any claims in writing as aforesaid within 120 days of

receiving the intimation from the Engineer-in-Charge that the final bill is ready for payment, the claim of the contractor shall be deemed to have been waived and absolutely barred and the IISER Tirupati shall be discharged and released of all liabilities under the contract in respect of these claims.

The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act, 1996 (26 of 1996) or any statutory modifications or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceeding under this clause.

It is also a term of this contract that the arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases where the total amount of the claims by any party exceeds Rs.1,00,000/- the arbitrator shall give reasons for the award.

It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid equally by both the parties.

It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any, of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof shall be paid and fix or settle the amount of costs to be so paid.

CLAUSE 26
Contractor to Indemnify IISER Tirupati against Patent Rights -

The Contractor shall fully indemnify and keep indemnified the Director IISER Tirupati against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against IISER Tirupati in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the Director IISER Tirupati if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

CLAUSE 27 :
Lump sum Provisions in Tender -

When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge payable of measurement, the Engineer-in-Charge may at his discretion pay the lump sum amount entered in the estimate, and the certificate in writing of the Engineer-in-Charge shall be final and

conclusive against the contractor with regard to any sum or sums payable to him under the provisions of the clause.

CLAUSE 28 :
Action Where no Specifications are Specified -

In case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standard Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per Manufacturer's Specifications, In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

CLAUSE 29 : With-Holding and Lien in Respect of Sums Due from Contractor:

(i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge or the IISER Tirupati shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Engineer-in-Charge or the IISER Tirupati shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalisation or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or the IISER Tirupati shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge of the IISER Tirupati or any contracting person through the Engineer-in-Charge pending finalisation of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or IISER Tirupati will be kept withheld or retained as such by the Engineer-in-Charge or IISER Tirupati till the claim arising out of or under the contract is determined by the arbitrator (if the contract is governed by the arbitration clause) by the competent court, as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the IISER Tirupati shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/ limited company as the case may be, whether in his individual capacity or otherwise.

(ii) IISER Tirupati shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract etc. to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be

liable to refund the amount of over-payment and it shall be lawful for IISER Tirupati to recover the same from him in the manner prescribed in sub-Clause (i) of this Clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by IISER Tirupati to the contractor, without any interest thereon whatsoever.

Provided that the IISER Tirupati shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Engineer-in-Charge or the Director IISER Tirupati on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by the Engineer-in-Charge or the Director IISER Tirupati.

CLAUSE 29A :
Lien in Respect of Claims in other Contracts

Any sum of money due and payable to the contractor (including security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or the IISER Tirupati or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or IISER Tirupati or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer-in-Charge or the IISER Tirupati or with such other person or persons.

It is an agreed term of the contract that the sum of money so withheld or retained under this Clause by the Engineer-in-Charge or the IISER Tirupati will be kept withheld or retained as such by the Engineer-in-Charge or IISER Tirupati or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the Arbitration Clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this Clause and duly notified as such to the contractor.

CLAUSE 30 :
Unfiltered Water Supply

The Contractor(s) shall make his/ their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions.

i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge.

ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in-Charge, unsatisfactory.

CLAUSE 31
Departmental Water Supply, if Available

Water if available may be supplied to the contractor by the department subject to the following conditions:-

(i) The water charges @ 1% shall be recovered on gross amount of the work done.

(ii) The contractor(s) shall make his/their own arrangement of water connection and laying of pipelines from existing main of source of supply.

(iii) The Department do not guarantee to maintain uninterrupted supply of water and it will be incumbent on the contractor(s) to make alternative arrangements for water at his/ their own cost in the event of any temporary break down in the IISER Tirupati water main so that the progress of his/their work is not held up for want of water. No claim of damage or refund of water charges will be entertained on account of such break down.

CLAUSE 32:
Alternate Water Arrangements

i) Where there is no piped water supply arrangement and the water is taken by the contractor from the wells or hand pump constructed by the IISER Tirupati, no charge shall be recovered from the contractor on that account. The contractor shall, however, draw water at such hours of the day that it does not interfere with the normal use for which the hand pumps and wells are intended. He will also be responsible for all damage and abnormal repairs arising out of his use, the cost of which shall be recoverable from him. The Engineer-in-Charge shall be the final authority to determine the cost recoverable from the contractor on this account and his decision shall be binding on the contractor.

ii) The contractor shall be allowed to construct temporary wells in IISER Tirupati land for taking water for construction purposes only after he has got permission of the Engineer-in-Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work.

CLAUSE 33 :
Return of Surplus Materials

Notwithstanding anything contained to the contrary in this contract, where any materials for the execution of the contract are procured with the assistance of IISER Tirupati either by issue from IISER Tirupati stocks or purchase made under orders or permits or licenses issued by IISER Tirupati, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of the IISER Tirupati and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of the terms of the license or permit and/or for criminal breach of trust, be liable to IISER Tirupati for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

CLAUSE 34 :
Employment of Technical Staff and Employees

Contractors Superintendence, Supervision, Technical Staff & Employees

(i) The contractor shall provide all necessary superintendence during execution of the work and all along thereafter as may be necessary for proper fulfilling of the obligations under the contract.

The contractor shall immediately after receiving letter of acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge, the name(s), qualifications, experience, age, address(s) and other particulars along with certificates, of the principal technical representative to be in charge of the work and other technical representative(s) who will be supervising the work. Minimum requirement of such technical representative(s) and their qualifications and experience shall not be lower than specified in Special Condition of contract. The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative(s) to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal, the contractor shall appoint another such representative(s) according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal technical representative and other technical representative(s) shall be appointed by the contractor soon after receipt of the approval from Engineer-in-Charge and shall be available at site before start of work.

All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s). The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Engineer-in-Charge and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative(s) in the site order book and shall affix his/their signature in token of noting down the instructions and in token of acceptance of measurements, checked measurements/test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.

If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is/are effectively appointed or is/are effectively attending or fulfilling the provision of this Clause, a recovery (non-refundable) shall be effected from the contractor as specified in Schedule `C' and the decision of the Engineer-in-Charge as recorded in the site order book shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical Principal technical representatives and/or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their

responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) (in the form of copy of Form-16 or CPF deduction issued to the Engineers employed by him) along with every on account bill/ final bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

ii) The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work.

The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconduct himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent substitutes.

CLAUSE 35 : **Levy/Taxes Payable by Contractor**

i) GST, building and other construction worker welfare cess or any other cess/ tax in respect of this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect.

ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities.

iii) If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the IISER Tirupati and does not any time become payable by the contractor to the State Government. Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the IISER Tirupati and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor.

CLAUSE 36:
Conditions for Reimbursement of Levy/ Taxes if levied after receipt of Tenders

i) All tendered rates shall be inclusive of all taxes and levies (including GST) payable under respective statutes. However, pursuant to the Constitution (46th Amendment Act, 1982), if any further tax or levy is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes/ levies, the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of the Director IISER Tirupati (whose decision shall be final and binding on the contractor) attributable to delay in execution of work within the control of the contractor.

ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the IISER Tirupati and/or the Engineer-in-Charge and further shall furnish such other information/ document as the Engineer-in-Charge may require from time to time.

iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy, pursuant to the Constitution (Forty Sixth Amendment) Act 1982, give a written notice thereof to the Engineer-in-Charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

CLAUSE 37 :
Termination of Contract on Death of Contractor

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the Engineer-in-charge on behalf of the Director IISER Tirupati shall have the option of terminating the contract without compensation to the contractor.

CLAUSE 38 :
If Relative Working in IISER TIRUPATI then the Contractor not Allowed to Tender

The contractor shall not be permitted to tender for works in the IISER Tirupati responsible for award and execution of contracts in which his near relative is posted as Accountant or as an Officer in any capacity between the grades of the Engineer-in-Charge and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Officer in IISER or in the Ministry of HRD. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this IISER Tirupati. **If however the contractor is registered in any other department, he shall be debarred from tendering in IISER TIRUPATI of this condition.**
NOTE: By the term “near relatives” is meant wife, husband, parents and grandparents, children and grand children, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.

CLAUSE 39:
No Gazetted Engineer to Work as Contractor within One Year of Retirement.

No Engineer of gazetted rank or other gazetted officer employed in engineering or administrative duties in an engineering department of the Government of India shall work as a contractor or employee of a contractor for a period of; one years after his retirement from government service without the previous permission of Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of Government of India as aforesaid, before submission of the tender or engagement in the contractor’s service, as the case may be.

CLAUSE 40:
Compensation During Warlike Situations

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for reconstruction of all works ordered by the Engineer-in-Charge, such payments being in addition to compensation up to the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by Engineer-in-Charge up to Rs.5000/- and by the Director IISER Tirupati concerned for a higher amount. The contractor shall be paid for the damages/ destruction suffered and for the restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

Provided always that no compensation shall be payable for any loss in consequence of hostilities or warlike operations(a) unless the contractor had taken all such precautions against air raid as are deemed necessary by the A.R.P. Officers or the Engineer-in-Charge. (b) for any material etc. not on the site of the work or for any tools, plant, machinery scaffolding, temporary building and other things not intended for the work.

In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the Engineer-in-Charge.

CLAUSE 41:
Apprentices Act Provisions to be Complied with

The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and the Engineer-in-Charge may in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

CLAUSE 42:
Release of Security Deposit after Labour Clearance.

Security Deposit of the work shall not be refunded till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually complete the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, or record till after 3 months after completion of the work and/ or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

(iv) SAFETY CODE

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well as suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1 (1/4 horizontal and 1 vertical)

2. Scaffolding of staging more than 3.6m (12 ft) above the ground or floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm (3ft) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends there of with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent if from swaying from the building or structure.

3. Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 (12ft) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.

4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90cm (3ft).

5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m (30ft) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11 ½") for ladder up to and including 3m (10ft) in length. For longer ladders this width should be increased at least ¼" for each additional 30cm (1foot) of length. Uniform step spacing of not more than 30cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.

6. Excavation and Trenching - All trenches 1.2m (4ft) or more in depth, shall at all times be supplied with the least one ladder for each 30m (100ft) in length or fraction thereof Ladder shall extend from bottom of the trench to at least 90 cm (3ft) above the surface of the ground. The side of the trenches which are 1.5m (5ft) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5m (5ft) of the edges of the trench or half of the depth of the trench

whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

7. Demolition – Before any demolition work is commenced and also during the progress of the work,

   i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

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

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

   iv) Wire mesh netting to be provided for dismantling areas.

8. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned. The following safety equipments shall invariably be provided :

   i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

   ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.

   iii) Those engaged in welding works shall be provided with welder's protective eye-shields and helmets.

   iv). Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

   v). When workers are employed in sewers and manholes, which are in active use, the contractor shall ensure that the manholes are opened and ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition, the contractor shall ensure that the following safety measure is adhered to:

      a). Entry for workers into the line shall not be allowed except under

      supervision of the Engineer-in-Charge or any other Higher officer.

b). At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

c). Before entry presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.

d). Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.

e). Safety belt with rope should be provided to the workers. While working inside the manholes such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

f). The area should be barricaded or cordoned of by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

g). No smoking or open flames shall be allowed near the blocked manhole being cleaned.

h). The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

i). Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer- in-Charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.

j). Gas masks with Oxygen Cylinder should be kept at site for use in emergency.

k). Air-blowers should be used for flow of fresh air through the manholes. Whenever called for portable air blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at least 2 metres away for the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

l). The workers engaged for cleaning the manholes/ sewers should be properly trained before allowing to work in the manhole.

m). The workers shall be provided with Gumboots or non sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be

supplied with barrier cream for anointing the limbs before working inside the sewer lines.

n). Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.

o). If a man received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

p). The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case well be final.

vi). The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precaution should be taken:-

a). No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

b). Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scraped.

c). Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.

9. An additional Clause (viii) (i) of Safety Code (iv) the Contractor shall not employ women and man below the age of 18 on the work of painting with product containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use :

i). While lead, sulphate of lead or product containing these pigment, shall not be used in painting operation except in the form of pastes or paint ready for use.

ii). Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

iii). Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scraping.

iv). Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

v). Overall shall be worn by working painters during the whole of working period.

vi). Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.

vii). Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by competent authority of Institute.

viii). Institute may require, when necessary medical examination of workers.

ix). Instruction with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

10. When the work is done near any place where there is risk of drowning, all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

11. Use of hoisting machines and tackle including their attachment, anchorage and supports shall conform to the following standards or conditions :-

i). a). These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

b). Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

ii). Every crane driver or hoisting appliance operator, shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

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

iv). In case of IISER Tirupati machines, the safe working load shall be notified by the Electrical Engineer-in-charge. As regards contractor's machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer-in-Charge concerned.

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

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

14. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place of work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

15. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer-in-Charge or their representatives.

16. Notwithstanding the above clauses from (1) to (15) there is nothing in these to exempt the contractor from the operations of any other Act or Rules in force in the Republic of India.

(v) MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGMENTS FOR WORKERS EMPLOYED BY CONTRACTORS FOR THIS WORK.

1. APPLICATION

The rules shall apply to all buildings and construction works in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period which the contract work is in progress.

2. DEFINITION

Work place means a place where twenty or more workers are ordinarily employed in connection with construction work on any day during the period during which the contract work is in progress.

3. FIRST-AID FACILITIES

(i) At every work place there shall be provided and maintained, so as to be easily accessible during working hours, First –aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

(ii)The First-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment:-

(a) For work places in which the number of contract labour employed does not exceed 50.

Each first-aid box shall contain the following equipments:

1. 6 small sterilized dressings.
2. 3 medium size sterilized dressings
3. 3 large size sterilized dressings
4. 3 large burn dressings
5. 1(30ml) bottle containing a two percent alcoholic solution of iodine
6. 1(30ml) bottle containing salvolatile having dose and mode of administration indicated on the label.
7. 1 Snakebite lancet.
8. 1(30ml) bottle of potassium permanganate crystals.
9. 1 Pair scissors.
10. 1 copy of first aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
11. 1 Bottle containing 100 Tablets (Each of 5 gms)of asprin.
12. Ointment for burns.
13. A Bottle of suitable surgical antiseptic solution.

a. For work places in which the number of contract labour exceed 50.

Each first-aid box shall contain the following equipments:

1. 12 small sterilized dressings
2. 6 medium size sterilized dressings
3. 6 large size sterilised dressings
4. 6 large size sterilized burn dressings
5. 6(15 gms) packets sterilized cotton wool.
6. 1(60 ml.) bottle containing a two percent alcoholic solution iodine
7. 1 (60ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
8. 1 roll of adhesive plaster
9. snake bite lancet
10. 1 (30gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes/ Government of India.
13. A bottle containing 100 tables (each of 5 gms.) of aspirin
14. Ointment for burns
15. A bottle of suitable surgical antiseptic solution.

(iii) Adequate arrangements shall be made for immediate recoupment of the Equipment when necessary.

(iv) Nothing except the prescribed contents shall be kept in the First-aid box.

(v) The First-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

(vi) A person in charge of the First-aid box shall be a person trained in First-aid treatment, in the work places where the number of contract labour employed is 150 or more.

(vii) In work places where the number of contract labour employee is 500 or more and hospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.

(viii) Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

4. DRINKING WATER

In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn form it for, drinking. All such wells shall be entirely closed in and be provided with a trap door, which shall be dust and waterproof.

A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. WASHING FACILITIES

(i) In every work place adequate and suitable facilities for the washing shall be provided and maintained for the use of contract labour employed therein .

(ii) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

(iii) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

6 LATRINES AND URINALS

(i) Latrine shall be provided in every work place on the following scale namely:

(a) Where female are employed, there shall be at least one latrine for every 25 females.

(b) Where male are employed, there shall be at least one latrine for every 25 males.

Provided that, where the number of males or females exceed 100,it shall be sufficient if there is one latrine for 25 males or females as the case may be up to first 100 ,one for every 50 thereafter.

(ii) Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have proper door and fastening.

(iii) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials shall be cement washed inside and outside at least once a year, latrines shall not be of a standard lower than borehole system.

(iv) (a) Where workers of both sexes are employed , there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women only" as case may be.

(b)The notice shall also bear the figure of a man or of a woman, as the case may be.

(v) There shall be at least one urinal for male workers up to 50 & one for female workers up to 50 employed at time, provided that where the number of male or female workmen, as the case may be exceeds 500,it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 & one for every one 100 or part thereafter.

(vi) (a) The latrines & urinals shall be adequately lighted & shall be maintained in a clean & sanitary condition at all times.

(b)Latrines & urinals other than those connected with flush sewage system shall comply with the requirements of the Public Health Authorities.

(vii) Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrines & urinals.

(viii) Disposal of excreta: -unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator. Alternately excreta may be disposed of by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose &covering it with a 15 cm. Layer of waste or refuse & then covering it with layer earth for a fortnight (when it will turn to manure)

(ix.) The Contractor shall at his own expense, carry out all the instructions issued to him by the Engineer–in- Charge to effect proper disposal of night soil and other conservancy work in respect of contractor's workmen or the employees on the site. The contractor shall be levied by Municipal or Cantonment Authority for execution of such on his behalf.

7 PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 meters (10 ft.) from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m. (6 sft.) per head.

Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8 CRECHES

(i) At every work place, at which 20 or more women worker are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under at the age of six years. One room shall be used as a play room for the children and the other as their bedroom. The rooms shall be constructed with specifications as per clause 19H (ii) a, b & c.

ii) The rooms shall be provided with suitable and sufficient openings in for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

iii) The contractor shall supply adequate number of toys and games in the playroom and sufficient number of cots and bedding in the bedroom.

iv) The contractor shall provide one Ayaa to look after the children in the crèche when, the number of women workers does not exceed 50 and two when the number of women workers exceed 50.

v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

9 CANTEEN

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering one hundred or more are ordinarily employed an adequate canteen shall be provided by the contractor for the use of such contract labour.

(ii) The canteen shall be maintained by the contractor in an efficient manner.

(iii) The canteen shall consist of at least a dining hall, kitchen, store room, pantry and washing places separately for workers and utensils.

(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.

The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colure washed at least once in each year.

Provided that the inside walls of the kitchen shall be lime-washed every four months.

(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

(viii) Suitable arrangements shall be made for the collection and disposal of garbage.

(ix) The dining hall shall accommodate at a time 30% of the contract labour working at a time.

(x) The floor area of dining hall excluding the area occupied by the service counter any furniture except tables and chairs shall not be less than one square meter (10sft) per diner to be accommodated as per prescribed as prescribed in sub-Rule 9.

(xi). (a) A portion of dining hall and service counter shall be partitioned off and reserved for women worker in proportion to their number.

(b)Washing place for women shall be separate and screened to secured privacy

(xii) Sufficient tables stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule9.

(xiii) (a) 1. They shall be provided and maintained sufficient utensils crockery, furniture and any other equipments necessary for the efficient running of the canteen

2. The furniture utensils and other equipment shall be maintained in a clean &hygienic condition.

(b) 1. Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

2. A service counter, if provided, shall have top of smooth and impervious material.

3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipments.

(xiv) The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

(xv) The charges for food stuffs, beverages and any other items served in the canteen shall be based on 'No profit, No loss' and shall be conspicuously displayed in the canteen.

(xvi) In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken in to consideration as expenditure namely.

(a) The rent of land and building.

(b) The depreciation and maintenance charges for the building and equipments provided for the canteen.

(c) The cost of purchase, repairs and replacement of equipments including furniture, crockery, cutlery and utensils.

(d) The water charges and other charges incurred for lighting and ventilation.

(e) The interest and amounts spent on the provision and maintenance equipments provided for the canteen.

(xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors

10. ANTI MALARIAL PRECAUTIONS:-

The contractor shall at his own expense, conform to all anti- material instructions given to him by Engineer –in-Charge including the filling up of any borrow pits which may have been dug by him.

11 The above rules shall be incorporated in the contracts and in notices inviting tenders and shall form an integral part of the contracts .

12 AMENDMENTS.

Government may, from time to time, add to or amend these rules and issue directions- it may consider necessary for purpose of removing any difficulty which may arise in the administration thereof

(vi) Contractor's Labour Regulations

1. DEFINITIONS

i. Workman means any person employed by IISER Tirupati or its contractor directly or indirectly through a subcontractor with or without the knowledge of the IISER Tirupati to do any skilled, semiskilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment are expressed or implied but does not include any person:-

a) Who is employed mainly in a managerial or administrative capacity : or

b) Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercises either by the nature of the duties attached to the office or by reason of powers vested in him, function mainly of managerial nature: or

c) Who is an out worker, that is to say, person to whom any articles or materials are given out by or on behalf of the principal employers to be made up cleaned, washed, altered, ornamental finished, repaired adopted or otherwise processed for sale for the purpose of the trade or business of principal employers and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of principal employer.

No person below age of 14 years shall be employed to act as a workman.

ii) **Fair Wages** means wages whether for time or piece work fixed and notified under the provisions of the Minimum Wages Act from time to time.

iii) **Contractors** shall include every person who undertakes to produce a given result other than a mere supply of goods or articles of manufacture through contract labour or who supplies contract labour for any work and includes a subcontractor.

iv) **Wages** shall have the same meaning as defined in the Payment of Wages Act.

2. i) Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

ii) When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week, he shall be paid over time for the extra hours put in by him at double the ordinary rate of wages.

iii) a) Every worker shall be given a weekly holiday normally on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules 1960 as amended from time to time irrespective of whether such worker is governed by the Minimum Wages Act or not.

b) Where the minimum wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest,

the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.

c) Where a contractor is permitted by the Engineer-in-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substituted holiday to him for the whole day on one of the five days immediately before or after the normal weekly holiday and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

3. DISPLAY OF NOTICE REGARDING WAGES ETC.

Contractor shall before he commences his work on contract , display and correctly maintain and continue to display and correctly maintain in a clear and legible condition in conspicuous places on the work , notices in English and in local Indian languages spoken by the majority of the workers giving the minimum rates of wages fixed under minimum wages acts, the actual wages being paid, the hours of work for which such wages are earned, wages periods, dates of payments of wages and other relevant information as per appendix 'III' .

4. PAYMENT OF WAGES.

i. The contractor shall fix wage periods in respect of which wages shall be payable

ii. No wage period shall exceed one month.

iii. The wages of every person employed as contract labour in an establishment or by contractor where less than one thousand such person are employed shall be paid before expiry of seventh day & in other cases before expiry of tenth day after the last day of period in respect of which the wages are payable

iv. Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

v. All payment of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the Expiry of the wage period, final payment shall be made within 48 hours of the last working day.

vi. Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf.

vii. All wages shall be paid in current coin or currency or in both.

viii. Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.

ix. A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgment.

x. It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Engineer–in-charge or any other authorized representative of the Engineer-in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

xi. The contractor shall obtain from the Engineer-in-charge or any other authorized representative of the Engineer-in-Charge as the case may be, a certificate under his signature as the end of the entries in the "Register of wages" or the "Wage cum-Muster Roll " as the case may be in the following from :-

"Certified that the amount shown in column No---------- has been paid to the workman concerned in my presence on ---------- at ----------"

5. FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES

(i) The wages of a worker shall be paid to him without any deduction of any kind except the following

(a) Fines

(b) Deduction for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.

(c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to his neglected or default.

(d) Deduction for recovery of advance or for adjustment of overpayment of wages, advances granted shall be entered in a register.

(e) Any other deduction which the central government may from time to time allow.

(ii) No fine should be imposed on any worker save in respect of such acts and omissions on his part have been approved of by the Chief Labour Commissioner.

Note:- An approved list of Acts & Omissions for which fine can be imposed is enclosed at Appendix-X

(iii) No fine shall be imposed on a worker and no deduction for damage and loss shall be made from his wages until the worker has been given opportunity of showing cause against such fines or deductions.

(iv) The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the total wages, payable to him in respect of that wage period.

(v) No fine imposed on any worker shall be recovered from him by installment, or after the expiry of sixty days from the date on which it was imposed.

(vi) Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

6. LABOUR RECORDS

(i) The contractor shall maintain a **Register of persons employed** on work on contract in Form XIII of the CL (R&A) Central Rules 1971 (Appendix IV)

(ii) The contractor shall maintain a **Muster** Roll register in respect of all workmen employed by him on the work under Contract in Form XVI of the CL (R&A) Rules 1971 (Appendix V).

(iii) The contractor shall maintain a **Wage Register** in respect of all workmen employed by him on the work under contract in Form XVII of the CL (R&A) Rules 1971 (Appendix VI).

(iv) **Register of accident** - The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:

a) Full particulars of the labourers who met with accident
b) Rate of Wages
c) Sex
d) Age
e) Nature of accident and cause of accident.
f) Time and date of accident
g) Date and time when admitted in Hospital,
h) Date of discharge from the Hospital
i) Period of treatment and result of treatment.
j) Percentage of loss of earning capacity and disability as assessed by Medical officer
k) Claim required to be paid under Workmen's Compensation Acts.
l) Date of payment of compensation.
m) Amount paid with details of the person to whom the same was paid.
n) Authority by whom the compensation was assessed.
o) Remarks

The contractor shall maintain a **Resister of Fines** in the in the form XII of CL(R&A)Rules 1971(Appendix-XI)

The Contractor shall display in good condition and in conspicuous place of work the approved list of acts and omission for which fine can be imposed (Appendix-X).

The contractor shall maintain a **Resister of deduction for damage or loss** in Form XX of the CL(R&A) Rules 1971(Appendix-XII)

The contractor shall maintain a Register **of Advances** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIII).

The contractor shall maintain a Register of Overtime in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIV).

7.ATTENDANCE CARD-CUM-WAGE SLIP

i) The contractor shall issue an **Attendance card-cum-wage slip** to each workman employed by him in the specimen format (Appendix-VII)

ii) The card shall be valid for each wage period.

iii) The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

iv) The card shall remain in possession of the worker during the wage period under reference.

v) The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

vi) The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

8. EMPLOYMENT CARD

The contractor shall issue an **Employment Card** in Form XIV of the CL (R&A) Central Rules 1971 to each worker within three days of the employment of the (Appendix-VIII).

9. SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a **Service certificate** in Form XV of the CL (R&A) Central Rules 1971 (Appendix-IX)

10. PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulation Nos. 6&7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-in- Charge or Labour Officer or any other officers authorized by the Ministry of Urban Development in this behalf.

11. POWER OF THE LABOUR OFFICER TO MAKE INVESTIGATION OR INQUIRY

The Labour officer or any person authorized by Central Government on their behalf shall have power to make to make enquiry with a view to ascertaining & enforcing due & proper observance of Fair wage Clauses and the Provisions of these Regulations. He shall investigate in to any complaint regarding the default made by the contractor or subcontractor in regard to such provision.

12. REPORT OF LABOUR OFFICER.

The Labour Officer or other persons authorized as aforesaid shall submit a report of result of his investigation or enquiry to the Director IISER Tirupati concerned indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned. In case appeal is made by the contractor under Clause 13 of

these regulation, actual payment to labourers will be made by Director IISER Tirupati after the Engineer-in-Charge has given his decision on such appeal.

i) The Director IISER shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer or the Engineer-in-Charge as the case may be.

13. APPEAL AGAINST THE DECISION OF LABOUR OFFICER

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorized may appeal against such decision to the Engineer-in-Charge concerned within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Director IISER concerned but subject to such appeal, the decision of the officer shall be final and binding upon the contractor.

14. PROHIBITION REGARDING REPRESENTATION THROUGH LAWYER

i) A. workman shall be entitled to be represented in any investigation or enquiry under these regulations by:

a) An officer of a registered trade union of which he is a member.

b) An officer of a federation of trade unions to which the trade union referred to in Clause (a) is affiliated.

c) Where the employer is not a member of any registered trade union, by an officer of a registered trade union, connected with the industry in which the worker is employed or by any other workman employed in the industry in which the worker is employed.

ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by

b) An officer of an association of employers of which he is a member.

c) An officer of a federation of associations of employers to which association referred to in Clause (a) is affiliated.

d) Where the employers is not a member of any association of employers, by an officer of association of employer connected with industry in which employer engaged or by any other employer, engaged in the industry in which the employer is engaged.

iii) No party shall be entitled to be represented by legal practitioner in any investigation or enquiry under these regulations.

15. INSPECTION OF BOOKS AND SLIP:-

Contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Officer or any other person, authorized by the Central Government on his behalf.

16. SUBMISSION OF RETURNS

The contractor shall submit periodical returns as may be specified from time to time.

17. AMENDMENTS

The Central Government may from time to time add to or amend the regulation and on any question as to the application /interpretation or effect of those regulations the decision of the Engineer-in-Charge concerned shall be final.

Appendix 'I'

(vii) Form of Performance Security (Guarantee)

Bank Guarantee Bond

1. In consideration of the Director IISER Tirupati (hereinafter called "IISER-Tirupati") having offered to accept the terms and conditions of the proposed agreement between----------and---------- (hereinafter called "the said Contractor(s)") for the work ----------(hereinafter called "the said agreement") having agreed to production of an irrevocable Bank Guarantee for Rs.---------(Rupees ----------only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

   We ---------- (hereinafter referred to as "the Bank") hereby (indicate the name of the Bank) Undertake to pay to the IISER Tirupati an amount not exceeding Rs----------.(Rupees ----------only) on demand by IISER Tirupati

2. We ----------do hereby undertake to pay the amounts due and payable (indicate the name of the Bank) under this Guarantee without any demure, merely on demand from the IISER Tirupati stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s).Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs---------- (Rupees----------only)

3. We, the said bank further undertake to pay the IISER Tirupati any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

   The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4. We, ---------- further agree that the guarantee herein contained shall (indicate the name of the Bank) remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the IISER Tirupati under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the IISER Tirupati certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. We, ---------- further agree with the IISER Tirupati that the IISER Tirupati (indicate the name of the Bank) shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of

the powers exercisable by the IISER Tirupati against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the IISER Tirupati or any indulgence by the IISER Tirupati to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, ---------- lastly undertake not to revoke this guarantee except (indicate the name of the Bank) with the previous consent of the IISER Tirupati in writing.

8. This guarantee shall be valid up to----------unless extended on demand by the IISER Tirupati. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs---------- (Rupees----------only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

   Dated the ----------day of----------for----------(indicate the name of the Bank)

(viii) Proforma of Agreement

ARTICLE OF AGREEMENT is made at Tirupati on the ..... day of..... 2017 between Indian Institutes Of Science Education and Research Tirupati, (IISER Tirupati) (Herein after referred to as the employer which expression shall includes its successors and assigns where the context so admits) of the one part and ----------
---

(Hereinafter referred to as the "contractor(s) which expression shall include his/their respective heirs, executors, administrators and assigns where the context so admits) of the other part.

WHEREAS the employer is desirous of getting the work……..done and caused drawings, schedule of quantities, terms and conditions and specification describing the work to be executed and completed maintained.(hereinafter called "the works")and has accepted a tender of the CONTRACTOR for the execution, completion and guarantee of such works.

AND WHERE AS the contractor has deposited a Sum Of Rs.----------

---------- With employer as security

for the due performance of this agreement as provided in the said Conditions.

NOW IT IS HEREBY agreed and declared by and between the parties as follows.

(a) In consideration of the payments to be made to him as herein after provided the contractor shall upon and subject to the condition herein contained and the said conditions executed and complete the work shown upon the said drawings and such further detailed drawings which may be furnished to him and described in the said specifications and the said priced schedule of quantities within ---------- from the date of order to commence the work.

(b) The employer shall pay to the contractor such sum that shall become payable hereunder at the times and in the manner specified in the said conditions.

(c) Time is essence of this agreement and the contractor agrees to pay compensation for delay as per Clause 2 of general Condition of Contract.

(e) The documents mentioned below under (g) shall form the basis of this agreement and the decision Engineer or the Engineers in Charge, in reference to all matters of dispute as to material and workmanship shall be final and binding on both the parties.

(f) The employer through the Engineer-in-Charge reserves to himself the right of altering the drawings and the adding to or omitting any items of works or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall not violate agreement.

(g) This agreement comprises the work said above and the entire subsidiary work connected there with, even though work may not be shown on the drawings or described in the said specifications or the priced schedule of quantities.

This agreement contains the following documents in addition to pages of articles of agreement.

(a) NIT/WORK ORDER
(b) Item rate tender form & contract for works.
(c) General Rules and Directions
(d) Condition of contracts
(e) Clauses of contracts
(f) Safety code
(g) Models rules for the protection of health, sanitary arrangements for workers employed by IISER Tirupati or its Contractors.
(h) Contractors labour regulations
(i) Proforma of agreement
(j) Proforma of Schedule A to C
(k) Special Condition of contracts
(l) Technical specifications
(m) Tenders drawings
(n) Price Schedule/ Schedule of Quantities
(o) All corresponds between the parties until award of contract.
(p) Prequalification document

In witness whereof the parties hereto have their respective hands the day and the year herein above written.

Signed by for and on behalf of the employer.

Superintending Engineer.

Witness (1)----------

Witness (2)----------

Signed by the said contractor

Address---------- Witness (1)----------

Countersigned Witness (2)----------

(IX) PROFORMA BANK GUARANTEE IN LIEU OF BID SECURITY

(On Non Judicial Stamp paper to be stamped in accordance with stamp act, the stamp paper to be in name of Executing Bank)

Ref..... Date.....

Bank Guarantee No.....

To **INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH,TIRUPATI**

_____

_____

_____

Dear Sir,

In accordance with your Notice Inviting Tender for_____under your tender No_____dated_____M/s_____(hereinafter called the Tenderer) with following directors on their Board of Directors /Partners of the firm.

1_____ 2_____

3_____ 4_____

5_____ 6_____

7_____ 8_____

9_____ 10_____

Wish to participate in the said tender for the following:

1_____

2_____

3_____

Whereas it is a condition in the tender documents that the tenderer has to deposit Bid Security with respect to the tender, with Indian Institute of Science Education & Research, Tirupati amounting to Rs…….. or alternatively the tenderer is required to submit "Bank Guarantee" from a nationalised bank irrevocable and operative till 28 days after the validity of the offer. (i.e. 120 days from the date of opening of tender), for the like amount which amount is likely to be forfeited on the happening of contingencies mentioned in the tender documents. And whereas the tenderer desires to secure exemption from deposit of Bid Security and has offered to furnish a Bank Guarantee for a sum of Rs…….. to the IISER, Tirupati for the purpose of securing exemption from the deposit of Bid Security.

1. NOW THEREFORE, we the …….. Bank, a body corporate constituted under the Banking Companies (Acquisition and Transfer of undertakings) Act 1969 and having a branch office at…….. (hereinafter referred to as the Bank") do hereby undertake and agree to pay on demand in writing by the IISER, Tirupati the amount of Rs…….. (Rupees……..) to the **Indian Institute of Science Education & Research, Tirupati** without any demur, reservation or recourse.

2. We, the aforesaid Bank, further agree that the IISER, Tirupati shall be the sole judge of and as to whether the tenderer has committed any breach or breaches of any of the terms and conditions of the tender and the extent of loss, damage, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the IISER, Tirupati on account thereof the extent of the bid security required to be deposited by the Tenderer in respect of the said Tender document and the decision of the IISER, Tirupati that the Tenderer has committed such breach or breaches and as to the amount or amounts of loss, damage, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the IISER, Tirupati shall be final and binding on us.

3. We, the said Bank further agree that the Guarantee herein contained shall remain in full force and effect until it is released by the IISER, Tirupati and change in the constitution, liquidation or dissolution of the Tenderer shall not discharge our liability guaranteed herein.

4. It is further declared that it shall not be necessary for the IISER, Tirupati to proceed against the Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank notwithstanding any security which the IISER, Tirupati may have obtained or shall obtain from the Contractor at the time when proceedings are taken against the Bank for whatever amount may be outstanding or unrealized under the Guarantee.

5. The right of the IISER, Tirupati to recover the said amount of Rs…….. (Rupees ……..) from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been

raised by the said M/s..... (Tenderer) and/or that any dispute or disputes are pending before any authority, officer, tribunal or arbitrator(s) etc.

6. Notwithstanding anything stated above, our liability under this guarantee shall be restricted to Rs.....(Rupees.....) and our guarantee shall remain in force up to..... and unless a demand or claim under the guarantee is made on us in writing within three months after the aforesaid date i.e. on or before the ..... all your rights under the guarantee shall be forfeited and we shall be relieved and discharged from all liabilities there under.

Date.....

place.....

(Signature)_____

(Printed Name)_____

(Designation)_____

(Bank's Common seal_____

(Authorisation No.)_____

In the presence of:

Witness

1)_____

2)_____

Accepted

(Signature of the Officer)

For and on behalf of the

INDIAN INSTITUTE OF SCIENCE EDUCATION
AND RESEARCH , TIRUPATI

GUARANTEE TO BE EXECUTED BY CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS.

This agreement made this_____day of_____Two Thousand_____between_____son of_____(hereinafter called the guarantor on one part) and The Director, Indian Institute of Science Education & Research, Tirupati (hereinafter called IISER, Tirupati 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 IISER Tirupati of the other part, where by the contractor, interalia, undertook to render to buildings and structures in the said contract recited completely water and leak proof.

AND WHEREAS THE 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 the 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 earthquakes or structural defects or misuse of roof or alternations 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 or construction adjoining to existing roof, where by roofing 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 defects being found, render the building water proof to the satisfaction of 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 IISER by some other contractor at the GUARNATOR'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 GURANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the IISER, the decision of the Engineer-in-Charge will be final and binding of the parties.

IN WITNESS WHERE OF these present have been executed by the obligator _____ and by_____and for and on behalf of the The Director, Indian Institute of Science Education & Research, Tirupati on the day, month and year first above written.

SIGNED, sealed and Delivery by (OBLIGATOR) in the presence of :

1. _____

2. _____

Accepted

(Signature of the Officer)

For and on behalf of the

INDIAN INSTITUTE OF SCIENCE EDUCATION
AND RESEARCH, TIRUPATI

APPENDIX (xv) -CLAUSE 25

APPENDIX XV Notice for appointment of Arbitrator [Refer Clause 25]

To
The Chairman
Building and Works Committee
IISER Tirupati.

Dear Sir,
In terms of clause 25 of the agreement, particulars of which are given below, I/we hereby give notice to you to appoint an arbitrator for settlement of disputes mentioned below:

1. Name of applicant
2. Whether applicant is Individual/Prop. Firm/Partnership Firm/Ltd. Co.
3. Full address of the applicant
4. Name of the work and contract number in which arbitration sought
5. Name of the Division which entered into contract
6. Contract amount in the work
7. Date of contract
8. Date of contract Date of initiation of work
9. Stipulated date of completion of work
10. Actual date of completion of work (if completed)
11. Total number of claims made
12. Total amount claimed
13. Date of intimation of final bill (if work is completed)
14. Date of payment of final bill (if work is completed)
15. Amount of final bill (if work is completed)
16. Date of request made to SE for decision
17. Date of receipt of SE's decision
18. Date of appeal to you
19. Date of receipt of your decision.

Specimen signatures of the applicant

(only the person/authority who signed the contract should sign)

I/We certify that the information given above is true to the best of my/our knowledge. I/We enclose following documents.

1. Statement of claims with amount of claims.
2.

Yours faithfully

Copy in duplicate to:
Engineer in Charge.

(v) PROFORMA OF SCHEDULES

(Operative Schedules to be supplied to each intending tenderer)

SCHEDULE 'A'

Schedule of quantities Enclosed as Financial bid document

SCHEDULE 'B'

Schedule of materials to be issued to the contractor.

S.No	Description of item	Quantity	Rates in figures & words at which the material will be charged to the contractor	Place of issue
1	2	3	4	5
	NIL			

Tools and plants to be hired to the contractor

S.No	Description	Hire charges per day	Place of issue
1	2	3	4
	NIL		

Extra schedule for specific requirements/document for the work, if any. -- NIL—

Reference to General Conditions of contract.-

	Name of work &Location	:	Construction of UG Block with associated services at IISER Tirupati, Andhra Pradesh.
	NIT NUMBER	:	2/ IISER/TIRUPATI/2018-19
	Estimated cost put to tender	**:**	**Rs. 1516 lakh (Civil- Rs. 1165/- Lakh + E & M- 351/- Lakh)**
(i)	Earnest money	**:**	**Rs. 25 Lakhs** (to be returned after receiving performance guarantee)
(ii)	Performance Guarantee	:	5% of tendered value.
(iii)	Security Deposit	:	2.5 % of tendered/accepted value.

SCHEDULE 'C'

GENERAL RULES & DIRECTIONS :

Officer inviting tender	Superintending Engineer IISER, Tirupati.
Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3:	See below

Definitions:

2(v)	Engineer-in-Charge	Superintending Engineer IISER, Tirupati.
2(viii)	Accepting Authority	Director, IISER, Tirupati
2(ix)	Percentage on cost of materials and labour to cover all overheads and profits	15%

2(x)	Standard Schedule of rates	CPWD Delhi Schedule of Rates 2016 plus cost Index enhancement & market rates
2(viii)	Department	Indian institute of Science Education & Research, IISER, Tirupati
2(ix)	Standard contract Form	Percentage rate contract

Clause 1

(i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance 15days

(ii) Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period provided in (i) above 7 days

Clause 2

Authority for fixing compensation under clause 2. The Director Indian institute of Science Education & Research, IISER Tirupati

Clause 2 A

Whether Clause 2A shall be applicable Yes Applicable

Clause 5

Number of days from the date of issue of letter of award works for reckoning date of start 10 days

Mile stone(s) as per table given below:-

Sl No	**Description of Milestone (Physical)**	**Time allowed in days/months (From date of start)**	**Amount to be with-held in case of non-achievement of Milestone**
1	Foundation work up to plinth	45 days	2 % of tender value
2	Completion of Structure i/c Roof	90 Days	2 % of tender value
3	Internal works i/c flooring , plumbing	130 days	2 % of tender value
4	Completion of Services (Elect & HVAC)	150 days	2 % of tender value
5	Testing and Commissioning of services	165 days	1% of Tender Value
6	Site Clearance and Handling Over	180 days	1 % of Tender Value

Time allowed for execution of Full scope of work. However Milestone Part completion — **6 months including Monsoon period**

Authority to decide:

(i)	Extension of time	Engineer in charge
(ii)	Rescheduling of mile stones	Superintending Engineer
(iii)	Shifting of date of start in case of delay in handing over of site:	Director IISER Tirupati

Clause 6, 6 A

Clause applicable – (6or 6A) — 6A Applicable

No running account bill shall be paid for the work till the applicable labour licenses, registration with GST, EPFO, ESIC and BOCW Welfare board, whatever applicable are submitted by the contractor to the Engineer in charge.

Clause 7

Gross work to be done together with net payment /adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment — Rs. 2.00 Crores

Clause 7A

Whether clause 7A shall be applicable: — Yes.

Clause 10

List of testing equipment to be provided by the contractor at site lab. — List of Equipment for Field Testing Laboratory (Minimum) As per Annexure-III vide page 43-44 & Plant & Equipment as per Annexure-II page 41-42

Clause 10 B

Whether Clause 10 B shall be applicable — 10B applicable

Clause 10B(i)

Whether Clause 10B (i) shall be applicable. : Applicable.

Clause 10B(ii)

Whether Clause 10B (ii) shall be applicable. : Applicable.

Clause 10 C

Component of labour expressed as percent of value of work = 25%

Clause 10 CA **Applicable**

S. No.	Materials covered under this Clause	Base price and its corresponding period of all the materials covered under clause 10CA (In Rupees)	Nearest Materials (other than cement*, reinforcement bars, the structural steel and POL) for which All India whole sale Price Index to be Followed
1)	Cement (OPC) 43 grade	Rs. 5,200/- per MT.	---
2)	Cement (PPC)	Rs. 5,000/- per MT.	---
3)	Steel Reinforcement- TMT	Rs. 42,000/- per MT.	---

Includes Cement component used in RMC brought at site from outside approved RMC plants, if Any.

Note: 1

(i) Base price of TMT reinforcement bars (Fe.500 D grade conforming to BIS 1786-2008) produced by main producers as mentioned in "List showing Approved Makes**"**

(ii) Conditions for allowing TMT reinforcement bars (Fe. 500 D grade conforming to BIS 1786-2008) procured from secondary producers having valid BIS license and license from either of the firms Tempcore, Thermex, Evcon Turbo & Turbo Quench:

a) The base price of TMT reinforcement bars as stipulated under para (i) above shall be reduced by Rs.3,000/- per MT.

b)The rate of providing and laying TMT reinforcement bars as quoted by the contractor in the tender shall also be reduced by Rs. 3.70 per kg.

CLAUSE 10 CC **NOT APPLICABLE**

Clause 10 CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column ..... 12 months

Schedule of component of other Materials, Labour, POL etc.

for price escalation.

Component of civil (except materials covered under Clause 10CA /Electrical Construction materials expressed as percent of total value of work Xm -- 45 %

Component of Labour expressed as percent of total value of work. Y -- 25 %

Component of P.O.L-

expressed as percent of total value of work. Z..... 0..... %

Clause 11

Specifications to be followed for execution work

1) Technical specification given in Tender documents.

2) CPWD standard specification 2009 Volume I & II with up to date correction slips for civil works.

2a) CPWD standard specification for internal Electrical works – 2013, external electrical services- 2007, DG set & Wet riser, sprinkler, specification-2006, Substation works Part IV-2013.

3) Indian Standard Specification

4) Manufactures specification

5) Engineer In charge decision.

Clause 12

Type of work	**Project and original work**	
12.2 & 12.3	Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for building Super structure work & other Associated Electro-mechanical works	30 %
12.5	(i) Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for foundation work	30%
	(Except items mentioned in earth work sub head in DSR and related items)	
	(ii) Deviation Limit for items mentioned in earth work Sub head of DSR or related items	100%

Clause 16

Competent Authority for deciding reduced rates	The Director Indian institute of Science Education &. Research, IISER Tirupati

Clause 18

List of mandatory machinery, tools & plants - As per Annexure-II in the NIT
To be deployed by the contractor at site at his cost: Condition of Contract.

Clause 25

Constitution of Dispute Redressal Committee (DRC) Chairman - Prof. L S Shashidhara, IISER, Tirupati.
Members: (1) Mr Sushant Baliga, Retd. ADG CPWD, New Delhi

Clause 34 (i)

Requirement of Technical Representative(s) and recovery rate to be affected from Contractor bill for non-deployment of technical staff at site of work:

S.No.	Technical Representative(s)	Qualification & Discipline of the Technical representative(s)	Minimum Experience of the Technical representative(s)	Minimum Numbers to be employed at site for full duration of the project	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 34(i)	
					Figure	Words
1	Project Manager (Full duration of project)	BE Civil	15 years	1	60000	Sixty thousand only
2	Site Engineer Civil /Electrical (Full duration of project)	BE (Civil/Elect.)	10 years	1	40000	Forty thousand only
3	Site Engineer Planning and billing Engineers (Full duration of the project)	BE/Diploma in civil /Electrical Engineering	5 years	1	30000	Thirty thousand only
4	Site Engineer Elect & HVAC Engineer (Full duration of project)	Graduate Engineer with Electrical/ HVAC	5 years	1	30000	Thirty thousand only
5	Quality Engineer (Full duration of project)	BE Civil /Diploma with 10 years experience	5 years	1	30000	Thirty thousand only

Note:

1. Assistant Engineers retired from Government services who are holding Diploma will be treated at par with Graduate Engineers. Diploma holder with minimum 10 years' relevant experience with a reputed construction company can be treated at par with Graduate Engineers for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineers.
2. The contractor shall submit a certificate of employment of the technical representative(s) (in the form of copy of Form -16 or CPF deduction issued to the Engineers employed by him) along with every account bill/final bill and shall produce evidence if at any times so required by the Engineer-in-charge.
3. The CV of technical persons shall be presented to Engineer in charge before deployment in above work for approval. Once inducted they will not be transferred or removed without the permission on Engineer in Charge.

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) TIRUPATI

VOLUME II

SPECIAL CONDITIONS OF CONTRACT

&

PARTICULAR SPECIFICATIONS

"CONSTRUCTION OF UG Block with associated Services"
AT IISER TIRUPATI

NIT NUMBER : 2/IISER/TIRUPATI/2018-19

Bids to be submitted online on : (URL:https://eprocure.gov.in/eprocure/app

LIST OF ANNEXURES

SPECIAL CONDITIONS OF CONTRACT

A) Civil Works:

1 GENERAL

These special conditions supplement the General Conditions of Contract and shall be considered as part of the contract document. Where these special instructions are at variance with the corresponding conditions, stipulations, and specifications elsewhere in the tender document, these special instructions shall prevail.

1.1 Specifications & Order of preference:

1.1.1 Except for the items, for which Technical/Particular Specifications are given or where it is specifically mentioned otherwise in the description of the items in the schedule of quantities, the work shall generally be carried out in accordance with the "CPWD Specifications 2009 Vol. I & II" with up to date correction slips, CPWD standard specification for internal Electrical works – 2013, external electrical services- 2007, DG set & Wet riser, sprinkler, specification-2006, Substation works Part IV-2013 additional / Particular Specifications, Architectural / structural drawings and as per instructions of Engineer-in-Charge.

1.1.2 The several documents forming the tender are to be taken as mutually complementary to one another. Detailed drawings shall be followed in preference to small scale drawings and figured dimensions in preference to scaled dimensions.

1.1.3 If there is any difference or discrepancy between the description of items as given in the schedule of quantities, particular specifications for individual items of work (including special conditions) and I.S. Codes etc., the following order of preference shall be observed :

(i) Description of items as given in Schedule of Quantities.

(ii) Particular Specifications, Special Conditions and Additional conditions, if any.

(iii) Drawings.

(iv) CPWD Specifications.

(v)General conditions of contract for CPWD works.

(vi) Indian Standard Specifications of B.I.S.

(vii) Manufacturers' specifications & as decided by Engineer-in-charge.

(viii) Sound Engineering practices.

"In the event of any variation/ discrepancy in the drawings, specifications and tender documents etc. the decision of the Engineer-in-charge shall be final binding and conclusive on the contractor and in the case the contractor have any doubt and the same should be got clarified immediately from the Engineer-in-charge and no

claim of the contractor shall be entertained thereafter. Moreover, the agency is not allowed to take benefit out of any clerical/ grammatical mistake in the standard clauses/Schedule of Quantities/Specifications etc. being used in the agreement".

1.1.4 Any reference made to any Indian Standard Specifications, shall imply to the latest version of that standard, including such revisions / amendments as issued by the Bureau of Indian Standards up to last date of receipt of tenders. The Contractor shall keep at his own cost all such publications including relevant Indian Standard Codes applicable to the work at site.

1.2 Scope:

1.2.1 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.

1.2.2 The works to be undertaken by the contractor shall inter alia include the following:
Preparation of detailed SHOP drawings and AS BUILT drawings wherever applicable.
Obtaining of Statutory permissions wherever applicable and required. Pre-commissioning tests as per relevant standard specifications, code of practice, Acts and Rules wherever required.
Warranty obligation for the equipment and/or fittings/fixtures supplied by the contractor.

1.2.3 Contractor shall provide all the shop drawings or layout drawings for all the co-ordinated services before starting any work or placing any order for 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.

1.2.4 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.

1.3 Deployment of Technical staff & skilled labour:

1.3.1 The quality of work is of paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipment to execute the work to provide the desired quality.

The Contractor shall depute Site Engineer & skilled workers as required for the work. He shall submit organization chart along with details of Engineers and supervisory staff. It shall be ensured that all decision making powers shall be available to the representatives of the contractor at site itself to avoid any likely delays on this account. The contractor shall also furnish list of persons for specialized works to be executed for various items of work. The Contractor shall identify and deploy key persons having qualifications and experience in the similar and other major works, as per the field of their expertise. If during the course of execution of work, the Engineer-in-Charge is of the opinion that the deployed staff is not sufficient or not well experienced; the Contractor shall deploy more staff or better-experienced staff at site to complete the work with quality and in stipulated time limit. The Project Manager of the contractor having minimum twenty years of experience in similar nature of work along with all technical staff as mentioned in the clause 36 of the GCC, shall always be available at the site during execution of work. Removal of Machinery, Tools & Equipment:

1.4

1.4.1 Removal of machinery, tools & equipment shall be allowed to be moved away from the site only when, in written opinion of Engineer-in-Charge, the same are no longer required at site of work.

1.5 Soil conditions of site:

1.5.1 Contractor(s) shall study the soil investigation report for the site, available in the office of the Engineer-in-Charge and satisfy himself about complete characteristics of soil and other parameters at site. No claim whatsoever on account of any discrepancy between the sub-surface strata conditions that may be actually encountered at the time of execution of the work and those given in soil report, in-accuracy or interpretation thereof shall be entertained from the Contractor under any circumstances. The ground water table is in variable condition and the information given in the report is only indicative and it may vary from time to time.

1.6 Site condition:

1.6.1 The tenderer shall acquaint himself with the site of work and see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of materials by the contractor, the same shall be provided, improved and maintained by the contractor at his own cost.

1.7 Precautionary measures:

1.7.1 Temporary barricading shall be provided at Site by the contractor at their own cost. The barricading physically define the boundaries of the plot for restricted entry to only those involved in the work and also to prevent any accident and also not causing any inconvenience to the traffic. The barricading panels shall be painted and "IISER TIRUPATI" mark should be made in suitable size, shapes and number as directed by Engineer-in-charge without any extra cost. It shall be dismantled and taken away by the contractor after completion of the work at his own cost with the permission of Engineer-in-charge.

1.7.2 Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost. The contractor shall take all precautions to prevent his workmen and employees from removing and damaging any Flora (plant/vegetation) from the campus/site.

1.7.3 The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night, speed limit boards, red flags, red lights and providing barriers. He shall be responsible for all damages and accidents caused to work due to negligence on his part. No hindrances shall be caused to traffic, during the execution of the work. In case of any accident of the labourers/ contractual staff, the entire responsibility will rest on the contractor and any compensation under such circumstances, if becomes payable, shall be entirely borne by the contractor.

1.7.4 The contractor, his authorized representative, workmen etc. shall strictly observe orders pertaining to fire precautions prevailing in the area.

1.7.5 The Contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupants of the adjacent properties and to the public in general .The Contractor shall take all care, as not to damage any other adjacent property or other services running adjacent to the plot. If any damage is done, the same shall be made good by the Contractor at his own cost and to the entire satisfaction of the Engineer-in-Charge. The Contractor shall use such methodology and equipment for execution of the work, so as to cause minimum environmental pollution of any kind during construction, to have minimum construction time and minimum inconvenience to road users and to the occupants of the buildings on the adjacent plot and public in general, etc. He shall make good at his own cost and to the entire satisfaction of the Engineer in Charge any damage to roads, paths, cross drainage works or public or private property whatsoever caused, due to the execution of the work or by traffic brought thereon, by the Contractor. Further, the Contractor shall take all precautions to prevent any pollution of streams and waterways. All waste or superfluous materials shall be carted away by the Contractor, entirely to the satisfaction of the Engineer-in-Charge. Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants /

users of adjoining buildings. No claim what so ever on account of site constraints mentioned above or any other site constraints not specifically stated here, shall be entertained from the Contractor. Therefore, the Contractors are advised to visit site and get firsthand information of site constraints. Accordingly, they should quote their tenders. Nothing extra shall be payable on this account.

1.8 General cleanliness of the site and Stacking & Storage of Materials:

1.8.1 The site of work shall be always kept clean in general strictly adhering to approved job layout and green building parameters. The Contractor shall take all care to prevent any water- logging at site. The waste water shall not be allowed to be collected at site. It may be directly pumped into the public drainage system with prior approval of the concerned authorities. For discharge into public drainage system, necessary permission shall be obtained from concerned authorities after paying the necessary charges, if any, directly to the authorities. The work shall be carried out in such a way that the area is kept clean and tidy. All the fees/charges in this regard shall be borne by the Contractor. Nothing extra shall be payable on this account.

1.8.2 The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, compound wall, services etc. are to be constructed.

1.8.3 For construction works which are likely to generate malba / rubbish, contractor shall dispose of malba, rubbish & other unserviceable materials and wastes at his own cost to the notified/specified dumping ground and under no circumstances these shall be stacked / dumped even temporarily, outside the construction premises.

1.8.4 The contractor shall construct suitable godowns, yard at the site of work for storing all other materials so as to be safe against damage by sun, rain, damages, fire, theft etc. at his own cost and also employ necessary watch and ward establishment for the purpose at his cost.

1.9 Lab Equipment:

The contractor shall provide at his own cost suitable weighing, surveying and levelling and measuring arrangements as may be necessary at site for checking. All such equipment shall be got calibrated in advance from laboratory, approved by the Engineer-in-Charge. Nothing extra shall be payable on this account. A site laboratory with the minimum equipment as specified in NIT shall be established, made functional and maintained within 21 days from the award of the work without any extra cost to the IISER Tirupati.

1.10 Setting Out

1.10.1 The contractor shall establish, maintain and assume responsibility for grades, lines, levels and bench marks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions to the Engineer-in-Charge before commencing work. Commencement of work shall be regarded as the contractor's acceptance of such grades, lines, levels and dimensions and no claim shall be entertained at a later date for any errors found.

1.10.2 In order to set the alignment of buildings / foundations and to mark the same on the ground, the agency is to adopt “total station” surveying method. The agency is to engage a well versed and well experienced surveyor in “total station” survey. Nothing extra for this total station survey is payable

If at any time, any error in the respect of setting out appears during the progress of the work, the contractor shall, at his own expense rectify such error if so required, to the satisfaction of the Engineer-in-Charge.

Though the site levels are indicated in the drawings, the contractor shall ascertain himself and confirm the site levels with respect to GTS bench mark from the concerned authorities. The contractor shall protect and maintain temporary/ permanent benchmarks at the site of work throughout the execution of the work. These bench marks shall be got checked by the Engineer-in-Charge or his authorized representatives. The work at different stages shall be checked with reference to bench marks maintained for the said purpose. Nothing extra shall be payable on this account.

The approval by the Engineer-in-Charge, of the setting out by the contractor, shall not relieve the contractor of any of his responsibilities and obligation to rectify the errors/defects, if any, which may be found at any stage during the progress of the work or after the completion of the work.

1.10.3 The contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignments, the level and correctness of every part of the work and shall rectify effectively any errors or imperfections therein. Such rectifications shall be carried out by the contractor at his own cost to the instructions and satisfaction of the Engineer-in-Charge.

1.10.4 The Contractor shall carry out survey of the work area, at his own cost, setting out the layout of building in consultation with the Engineer-in-Charge & proceed further. Any discrepancy between the architectural drawings and actual layout at site shall be brought to the notice of the Engineer-in-charge. It shall be responsibility of the Contractor to ensure correct setting out of alignment. Total station survey instruments only shall be used for layout, fixing boundaries, and centre lines, etc., along with theodolites. Nothing extra shall be payable on this account.

1.10.5 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings.

1.11 Temporary Water, Electricity & Telephone Connections:

1.11.1 The contractor shall make his own arrangements for water including boring of tube wells etc. if necessary and for Electricity by obtaining electric connections and by providing diesel generators of adequate capacity if required and make necessary payments directly to the State Govt. IISER Tirupatis concerned. Necessary approval shall be taken by the contractor from the ground water IISER Tirupati for boring of tube wells. Nothing extra shall be paid on these accounts. 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 except testing charges etc.

shall be borne by the contractor. The contractor shall obtain environmental and pollution clearance for the diesel generators. Nothing extra shall be paid on this account.

1.11.2 The Contractor shall arrange electricity at his own cost for testing of the various electrical installations as directed by Engineer-in-Charge and for the consumption by the contractor for executing the work. Also all the water required for testing various electrical installations, fire pumps, wet riser / firefighting equipment, fire sprinklers etc. and also testing water supply, sanitary and drainage lines, water proofing of underground sump, overhead tanks, water proofing treatment etc. shall be arranged by the contractor at his own cost. Nothing extra shall be payable on this account.

1.11.3 Arrangement of temporary telephone connection, water and electricity required by Contractor, shall be made by him at his own cost and also necessary permissions shall be obtained by him directly from concerned authorities, under intimation to the IISER Tirupati. Also, all initial cost and running charges, and security deposit, if any, in this regard shall be borne by him. The Contractor shall abide by all the rules/ bye laws applicable in this regard and he shall be solely responsible for any penalty on account of violation of any of the rules / byelaws in this regard. Nothing extra shall be payable on this account.

1.11.4 The Contractor shall be responsible for maintenance and watch and ward of the complete installation and water / electricity meter and shall also be responsible for any pilferage, theft, damage, penalty etc. in this regard. The Contractor shall indemnify the IISER Tirupati against any claim arising out of pilferage, theft, damage, penalty etc. whatsoever on this account. Security deposit for the work shall be released only after No Dues Certificates are obtained from the local Authorities from whom temporary electric/ water / telephone connection have been obtained by the Contractor. Nothing extra shall be payable on this account.

1.11.5 The IISER Tirupati shall in no way be responsible for either any delay in getting electric and/or water and/or telephone connections for carrying out the work or not getting connections at all. No claim of delay or any other kind, whatsoever, on this account shall be entertained from the Contractor. Also contingency arrangement of stand-by water & electrical supply shall be made by the Contractor commencement and smooth progress of the work so that work does not suffer on account of power failure or disconnection or not getting connection at all. No claim of any kind whatsoever shall be entertained on this account from the Contractor. Nothing extra shall be payable on this account.

1.12 Architectural and structural Drawings:

1.12.1 Although architectural drawings are uploaded in the web along with NIT for reference to the bidder or made available in the office of Engineer in Charge, IISER TIRUPATI, the main working & detailed architectural drawings and structural drawings shall be developed by appointing associated agency as per terms and condition of the contract.

1.12.2 The information and site data shown in the drawings and mentioned herein and also elsewhere in the tender documents are being furnished for general information and guidance only. IISER Tirupati shall not bear responsibility for lack of such knowledge and also the consequences thereof. The Engineer-in-charge in no case shall be held responsible for the accuracy thereof or any interpretation/ or conclusions drawn there from by the contractor.

1.13 Scaffolding & Staging:

1.13.1 Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the contractor. The scaffolding 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. Single scaffolding system is strictly prohibited and shall invite necessary action. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. Nothing extra shall be payable on this account. It shall be ensured that no damage is caused to any structure due to the scaffolding.

1.13.2 The contractor should submit the shop drawings of staging and shuttering for approval of Engineer-in-Charge before actually commencing the execution of work under the item. Nothing extra shall be payable on this account.

1.14 Co-ordination with other agencies:

1.14.1 The Contractor shall conduct his work so as not to interfere with or hinder the progress of the work being performed by other Contractors or by the Engineer-in-Charge. As far as possible, he shall arrange his work and place, so as not to interfere with the operations of other Contractors or shall arrange his work with that of the others, in an acceptable and coordinated manner and shall perform it in proper sequence.

1.14.2 Other agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.

1.14.3 The Contractor shall cooperate with and provide the facilities to the associate-Contractors and other agencies working at site for smooth execution of the work. The Contractor shall --

Allow use of scaffolding already erected, toilets, sheds etc.
Properly co-ordinate their work with the work of other Contractors.
Provide control lines and benchmarks to his associate-Contractors and the other Contractors.
Provide electricity and water at mutually agreed rates.
Provide hoist and crane facilities for lifting material at mutually agreed rates.
Co-ordinate with other Contractors for leaving inserts, making chases, alignment of services etc. at site.
Adjust work schedule and site activities in consultation with the Engineer-in Charge and other Contractors to suit the overall schedule completion. Resolve the disputes with other Contractor amicably and the Engineer-in-Charge shall not be

made intermediary or arbitrator. The contractor shall indemnify the IISER Tirupati against any claim(s) arising out of such disputes.

1.15 Procurement of materials:

1.15.1 All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

1.15.2 The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work.

1.16 Protection of Existing Services & buildings and Materials:

1.16.1 Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the damage by the contractor at his own expense. The contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services. In case temporary supporting of such services is required to facilitate the work, the same shall be done by the contractor at no extra cost.

1.16.2 In case the existing services are to be shifted permanently, then before dismantling the existing services, alternate/diversion of service lines has to be laid by the contractor so that there is no interruption in use of existing services. The contractor has to plan the alternate suitable route for diversion/shifting of service lines and get the same approved from the Engineer-in-Charge before starting shifting of services. Nothing extra shall be paid except the payment of dismantling and laying of new service lines as per conditions of contract.

1.16.3 All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on project location during excavation/construction shall be the property of the Government, and shall be dealt with as per provisions of the relevant legislation. The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Engineer-in-charge of such discovery and carry out the official instructions of Engineer-in-charge for dealing with the same, till then all work shall be carried out in a way so as not to disturb/ damage such article or thing.

1.16.4 The contractor shall be responsible for the watch and ward / guard of the buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to IISER Tirupati. No extra payment shall be made on this account.

1.16.5 The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock key system.

1.17 Rates and other conditions for payment:

The rates quoted by the Contractor are deemed to be inclusive of the following--

1.17.1 site clearance, setting out work, profile, establishment of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, barricading, signage, labour safety, welfare & training measures, preparatory works, working during monsoon, working at all depths, height, lead, lift and location etc. until / unless specified otherwise, implementation of green building norms to achieve desired GRIHA (5 star) Rating etc. and any other incidental works required to complete this work. Nothing extra shall be payable on this account.

1.17.2 For works below ground level the contractor shall keep that area free from water. If dewatering or bailing out of water is required the contractor shall do it and nothing extra shall be paid except otherwise provided in the items of schedule of quantities.

1.17.3 Any legal or financial implications resulting out of disposal of earth shall be sole responsibility of the contractor. Nothing extra over the schedule shall be paid on this account.

1.17.4 All labour, material, tools and plants and other inputs involved in the execution of the item.

1.17.5 Providing sunk flooring in bath-rooms, kitchen, etc.

1.17.6 Performance test of the entire installation(s) before the work is finally accepted.

1.17.7 Any cement slurry added over base surface (or) for continuation of concreting for better bond is deemed to have been built in the items.

1.17.8 The percentage quoted by the tenderer, shall be inclusive of all taxes including GST and levies applicable in respect of this contract shall be payable by the contractor and Government will not entertain any claim whatsoever in respect of the same.

1.17.9 For completing the work in time, the Contractor might be required to work in two or more shifts (including night shifts). No claim whatsoever shall be entertained on this account, not with-standing the fact that the Contractor may have to pay extra amounts for any reason, to the labourers and other staff engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the Contractor with them.

1.17.10 The Contractor shall keep himself fully informed of all acts and laws of the Central & State Governments, all orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules regulations and bye-laws laid down by Collector / MC etc. and any other statutory bodies shall be adhered to, by the contractor, during the execution of work. The Contractor shall also adhere to all traffic restrictions notified by the local authorities. It is clarified that the extra sewerage

charges (one time charges for commencement of work) required to be paid to the Municipal Corporation / other statutory bodies shall be paid by the IISER Tirupati and need not be considered by the contractor. The water charges (for municipal water connection as well as tanker water) shall be borne by the contractor. Also, if the contractor obtains water connection for the drinking purposes from the municipal authorities or any other statutory body, the consequent sewerage charges shall be borne by the contractor. All statutory taxes, levies, charges (including GST, water and sewerage charges, charges for temporary service connections and / or any other charges) payable to such authorities for carrying out the work, shall be borne by the Contractor. The Contractor shall arrange to give all notices as required by any statutory / regulatory authority and obtain all requisite licenses wherever required and shall pay to such authority all the fees that are required to be paid for the execution of work. He shall protect and indemnify the IISER Tirupati and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself or by his employees or his authorized representatives. Nothing extra shall be payable on these accounts. The fee payable to statutory authorities for obtaining the various permanent service connections and Occupancy Certificate for the building shall be borne by the IISER Tirupati.

1.17.11 Royalty at the prevalent rates shall have to be paid by the contractor (Rates of Seigniorage fee enclosed in the document is for guidance only and no claims shall be entertained on account of this) on all the boulders, stone aggregate, brick aggregate, shingle, coarse or fine sand, earth, gravel, bajri etc. collected by him for the execution of the work, directly to the Revenue Authority or authorized agent of the State Government concerned or Central Government.

Royalty at the prevalent rates shall be paid by the contractor or the RMC supplier as per the terms of supply between them, on all materials such as stone aggregate, coarse or fine sand etc. collected by him for the execution of the work, directly to the revenue authority of the State Government concerned. Further, contractor needs to submit proof of submission of full royalty to the State Government or local authority. Nothing extra shall be payable on this account.

1.17.12 All ancillary and incidental facilities required for execution of work like labour camp, stores, fabrication yard, offices for Contractor, watch and ward, temporary ramp required to be made for working at the basement level, temporary structure for plants and machineries, water storage tanks, installation and consumption charges of temporary electricity, telephone, water etc. required for execution of the work, liaison and pursuing for obtaining various No Objection Certificates, completion certificates from local bodies etc., protection works, barricading, testing facilities / laboratory at site of work, facilities for all field tests and for taking samples etc. during execution or any other activity which is necessary (for execution of work and as directed by Engineer-in-Charge), shall be deemed to be included in rates quoted by the Contractor, for various items in the schedule of quantities. Nothing extra shall be payable on these accounts. Before start of the work, the Contractor shall submit to the Engineer-in-Charge, a site / construction yard layout, specifying areas for construction, site office, positioning of machinery, material yard, cement and other storage, steel fabrication yard, site laboratory, water tank, etc.

1.17.13 The Contractor shall assume all liability, financial or otherwise in connection with this contract and shall protect and indemnify the IISER Tirupati from any and all damages and claims that may arise on any account. The Contractor shall indemnify the IISER Tirupati against all claims in respect of patent rights, royalties, design, trademarks of name or other protected rights, damages to adjacent buildings, roads or members of public, in course of execution of work or any other reasons whatsoever, and shall himself defend all actions arising from such claims and shall indemnify the IISER Tirupati in all respect from such actions, costs and expenses. Nothing extra shall be payable on this account.

1.17.14 The Contractor shall make all necessary arrangements for protecting from rain or likewise extreme weather conditions, the work already executed and for carrying out the further work, during monsoon including providing and fixing temporary shelters, protections etc. Nothing extra shall be payable on this account. Also, no claims for hindrance shall be entertained on this account.

1.17.15 In case of flooding of site on account of rain or any other cause and any consequent damage, whatsoever, no claim financially or otherwise shall be entertained not withstanding any other provisions elsewhere in the contract agreement. Also, the Contractor shall make good, at his own cost, the damages caused, if any. Further, no claims for hindrance shall be entertained on this account.

1.17.16 No payment shall be made for any damage caused by fire, rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The contractor shall be fully responsible for any damage to the govt. property and the work for which payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The contractor shall be fully responsible for safety and security of his material, T&P/Machinery brought to the site by him. The contractor shall maintain all the work in good condition at his own cost till the completion of the entire work.

1.17.17 In case the same item appears more than once in the schedule of work under the same sub head or among the different sub heads of works, the lowest rate quoted for that item shall be taken for other items also and tender will be evaluated accordingly.

1.17.18 The ESI and EPF contribution on the part of employer in respect of this contract shall be paid by the contractor. These contributions on the part of employer paid by the contractor shall be reimbursed by the Engineer in charge to the contractor on actual basis. The applicable and eligible amount of EPF& ESI shall be reimbursed preferably within 7 days but not later than 30 days of submission of documentary proof of payment which are in order.

1.18 Foreign Exchange:

1.18.1 No foreign exchange shall be made available by the IISER Tirupati for importing (purchase) of equipment, plants, machinery, materials of any kind or any other items if required to be carried out during execution of the work. No delay and no claim of any kind shall be entertained from the Contractor, on account of variation in the foreign exchange rate.

1.181.2 The contractors have to quote the corresponding imported items in “Indian Rupees” in the Schedule of Quantities which shall include all incidental charges including freight, taxes including GST,

import duties, fluctuations in currency rates. No extra payment will be made over and above the quoted rates.

1.19 Tools & Plant:

1.19.1 No tools and plants including any special T&P etc. shall be supplied by the IISER Tirupati and the Contractor shall have to make his own arrangements at his own cost. No claim of hindrance (or any other claim) shall be entertained on this account.

1.20 Horticultural works:

1.20.1 Horticultural activities, tree plantation, Nursery plantation shall be taken up in the campus along with constructional activities, as such, care shall be taken to avoid damages to these including existing trees, recently planted trees including tree guards and irrigation water supply piping system. Hence, while taking up excavation activities, trees as well as their root zones be protected and the stacking of excavated earth shall be made in such a way that neither plants are buried nor damaged. The initial survey, demarcation of roads and various buildings, sub grade of roads have been made in the campus which shall not be disturbed or damaged by vehicular movement or manual tampering; else the same shall be made good by the contractor at his own cost. In case of failure to comply with the above requirements the damage caused shall be made good at cost of contractor and the cost so incurred and assessed by Engineer in charge shall be recovered from running account bill of contractor.

1.21 As Built & Service Drawings:

1.21.1 The contractor shall submit completion plan (4 sets) as required vide General Specifications for Electrical works as applicable within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum of 0.1 % of Tendered Value or Rs. 25,000/- whichever is more as may be fixed by the Engineer in charge concerned and in this respect the decision of the Engineer in charge shall be final and binding on the contractor.

The contractor shall submit completion plans for Internal and External Civil, Electrical and Mechanical Services within thirty days of the completion of the work, provided that the service plans having been issued for execution by the Engineer-in-Charge, unless the contractor, by virtue of any other provision in the contract, is required to prepare such plans.

1.22 Computerized MBs & SMBs:

1.22.1 The contractor shall make available four (04) sets of computerized Standard Measurement Books (SMBs) having measurement of all the permanent standing in a building.

1.22.2 The contractor will submit computerized measurement sheet for the work carried out by him for making payment as per Clause – 6A of the General Conditions of Contract. For casting of RCC members and other hidden items the corrected and duly test checked measurement sheets of reinforcement or that of other hidden items shall be deposited with Engineer in charge or his authorized representative,

before casting of RCC or other hidden items. The delay in submission of corrected and duly checked measurement sheet may, therefore, delay casting of RCC or execution of hidden item for which no hindrance shall be recorded.

1.22.3 At any time, electronic measurement book may also be introduced. The contractor shall comply with the same as per the direction of Engineer-in-charge.

1.23 Water Supply & Sanitary Installations & Testing:

1.23.1 Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to approved manufacturers specifications where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost. The contractor shall submit for the approval of the Engineer-in-Charge, the name of the plumbing agency (along with their working experience in recent past) proposed to be engaged by him.

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

2.0 RECORDING OF HINDRANCES:-

2.1 Whenever any hindrance whether on part of IISER Tirupati or on part of contractor, comes to the notice of the PMC/Engineer in charge representative, he should at once make a note of such hindrance in the register kept at site, and immediately make a report to the Engineer in Charge within a week.

2.2 Each hindrance should be entered in the Hindrance Register, which should be authenticated by the Engineer in Charge and Contractor. The Engineer in charge shall review the Hindrance Register at least once in a month.

2.3 The hindrances on part of contractor are also to be entered in the Hindrance Register.

2.4 The hindrance register shall be submitted at the time of payment of each Running Account Bill.

3.0 SECRECY

3.1 The contractor shall take all steps necessary that all persons employed on any work in connection with the contract have noticed that the Indian Official Secrets Act 1923 applies to them & will continue so to apply even after the execution of such works under the contract.

3.2 The contract is confidential and must be strictly confined to the contractor's own use (except so far as confidential disclosure to sub-contractors or suppliers as necessary) and to the purpose of the contract.

3.3 All documents, copies thereof & extracts there from furnished to the contractor shall be returned to the Engineer-in-Charge on the completion of the work / works or the earlier determination of the contract.

4.0 LABOUR AND SECURITY

4.1 In the event of the contractor(s) committing a default or breach of any of the provisions of the Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and' Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Government a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 per cent of the estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the parties.

No payment shall be made for construction of labour housing.

4.2 The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable to the works, at his site office.

4.3 Contractor should provide his plan for labour huts as per his requirement and get it approved from the Engineer-in-Charge. The contractor will be provided space for labour huts etc. inside the campus but the space requirement and location, as assessed by Engineer-in-Charge shall be final and binding.

4.4 If as per the rules of the local authority, the huts for labour are not to be erected at the site of work by the contractors, the contractors are required to provide such accommodation as is acceptable to local bodies and nothing extra shall be paid on this account.

4.5 Contractor has to follow the security requirement of the campus and obtain necessary entry passes for the labour and vehicles and follow security checks at entry / exit gates, restriction on movement of vehicle, restricted timings of working etc. The IISER Tirupati however shall assist the contractor in obtaining such passes for movement of vehicles and labour. No claim whatsoever shall be entertained on account of delay in entry of vehicles and labour including restrictions in working hours, if there is any.

4.6 The contractor shall employ only Indian Nationals after verifying their antecedents and loyalty. The contractor shall, on demand submit list of his agents, employees and work people concerned & shall satisfy as to the bonafides of such people.

4.7 The contractor & his work people shall observe all relevant rules regarding security promulgated in which work is to be carried out by the Controlling Administrative Authority of the campus/area (hereinafter referred to as “Administrator”).

4.8 The contractor, his representative, workman shall be allowed to enter through specified gates & timing as laid down by the controlling authority. They shall be issued an identity card or an individual pass in accordance with the standing rules

regulations & they should possess the same while working. The contractor shall be responsible for the conduct & actions of his workmen, agents/ representatives.

4.9 Normally contractor shall be allowed to carry out work between 7 AM to 6 PM. However, he may also be allowed to carry out the work beyond 6 PM & up to 7 AM if the site conditions / circumstances so demand with prior written permission from the “Administrator”. However, if the work is carried out in more than one shift or at night, no claim on this account shall be entertained.

4.10 Normally contractor’s material / vehicles etc. shall be allowed to move in / go-out between 7 AM to 7 PM only & no movement of material / vehicles out of site of work shall be allowed during night hours unless specific permission is obtained from the “Administrator”.

4.11 In case if a separate entry has been allowed, the contractor has to make all arrangement for making a separate entry gate and barricading of the working area to segregate/separate the same from other areas. All these have to be done by the contractor at his own cost including safeguarding any untoward incident in the restricted area due to separate entry gate and barricading arranged by the contractor. No extra amount on this account shall be payable by the IISER Tirupati.

4.12 In the event of any restrictions being imposed by the Security agency, IISER TIRUPATI, Traffic or any other authority having jurisdiction in the area on the working or movement of labour /material, the contractor shall strictly follow such restrictions and nothing extra shall be payable to the contractor on such accounts. The loss of time on these accounts, if any, shall have to be made up by augmenting additional resources whatever required. Nothing extra shall be payable on this account.

5.0 OFFICE INFRASTRUCTURE:

5.1 For Quality Control Measures, Preparation of Bills and Monitoring the Quality, the contractor shall provide one Computer having Intel core i 5 3rd generation processor, MS-Windows-7, A-3 Coloured Inkjet & A-4 Laser jet Printers, Scanners, UPS etc. with data entry operator in the site office of Engineer-in-Charge.

5.2 The contractor shall make arrangement for Helmets and leather shoes (meant of construction work at sites) for all field staff of the IISER Tirupati during the entire period of construction for safety reasons. One helmet and two pairs of shoes per staff member (maximum twenty members) of the IISER Tirupatis per year shall be arranged by the contractor.

6.0 DOCUMENTATION

The Contractor shall render all help and assistance in documenting the total sequences of this project by way of photography, slides, audio / video recording & other records etc. Nothing extra shall be payable to Contractor on this account. However, cost of photographs, slides, audio / video graph etc. shall be borne by the IISER Tirupati. The original films shall be the property of the IISER Tirupati. No copy shall be prepared without the prior approval of the Engineer- in – Charge.

7.0 PROGRESS CHART: -

7.1 The contractor shall submit a Time and Progress Chart for each mile stone. The

Engineer-in-charge may within 30 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work. The chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given in Schedule 'C'.

7.2 In case of non-submission of construction programme by the contractor the program approved by the Engineer-in-charge shall be deemed to be final.
7.3 The approval by the Engineer-in-charge of such programme shall not relieve the contractor of any of the obligations under the contract.

7.4 The contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by Engineer-in-charge for
the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 2500/- (for works costing up to Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs.20 Crores) shall be made on per week or part basis in case of delay in submission of the monthly progress report.

7.5 The program chart should include the following: -
Descriptive note explaining sequence of various activities.
BAR CHARTS prepared in mutually agreed software or in other format decided
by Engineer-in-charge which will indicate resources in financial terms, manpower
and specialized equipment for every important stage.

Program for procurement of materials by the contractor.

Program for arranging and deployment of manpower both skilled and unskilled so as to achieve targeted progress.

Program of procurement of machinery / equipment having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor. In addition, to the above to achieve the progress of work as per programme, the contractor must bring at site adequate shuttering material required for cement concrete and RCC works etc. The contractor shall submit shuttering schedule adequate to complete the structure work within the laid down physical milestones.

Programme for achieving milestones.

7.6 The submission for approval by the Engineer-in-charge of such programme or such particulars shall not relieve the contractor of any of the duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-charge to take action against the contractor as per terms and conditions of the agreement.

8.0 PROGRESS AND MONITORING OF WORK:

8.1 The progress report shall contain the following, apart from whatever else may be required as specified:-

Construction schedule of the various components of the work through a bar chart for the next three months (or as may be specified), showing the micro milestones, targeted tasks and up to date progress. At least 10 digital photographs showing all the parts of construction site along with at least 5 minutes video of executions of different items in soft copy has to be submitted in every monthly progress report.

Progress chart of the various components of the work that are planned and achieved, for the month as well as cumulative up to the month, with reason for deviations, if any in a tabular format.

Plant and machinery statement, indicating those deployed in the work.

Man-power statement, indicating individually the names of all the staff deployed on the work, along with their designations. Number of skilled workers and unskilled workers deployed on the work and their location of deployment.

Financial statement, indicating the broad details of all the running account payment received up to date, such as gross value of work done, advances taken, recoveries effected, amount withheld, net payments details of cheque payment received, extra /substituted /deviations items if any, etc.

8.2 For completing the work in time, the Contractor might be required to work in two or more shifts (including night shifts). No claim whatsoever shall be entertained on this account, not with-standing the fact that the Contractor may have to pay extra amounts for any reason, to the labourers and other staff

engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the Contractor with them.

8.3 The work should be planned in a systematic manner so that chase cuttings in the walls, ceilings and floors is minimized. Wherever absolutely essential, the chase shall be cut using chase cutting machines. Chases will not be allowed to be cut using hammer / chisel. The electrical boxes should be fixed in walls simultaneously while raising the brick work. The contractor shall ensure proper co-ordination of various disciplines viz. building works, sanitary & water supply & electrical installations etc.

8.4 The contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose of the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of Engineer-in-charge.

8.5 The Contractor shall do proper sequencing of the various activities by suitably staggering the activities within various pockets in the plot so as to achieve early completion. The agency may deploy adequate equipment, machinery and labour as required for the completion of the entire work within the stipulated period specified. Also ancillary facilities shall be provided commensurate with requirement to complete the entire work within the stipulated period. Nothing extra shall be payable on this account. Adequate number/sets of equipment in working condition, along with adequate stand-by arrangements, shall be deployed during entire construction period. It shall be ensured by the Contractor that all the equipment, Tools & Plants, machineries etc. provided by him are maintained in proper working conditions at all times during the progress of the work and till the completion of the work. Further, all the constructional tools, plants, equipment and machineries provided by the Contractor, on site of work or his work shop for this work, shall be exclusively intended for use in the construction of this work and they shall not be shifted / removed from site without the permission of the Engineer-in-Charge.

8.6 All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

9.0 PROJECT REVIEW MEETINGS:

The contractor, immediately on award of work shall submit details of his key personnel to be engaged for the work at site. In addition, he shall furnish the Engineer-in-charge detailed organization involved with the work.

The contractor shall present the programme and status at various review meetings as required.

Monthly Review Meetings: Shall be attended by Project - in - charge and the Management Representative who can take independent decisions along with IISER TIRUPATI, client’s representatives.

Agenda
Progress Status/Statistics.

Completion Outlook.

Major hold ups/slippages.

Assistance required.

Critical issues.

Any decision on queries raised either by Contractor/PMC.

Anticipated cash flow requirement for next two months.

10.0 ENGAGING SPECIALISED AGENCIES FOR WORKS: -

10.1 The Contractor shall engage specialized agencies having adequate technical capability and experience of having executed at least one work of similar items for executing the following items of the work and/or any other items of work where specialized firm is required to be engaged as per contract conditions.

Water proofing treatment work of all types.
Aluminium Work.
Granite flooring/wall lining.
Stainless steel railing.
Pre-Engineered Structures
Sewage Treatment Plant
All types of false ceilings

10.2 The Specialized agency for the work shall be got approved from the Engineer-in-Charge well before actual commencement of the item of work. The contractor shall submit the list of specialized agencies proposed to be engaged by him along with their technical capability and necessary performance certificates, within 30 days of the stipulated date of start to substantiate technical capability and experience of the agency for prior approval of the Engineer-in-Charge.

10.3 It shall be the responsibility of main contractor to sort out any dispute / litigation with the Specialized Agencies without any time & cost overrun to the IISER Tirupati. The main contractor shall be solely responsible for settling any dispute / litigation arising out of his agreement with the Specialized Agencies. The contractor shall ensure that the work shall not suffer on account of litigation/ dispute between him and the specialized agencies / sub-contractor(s). No claim of hindrance in the work shall be entertained from the Contractor on this account. No extension of time shall be granted and no claim what so ever, of any kind, shall be entertained from the Contractor on account of delay attributable to the selection/rejection of the Specialized Agencies.

DEFECT LIABILITY PERIOD (REFUND OF SECURITY DEPOSIT) :

11.1 The defect liability / maintenance period shall be 12 months after the date of completion of work for this contract agreement. The Security Deposit shall be released after the defect liability period of 12 months after completion of work and for this, the contractor shall have to produce a certificate stating that no defects are pending for rectification from the Engineer-in-charge, but subject to other provisions specified elsewhere in the contract agreement.

12.0 SAFETY MEASURES

12.1 The issue of construction safety & standards has gained utmost importance in recent times. This subject is to be dealt with in an integrated manner with an approach to developing and establishing a safety culture at work sites. Broadly, its components are:
Creating awareness.
Education.
Training.
Implementation.
Enforcement measures.

All workers of contractor and associate agencies, invariably and at all the times, must follow all safety norms, adopt safe construction practices and use all required safety gadgets in their working throughout the project duration.

12.2 The contractor shall issue *Photo Identity Cards* with unique numbers containing salient information of workers for the labour & his staff.

12.3 The Contractor shall monitor and achieve the objectives of construction safety continuously, progressively and through affirmative action, and shall oversee implementation of safety program over the entire construction period.

12.4 Warning / Caution Boards
All temporary warning / caution boards / glow signage display such as “Construction Work in Progress”, “Keep Away”, “No Parking”, Diversions & protective Barricades etc. shall be provided and displayed during day time by the Contractor, wherever required and as directed by the Engineer-in-Charge. These glow signage and red lights shall be suitably illuminated during night also. The Contractor shall be solely responsible for damage and accident caused, if any, due to negligence on his part. Also he shall ensure that no hindrance, as far as possible, is caused to general traffic during execution of the work. This signage shall be dismantled & taken away by the Contractor after the completion of work, only after approval of the Engineer – in – Charge. Nothing extra shall be payable on this account.

12.5 Sign Boards
12.5.1 The Contractor shall provide and erect a display board of size and shape as required and paint over it, in a legible and workman like manner, the details about the salient features of the project, as

required by the Engineer-in-Charge. The Contractor shall fabricate and put up a sign board in an approved location and to an approved design indicating name of the project, client / owner, architects, structural consultants, IISER Tirupati etc. besides providing space for names of other Contractors, Associate contractors and specialized agencies. Nothing extra shall be payable on this account.

12.5.2 A display board shall be kept at site which would list the names of workers, teams and agencies following safety program in the best manner. This would be updated weekly.

12.5.3 Necessary protective and safety equipment shall be provided to the Site Engineer, Supervisory staff, labour and technical staff of the contractor by the Contractor at his own cost and used at site.

12.5.4 No inflammable materials including P.O.L shall be allowed to be stored in huge quantity at site. Only limited quantity of P.O.L may be allowed to be stored at site subject to the compliance of all rules / instructions issued by the relevant authorities and as per the direction of Engineer -in- Charge in this regard. Also all precautions and safety measures shall be taken by the Contractor for safe handling of the P.O.L products stored at site. All consequences on account of unsafe handling of P.O.L shall be borne by the Contractor.

13.0 SPECIAL CONDITION FOR HARDWARE AND SANITARY WARES:

13.1 Engineer-in-Charge will take a decision regarding model numbers of equivalent Door/window hard ware/ sanitary ware at the time of execution, in case the material, from the manufacturer whose model number is mentioned, is not available. However, in case, the equivalent model so approved, is cheaper than the model already mentioned in item/approved makes list, the price adjustment will be made based on the difference in market rate. In case, the rate of subsequently approved model is more, no extra payment will be made on this account."

13.2 The following procedure should be followed in case of removal of rejected/sub-standard materials from the site of work.

Whenever any material brought by the contractor to the site of work is rejected, entry thereof should invariably be made in the site order book under the signature of the PMC giving approximate quantity of such materials.

As soon as the material is removed, a certificate to that effect may be recorded by the PMC against the original entry, giving the date of removal, mode of removal i.e. whether by truck, carts or by manual labour. If removal is by truck, the registration number of the truck should be recorded.

14.0 MOBILIZATION ADVANCE:

Before any installment of advance is released, the contractor shall execute a bank guarantee bonds not more than 6 in number from the scheduled bank for the amount equal to 110% of the amount of advance and valid for the period till recovery of advance. This (bank guarantee from scheduled bank for

the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery.

15.0 INSPECTION OF WORKS:

15.1 In addition to the provisions of relevant clauses of the contract, the work shall also be open to inspection by the Director, IISER Tirupati, and other senior officers of IISER TIRUPATI in addition of the Engineer-in-charge, his authorized representatives, Authorities and Team of Third Party Quality Assurance engaged for the work. The contractor shall at times during the usual working hours and at all times at which reasonable notices of the intention of the Engineer-in-charge or other officers as stated above to visit the works shall have been given to the contractor, either himself be present to receive the orders and instructions or have a responsible representative duly accredited in writing, to be present for that purpose.

15.2 The committee/consultant appointed by IISER TIRUPATI, shall be inspecting the works including workshops and fabrication factory to ensure that the works in general being executed according to the design, drawings and specifications laid down in the contract. Their observations shall be communicated by IISER TIRUPATI engineering staff and compliance is to be reported to IISER TIRUPATI. The committee/consultant appointed by IISER TIRUPATI shall certify on completion of particular building that it has been constructed according to the approved drawings design and specifications.

15.3 Senior Officers of IISER TIRUPATI, Dignitaries from Central Ministry / IISER Tirupati, State Government and IISER Tirupati Authorities shall be inspecting the on-going work at site at any time with or without prior intimation. The contractor shall, therefore, keep updated the following requirements and detailing:-

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.

Entrance and area surrounding to be kept cleaned.

Display layout plan key plan, Building drawings including plans, elevations and sections.
Up to date displays of programme chart (Bar charts) in MS PROJECT etc.

Keep details of quantities executed, balance quantities, deviations, possible Extra item, substituted Item etc.
Keep plastic / cloth mounted one sets of building drawings.
Set of Helmets and safety shoes for safety.

16.0 INSURANCE POLICIES:

Before commencing the execution of work, the Contractor shall, without in any way limiting his obligations and liabilities, insure at his own cost and expense against any damage or loss or injury, which may be caused to any person or property, at site of work. The Contractor shall obtain and submit to the

Engineer-in-Charge proper Contractor All Risk Insurance Policy for an amount equivalent to the contract amount for this work, with Engineer-in-Charge as the first beneficiary. The insurance shall be obtained in joint names of Engineer-in-Charge and the Contractor (who shall be second beneficiary). Also, he shall indemnify the IISER Tirupati from any liability during the execution of the work. Further, he shall obtain and submit to the Engineer-in-Charge, a third party insurance policy for maximum Rs.10 lakh for each accident, with the Engineer-in-Charge as the first beneficiary. The insurance shall be obtained in joint names of Engineer-in-Charge and the Contractor (who shall be second beneficiary). The Contractor shall, from time to time, provide documentary evidence as regards payment of premium for all the Insurance Policies for keeping them valid till the completion of the work. The Contractor shall ensure that Insurance Policies are also taken for the workers of his Sub-Contractors / specialized agencies also. The contractor including subcontractors shall provide comprehensive group insurance cover for all the workers and their supervisory staff deployed at site. The details of insurance cover to be provided shall be submitted by the contractor / associate agencies within 20 days of date of start. In case of a default,

appropriate policy shall be got done by the safety monitoring committee and double the fee of the policy shall be recovered from the next bill of the contractor. Without prejudice to any of its obligations and responsibilities specified above, the Contractor shall within 15 days from the date of letter of acceptance of the tender and thereafter at the end of each quarter submit a report to the IISER Tirupati giving details of the Insurance Policies along with Certificate of these insurance policies being valid, along with documentary evidences as required by the Engineer-in-Charge. No work shall be commenced by the Contractor unless he obtains the Insurance Policies as mentioned above. Also, no payment shall be made to the Contractor on expiry of insurance policies unless renewed by the Contractor. Nothing extra shall be payable on this account. No claim of hindrance (or any other claim) shall be entertained from the contractor on these accounts.

17.0 APPLICABLE PERMITS:

17.1 The contractor(s) shall give to the Municipality, police and other authorities all necessary notices etc. that may be required by law and obtain all requisite licenses for temporary obstructions, enclosures etc. and pay all fee, taxes including GST and charges which may be levied on account of these operations in executing the contract. He shall make good any damage to the adjoining property whether public or private and shall supply and maintain lights either for illumination or for cautioning the public at night.

17.2 The contractor shall ensure that applicable permits mandated by the local bodies and in case warranted for this work are obtained as required under the Applicable Laws.

18.0 LOCAL BYE-LAWS:

18.1 The building work shall be carried out in the manner complying in all respects with the requirements of relevant bye-laws of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and nothing extra shall be paid on this account.

18.2 Some restrictions may be imposed by the local police etc. on the working time and for movement of labour, materials etc. the contractor shall be bound to follow all such restrictions/instructions and nothing extra shall be payable on this account.

18.3 The contractor shall not stack building material/ malba on the road or on the land owned by any other authority, as the case may be. In case, the Contractor is found stacking the building material/ malba as stated above, he shall be liable to pay the stacking charges as may be levied by local body or authority and also to face penal action as per the rules, regulations and bye-laws of the said body or authority. The Engineer-in-Charge shall be at liberty to recover the sums due but not paid to the concerned authorities on the above counts from any sums due to the contractor including amount of the Security Deposit or Retention Money in respect of this contract or any other contract.

19.0 FINAL TESTING OF THE INSTALLATION:

The Contractor shall demonstrate trouble free functioning of all the Civil and E &

installations and services. The Engineer-in-Charge or his authorized representatives shall carry out final inspection of the various Civil and E & M services and installations. Any defect(s) noticed during demonstration shall be rectified by the Contractor at his own cost to the entire satisfaction of the Engineer-in-Charge. Nothing extra shall be payable on this account.

20.0 OCCUPATION CERTIFICATE:

The contractor shall coordinate and facilitate IISER Tirupati for obtaining occupation certificate/completion certificate from local bodies if required including getting the required site visits conducted by such authorities with a view to obtain the same.

ADDITIONAL CONDITIONS (Civil Component)

1.0 QUALITY ASSURANCE/TESTING OF MATERIALS: -

1.1.1 Water tanks, taps, sanitary, water supply & drainage pipes, fittings & accessories should conform to bye-laws of local body/corporation, where CPWD specifications are not available. The Contractor (s) should engage approved, licensed plumbers for the work and get the materials (fixtures/fittings) tested, by the municipal Body/Corporation authorities wherever required at his own cost. The Contractor shall submit for the approval of the Engineer-in-Charge, the name of the plumbing agency (along with their working experience in recent past) proposed to be engaged by him.

1.1.2 With each Running Bill, the details of test carried out shall be submitted by the contractor as per Performa given in the tender document.

1.1.3 Samples of materials required for testing shall be provided free of charge by the contractor. The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimension as may be necessary. The sealed samples are to be handed over to the testing lab by the contractor in the presence of representative of Engineering in charge. The cost of other than steel & Ultrasonic pulse velocity tests, to be carried out in approved labs shall be borne by the contractor i/c All other expenditure required to be incurred for taking samples; conveyance, packing etc. shall be borne by the contractor himself.

1.1.4 The Contractor shall at his own risk and cost make all arrangements and shall provide all such facilities including material and labour, the Engineer-in-Charge may require for collecting, preparing, forwarding the required number of samples for testing as per the frequency of test stipulated in the contract specifications or as considered necessary by the Engineer-in-Charge, at such time and to such places, as directed by the Engineer-in-Charge. Nothing extra shall be payable for the above.

1.1.5 The Contractor or his authorized representative shall associate in collection, preparation, forwarding and testing of such samples. In case he or his authorized representative is not present or does not associate him, the result of such tests and consequences thereon shall be binding on the Contractor .The Contractor or his authorized representative shall remain in contact with the Engineer-in–Charge or his authorized representative associated for all such operations. No claim of payment or claim of any other kind, whatsoever, shall be entertained from the Contractor.

1.1.6 Maintenance of Register of Tests:-

All the registers of tests carried out a Construction Site or in outside laboratories shall be maintained by the contractor which shall be issued to the contractor by Engineer-in-Charge.

All Samples of materials including Cement Concrete Cubes shall be taken jointly with Contractor by representative of the Engineer in Charge. All the assistance shall be provided by the contractor. Cost of

sample materials is to be borne by the contractor and he shall be responsible for safe custody of samples to be tested at site.

All the test in field lab setup at Construction Site shall be carried out by the Engineering Staff deployed by the contractor which shall be 100% witnessed by representative of the 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 representative.

Contractor shall be responsible for safe custody of all the test registers.

1.1.7 Extensive testing of the materials used for construction is a pre-requisite for attaining high quality of the work. This shall also require specialized tests, physical, chemical, ultrasonic, x-ray and various other types of tests which cannot possibly be carried out in a site laboratory. These tests also require specialized personnel who regularly deal in such testing. Therefore the need arises for carrying out the tests in outside laboratories. These laboratories may be in the Govt. sector, Semi Govt. or Private sector. All Govt. Institutes, Indian Institute of Technology, National Institute of Technology, Central and State funded laboratories stands approved. No approval is required for testing in these laboratories/institutes. However, the outside private laboratories shall be approved in the following manner:-

The Engineer in charge will approve the private lab irrespective of distance for tests accredited by NABL or any other similarly placed accrediting government body which operates in accordance with ISO/IEC 17011 and acridities labs as per ISO/IEC 17025.

A lab will have to submit details of space available, equipment, staff (Technical and Non-Technical), accreditation and approval from various IISER Tirupati/institutes. Lab must be NABL approved.

Initial approval of lab should for one year and can be revalidated for further one year and so on.

Every lab will be audited for maintenance and calibration of equipment and employment of staff prior to approval/revalidation.

However, testing of material in any Govt., Lab / Public Undertaking Lab / IIT or NIT Lab / Govt. Engineering College may be allowed by Engineer in Charge.

1.1.8 Ultrasonic pulse velocity test shall be conducted on at least 5% of the total number of RCC members in each category i.e. beam, column, slab and footing for ensuring quality of concrete as per directions of Engineer- in charge. The cost of the same shall be borne by the contractor.

1.1.9 In case there is any discrepancy in frequency of testing as given in list of mandatory tests and that in individual sub-heads of work as per CPWD Specifications higher of the two frequencies of testing shall be followed and nothing extra shall be payable on this account.

1.1.10 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-charge & 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.

1.1.11 In addition to the supervision of work by IISER TIRUPATI Engineers, the Architects deployed by the IISER TIRUPATI, Quality Control/ Assurance Team and Third party Quality Control/ Assurance Team shall also be carrying out regular and periodic inspection of the ongoing activities in the work and deficiencies, shortcomings, inferior workmanship pointed out by them shall be communicated by IISER TIRUPATI engineers to the contractor. Upon receipt of instructions from Engineer in Charge these are also to be made good by necessary improvement, rectification, replacement up to his complete satisfaction. Special attention shall be paid towards line and level of internal and external plastering, 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, thinnest joints in stone/ tiling / cladding work, non-hollowness in floor and dado tiles work, protection of scratches over flooring by impounding layer of plaster of Paris, water tight pipe linings, absence of hollow vertical joints in brick masonry, proper compaction of filled up earth etc. to achieve an Institution of International standards and up keeping of quality assurance shall be of paramount importance, as such.

1.1.12 The Contractor shall submit, within 15 days after the date of award of work, a detailed and complete method statement for the execution, testing and Quality Assurance, of such items of works, as directed by the Engineer-in-Charge. All the materials to be used in the work, to give the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per 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.

1.2 FIELD LABORATORY

The contractor has to establish within 21 days from the award of work a field laboratory at site including all necessary equipment and skilled manpower for the Field Tests as indicated in the tender document at his own cost to have proper quality control. Rs.1,000/-per day shall be recovered from the contractor for any delay beyond the specified period. If contractor fails to establish lab within additional period of 15 days, the Engineer in charge shall initiate action as deemed fit under relevant clauses of the agreement.

For performing the above tests, the Field Testing Equipment and Instruments as indicated in the tender document are to be arranged and maintained by the contractor at his own cost.

1.2.1 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set-out tolerance limit shall be summarily rejected by the Engineer-in-

Charge & contractor shall be bound to replace / remove such sub-standard / defective work immediately.

1.2.2 The list of Laboratory/ Field equipment referred above is to be arranged and maintained by the contractor at the site of work. In case the equipment required for any test is not available at site, the IISER Tirupati shall get the test conducted from the third party. However in that event, besides providing free materials of sample, the cost of taking of sample, packing, transportation, testing charges etc. shall be borne by the contractor irrespective of the results.

1.3 SAMPLE OF MATERIALS:-

1.3.1 All materials and fittings brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work. If a particular brand of material is specified in the item of work in Schedule of Quantity, the same shall be used after getting the same approved from Engineer-in-Charge. Wherever brand / quality of material are not specified in the item of work, the contractor shall submit the samples as per List of Approved Makes given in the tender document for approval of Engineer-in-Charge. For all other items, ISI Marked materials and fittings 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 for the approval of Engineer-in-Charge.

1.3.2 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.

1.3.3 To avoid delay, contractor should submit samples / as stated above well in advance so as to give timely orders for procurement. 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. Samples including brand / quality of materials and fittings to be used in the work shall be got approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.

1.3.4 BIS marked materials except otherwise specified shall also be subjected to quality test besides testing of other materials as per the specifications described for the item/material. Wherever BIS marked materials are brought to the site of work, the contractor shall, furnish manufacturer's test

certificate or test certificate from approved testing laboratory to establish that the material procured by the contractor for incorporation in the work satisfies the provisions of specifications relevant to the material and / or the work done.

BIS marked items (except cement & steel for which separate provisions have been made) required on the work shall be got tested, for only important tests, which govern the quality of the product, as decided by the Engineer-in-Charge. The frequency of such tests (except the mandatory test) shall be 5% of the frequency as specified in BIS. For mandatory test, frequency shall be as specified in the CPWD Specifications.

1.3.5 For certain items, if frequency of tests is neither mentioned in the CPWD Specifications nor BIS, then tests shall be carried out as per directions of Engineer-in-Charge.

2.0 CEMENT & STEEL REINFORCEMENT

2.1 Contractor has to procure Cement and Steel and has to produce manufacturers test certificate and challan for each lot of Cement & Steel Reinforcement procured at site.

2.2 CEMENT:-

2.2.1 The contractor shall procure 43 grade ordinary Portland Cement (OPC) conforming to IS: 8112 / Portland Pozzolona Cement (PPC) conforming to IS: 1489 (Part-1) as required in the work from reputed manufacturers of cement as mentioned in “Approved Makes” or from any other reputed cement manufacture having a production capacity not less than 1 million Ton per annum as approved by Engineer in charge. The cement of approved make as aforesaid in 50 kg. bags bearing manufacturer’s name and ISI marking, along with manufacturers test certificate for each lot shall be procured by the contractor.

Minimum M30 grade of concrete shall be used in all structural elements of RCC, both in load bearing and framed structure.

Wet curing period shall be enhanced to a minimum of 10 days or its equivalent. In hot & arid regions, the minimum curing period shall be 14 days or its equivalent.

2.2.2 Samples of cement arranged by the contractor shall be taken by the Engineer-in-Charge and got tested in accordance with provisions of relevant BIS Codes. The cement for such testing purpose shall be supplied by the contractor free of charge. In case test results indicate that the cement arranged by the contractor does not conform to the relevant BIS Codes, the same shall stand rejected and shall be removed from the site by the contractor at his own cost within a week’s time of written order from the Engineer-in-Charge to do so. The cost of tests shall be borne by the contractor/IISER Tirupati in the manner indicated below:

By the contractor, if the results show that the cement does not conform to relevant BIS Codes.

By the IISER Tirupati, if the results show that the cement conforms to relevant BIS Codes.

2.2.3 Cement shall be brought at site in bulk supply of approximately 200 tonnes or as decided by the Engineer-in-Charge.

2.2.4 OPC & PPC bags shall be stored in separate godowns. Separate godowns for tested cement and fresh cement (under testing) to be constructed by the contractor at his own cost as per sketches given in C.P.W.D Specifications having weather-proof roofs and walls. The size of the cement godown is indicated in the sketches for guidance. The actual size of godown shall be as per site requirements and nothing extra shall be paid for the same. Each godown shall be provided with a single door with two locks. The keys of one lock shall remain with Engineer-in-Charge or his authorized representative of the work and that of other lock with the authorized agent of the contractor at the site of work so that the cement is issued from godown according to the daily requirement with the knowledge of both parties. The account of daily receipt and issue of cement shall be maintained in a register in the prescribed proforma and signed daily by the contractor or his authorized agent and Engineer-in-Charge or his authorized representative in token of its correctness. The day to day receipt and issue accounts of different grade/brand of cement shall be maintained separately in the standard proforma by the contractor or his authorized representative which shall be duly signed by the authorized representative of the Engineer-in-Charge before issue to the work on day to day basis.

Required number of cement godowns each having capacity as decided by the Engineer-in-Charge 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-downs. The contractor shall facilitate the inspection of the cement go-downs by the Engineer-in-Charge at any time.

2.2.5 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 Clause-42 of the contract and shall be governed by the conditions laid therein.

2.2.6 If the quantity of cement actually used in the work is found to be more than the theoretical quantity of cement including authorized variation, nothing extra shall be payable to the contractor on this account. In the event of it being discovered that after the completion of the work, the quantity of cement used is less than the quantity ascertained as herein before provided (allowing variation on the minus side as stipulated in Clause - 42), the cost of quantity of cement not so used shall be recovered from the contractor as specified in schedule. Decision of the Engineer-in-Charge in regard to theoretical quantity of cement which should have been actually used as per the schedule and recovered at the rate specified, shall be final and binding on the contractor.

For non-scheduled items, the decision of the Engineer in charge, regarding theoretical quantity of the cement, which should have been actually used, shall be final and binding on the contractor.

2.2.7 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.

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

2.2.9 In case the contractor brings surplus quantity of cement the same shall be removed from the site after completion of work by the contractor at his own cost after approval of the Engineer-in-Charge.

2.2.10 Cement, which is not used within 90 days from its date of manufacture, shall be retested at approved laboratory. Until the results of such tests are found satisfactory, it shall not be used on the work.

2.2.11 Compressive Strength of Cement

The average compressive strength of at least three mortar cubes (area of face 50 cm2) composed of one part of cement, three parts of standard sand (conforming to IS 650:1996) by mass and P/4+3.0 percent (of combined mass of cement plus sand) water, and prepared, stored and tested in the manner described in IS 4031 (Part 6): 1988, shall be as follows:

a) 72 ± 1 hour not less than 23 MPa
b) 162 ± 2 hour not less than 33 MPa
c) 672 ± 4 hour not less than 43 MPa

NOTE: - P is the percentage of water required to produce a paste of standard consistency (see as below)

Consistency of Standard Paste:-

The quantity of water required to produce a paste of standard consistency, to be used for the determination of the water content mortar for the compressive strength tests and for the determination of soundness and setting time, shall be obtained by the method described in IS 4031 (part 4) : 1988.

2.3 STEEL REINFORCEMENT: -

2.3.1 (a) The Contractor shall procure IS marked TMT bars of various grades from the steel manufacturers or their authorized dealers having valid BIS license for IS: 1786-2008 (Amendment-1 November 2012).

The procured steel should have following qualities:
Excellent ductility, bend ability and elongation of finished product due to possible refining technology.

Consumption of steel should be accurate as per design
Steel should have no brittleness problem in finished product.
Steel should carry the quality of corrosion and earthquake resistance.

Quality steel with achievement of proper level of sulphur and phosphorus as per IS: 1786-2008.

2.3.2 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.

2.3.3 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, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time on written orders from the Engineer-in-charge to do so. Else the IISER Tirupati shall remove it and recover double the cost of removal from the contractor.

2.3.4 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.

2.3.5 The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to prevent their 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.

2.3.6 For checking nominal mass, tensile strength, bend test, re-bend test etc. specimens 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 below 100 tonnes	For consignment above 100 tonnes
Under 10mm dia bars	One sample for each 25 tonnes or par thereof.	One sample for each 40 tonnes or part thereof.
10mm to 16mm dia bars	One sample for each 35 tonnes or part thereof.	One sample for each 45 tonnes or part thereof.
Over 16mm dia bars	One sample for each 45 tonnes or part thereof.	One sample for each 60 tonnes or part thereof.

2.3.7 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.

2.3.8 The actual issue and consumption of steel on work shall be regulated and proper accounts maintained as provided in clause 10 of the contract. The theoretical consumption of steel shall be worked out as per procedure prescribed in clause 42 of the contract and shall be governed by conditions laid therein. In case the consumption is less than theoretical consumption including permissible variations recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment need to be made.

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

2.3.10 The contractor shall submit original vouchers from the manufacturer for the total quantity of steel supplied under each consignment to be incorporated in the work. All consignment received at the work site shall be inspected by the Site staff along with the relevant documents before acceptance. The contractor shall obtain Original Vouchers and Test Certificates and furnish the same to the Engineer-in-Charge in respect of all the lots of steel brought by him from approved supplier to the site of work. The original vouchers and test certificates shall be defaced by the Site staff and kept on record in the site office.

2.3.11 Reinforcement including authorized spacer bars and laps shall be measured in length of different diameters as actually (not more than as specified in the drawings) used in the work nearest to a centimeter. Wastage and unauthorized overlaps shall not be measured.

2.3.12 The standard sectional weights referred to as in Table 5.4 in para 5.3.4 in CPWD Specifications will be considered for conversion of length of various sizes of M.S. Bars, Steel Bars and T.M.T. bars into Standard Weight.

2.3.13 Records of actual Sectional weights shall also be kept dia-wise and lot-wise. The average sectional weight for each diameter shall be arrived at from samples from each lot of steel received at site. The decision of the Engineer-in-Charge shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site of work each day will constitute one single lot for the purpose. The weight of steel by conversion of length of various sizes of bars based on the actual weighted average sectional weight shall be termed as Derived Actual Weight. However for the stipulated issue of steel reinforcement up to and including 10mm diameter bars, the actual weight of steel issued shall be modified to take into account the variation between the actual and the standard coefficients and the contractors' accounts will be debited by the cost of modified quantity.

2.3.14 (a) If the Derived Weight as in sub-para (2.3.12) above is less than the Standard Weight as in Sub-para (2.3.11) above then the Derived Actual Weight shall be taken for payment provided, if it is within the following tolerances specified in IS1786-2008, otherwise whole lot will be rejected.

Tolerances on Nominal Mass

Nominal Size in mm	Tolerance on Nominal mass Percent		
	Batch	Individual Sample*	Individual sample for coil**
a) Upto 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. **For coils batch tolerance is not specified.

If the Derived Actual Weight is found more than the Standard Weight, the Standard Weight as per in sub-para (2.3.11) above shall be taken for payment. In such case nothing extra shall be paid for the difference between the Derived Actual Weight and the Standard Weight.

2.4 SAFETY IN CONSTRUCTION

2.4.1 The contractor shall employ only such methods of construction, tools and plants as are appropriate.

2.4.2 The contractor shall take all precautions and measures to ensure safety of works and work man and shall be fully responsible for the same.

2.4.3 Safety pertaining to construction such as centering & shuttering, scaffolds, ladders, working platforms, gangway etc. shall be governed by CPWD safety code, relevant safety codes and the directions of Engineer in charge.

2.4.4 All the staging to be either of tubular steel structure with adequate bracings as approved or made of built up structural sections made from rolled structural steel sections.

2.4.5 Form work shall be properly designed for self weight, weight of reinforcement, weight of fresh concrete and in addition the various live loads likely to be imposed during construction process.

2.4.6 The form work shall be designed & constructed so as to remain sufficiently rigid during placing & compaction of concrete & shall be such as to prevent loss of slurry from the concrete.

2.4.7 The vertical supports shall be adequately braced or otherwise secured in position that these do not fall when the load gets released or the supports are accidentally hit.

2.4.8 A thorough inspection of tubular steel centring is necessary before its erection and members showing evidence of excessive rusting, kinks, dents or damaged welds shall be discarded. Buckled or broken members shall be replaced. Care shall also be taken that locking devices are in good working order and that coupling pins are effectively aligned to frames. Tubes should have end to end joints in

adjacent tubes staggered. Sleeve couplers should be used in preference to joint pins for axial connections.

2.4.9 Inclined forms which give rise to very high horizontal forces should be taken care of by trussing and diagonal bracing

2.4.10 Vertical members should be placed centrally under the members to be supported and over the member supporting them with no eccentricity exceeding 25mm

2.4.11 The centering frames shall be tied together with sufficient braces to make a rigid and solid unit. It shall be ensured that struts and diagonal braces are in proper position and are secured so that frames develop full load carrying capacity. As erection progresses, all connecting devices shall be in place and shall be fastened for full stability of joints and units.

2.4.12 Wedges under the supports shall be set on firm soil / PCC which assures adequate stability for all props. Care shall be taken not to disturb the soil under the supports. Adequate drainage shall be provided to drain away the water coming due to rains, easing of forms or during the curing of the concrete to avoid softening of the supporting soil strata.

2.4.13 During pouring of the concrete the centering shall be constantly inspected and strengthened, if required wedges below the vertical supports tightened and adjustment screws properly adjusted as necessary.

2.4.14 Only workmen actually engaged in the form work shall be allowed in the area during operations. Those engaged in removing the form work shall wear helmets, gloves and heavy soled shoes and approved safety belts etc.

2.4.15 The safety code as lay down in respective clauses of Agreement shall be strictly followed.

PARTICULAR SPECIFICATIONS

I) CIVIL

INDEX FOR TECHNICAL SPECIFICATIONS

1.0 FORMWORK FOR EXPOSED CONCRETE SURFACES

1.0 Material and Workmanship

1.1 The relevant specification of CPWD Vol-I clause No.5.2 shall be followed except that the laminated shuttering plywood not less than 12 mm with supporting frame work comprising of MS angle/ Tee/ Flat/ Channel/ I beam and steel sheathing and steel plates made out of CR MS sheet not less than 2 mm thickness (14 gauge) shall be used instead of ordinary shuttering plywood/ steel sheathing, to obtain a desired smooth exposed surface finish. Contractor shall prepare shop drawing for shuttering pattern, which matches the architectural control line and getting approved before starting the work. The exposed surface shall be in desired pattern and size as per the approved shuttering pattern drawing. The shuttering shall have restricted reuse to obtain good surface finish. Contractor shall get prior approved for reuse shuttering plate or shuttering ply. Before re-use, all forms shall be inspected by the Engineer-in-charge and their suitability shall be ascertained. If, any of the forms are found to be unsuitable, they shall be immediately replaced. Only similar type of material shall be used for the entire work. The surface shall be presentable without further treatment. The surface shall be rendered and sand papered to the satisfaction of the Engineer in charge.

The specifications as given in CPWD shall generally be followed. In addition, the Contractor shall ensure the following:

a) Since the exposed concrete is intended to make a visual statement the Contractor shall ensure that the concrete on de-shuttering presents a clean and even surface. Repair/ patchwork shall not be permitted.
b) Form exposed corners of beams and columns to produce square, smooth, solid, unbroken lines, except as otherwise shown.
c) The Contractor to furnish the shutter boards in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
d) All formed joints on concrete surfaces to be exposed shall be taped and shall align so that joints will not be apparent on the concrete surfaces.
e) The location of all exposed features such as through tie bolts, joints shall be planned in such a way that no bolt hole/joint line etc., seems to be arbitrary and/or out of place.
f) The shuttering shall be of superior construction so as to avoid slurry leakage and consequent honeycombing etc.
g) The pattern of formwork for exposed concrete works shall be approved by the EIC prior to execution.
h) Approval of EIC for the shuttering material shall not absolve the contractor of his responsibility regarding the quality of finished work.
i) The design of form work shall conform to sound engineering practices and relevant BIS Codes.

1.2 All vertical members for formwork scaffolding shall be of steel like props, H frame etc. Care shall be taken to set all formwork in perfect line, level (or in required camber or slope as specified) and plumb. Formwork propping shall be strong, rigid and sturdy. The formwork shall be as per pattern & design shown in drawings. Formwork shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Crimps, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off of all rust, dust and loose materials. **Mould release agent of approved make** or as per the Architect / Engineer in charge shall be applied on sheathing before placing the reinforcement steel. Also the formwork material will be of laminated plywood/best quality steel sheathing or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour and texture. After de-shuttering, all concrete surfaces shall be properly rendered with sand paper or emery stone. The sample of the exposed concrete shall be got approved by the architect or engineer in charge.

1.3 Exposed/ Ordinary fair finished formwork For walls, columns, beams of basement and water retaining structures

For water retaining structure the shuttering plates on either side shall be bolted with tie rods made from spring coils on either side, welded with two nos. 8mm MS rods. PVC cone shall be placed on either side of the tie rod. The whole tie rod assembly along-with PVC cone shall be placed/ fixed with special type of bolts on either side of the shuttering plates. Length of the tie rod along-with PVC cone shall be equal to the width/ thickness of the element to be shuttered. Holes of cones shall be filled with polymer grout.

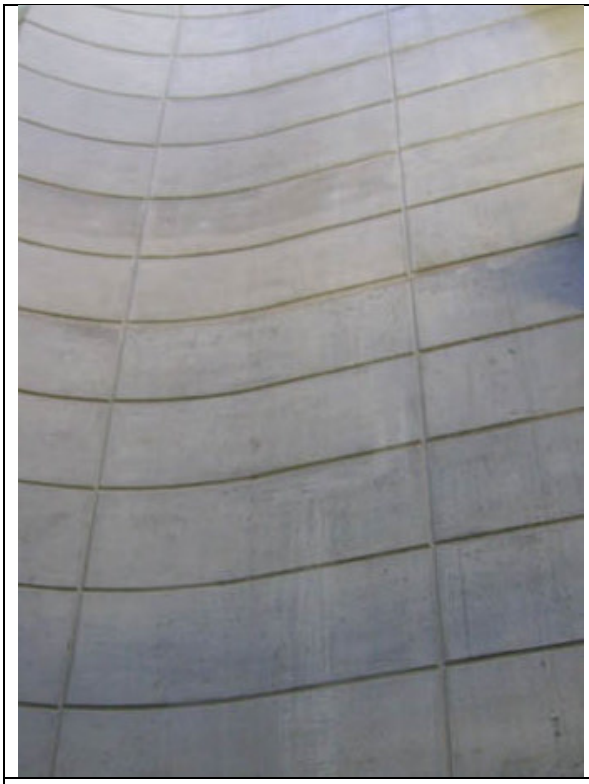
1.4 Exposed/ Ordinary fair finished formwork for walls, columns, beams of Super structure

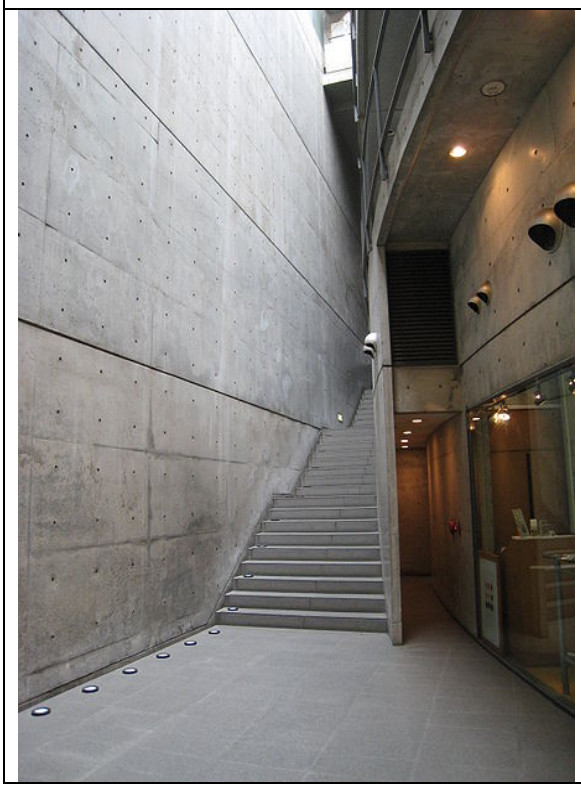
For walls, columns and beams, the shuttering plates on either side shall be bolted with through tie rods made from round bars minimum 12 mm with heavy quality PVC sleeves and minimum 25 mm thick PVC cones on either side of the sleeve. The whole tie rod assembly along-with PVC cone shall be placed /fixed with through bolts on either side of the shuttering plates. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

1.5 Mode of measurement and payment

Relevant specification shall be followed as per CPWD clause no-5.2 for any type and shape of elements.

The following reference images are attached to acquaint the Contractor of the expectation of the Client regarding the appearances of exposed concrete and are meant as a guide





END OF SECTION

2.0 SELF-COMPACTING CONCRETE

Ready Mix Concrete

Reference - IS 4926-1976 or amended

Terminology

Ready Mixed Concrete - Concrete delivered at site or into the purchaser's vehicle in a plastic condition and requiring no further treatment before being placed in the position in which it is to set and harden. All provisions for good workmanship, quality control and treatment, as stated in previous clauses shall be applicable.

Agitation - The process of continuing the mixing of concrete at a reduced speed during transportation to prevent segregation.

Agitator - Truck mounted equipment designed to agitate concrete during transportation to the site of delivery

Truck mixer - A mixer generally mounted on a self-propelled chassis capable of mixing the ingredients of concrete and of agitating the mixed concrete during transportation.

Types

Concrete-mix - Concrete shall be produced by completely mixing cement, aggregates, admixtures, if any and water at a stationary central mixing plant and delivered in containers fitted with agitating devices.

Materials

Cement - The cement used shall be ordinary Portland cement or low heat Portland cement conforming to IS-269* or Portland slag cement conforming to IS 455-or Portland-pozzolana cement conforming to IS: 1489-or rapid hardening Portland cement conforming to IS

8041E-as may be specified by Consultant at the time of placing the order. If the type is not specified ordinary Portland cement shall be used.

Fly ash when used for partial replacement of cement, shall conform to the requirements of IS: 3812 (part I

Water used for concrete shall conform to the requirement of IS: 456.

Admixtures shall only be used when so agreed to between the purchases and the manufacturer. The admixtures shall conform to the requirements of IS 456 and their nature, quantities and methods of use shall also be specified. Fly ash when used as an admixture for concrete shall conform to IS: 3812 (Part II

Measurement and Storage of Materials - Measurement and storage of materials shall be done in accordance with the requirements of IS: 456.

Basis of Supply

The ready mixed concrete shall be manufactured and supplied on the following basis. Specified strength based on 28-day compressive strength of 15-cm cubes tested in accordance with IS: 456 when the concrete is manufactured and supplied on the basis of specified strength, the responsibility for the design of mix shall be that of the manufacturer

General Requirement

In addition to the requirements specified in this standard and subject to such modifications as may be agreed to between the purchaser and the manufacturer at the time of placing order, the ready-mixed concrete shall generally comply with the requirements of IS: 456 The minimum quantity of cement and the details regarding proportioning and works control shall be as per Clauses above.

When a truck mixer or agitator is used for mixing a transportation of concrete, no water from the truck-water system or from elsewhere shall be added after the initial introduction of the mixing water for the batch, except when on arrival at the site of the work, the slump of the concrete is less than that specified; such additional water to bring the slump within required limits shall be injected into the mixer under such pressure and direction of floor that the requirements for uniformity specified in Appendix A are met.

Unless otherwise agreed to between the purchaser and the supplier, when a truck mixer of agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be complete within 1.5 hours (when the prevailing atmospheric temperature is above 20°C) and within 2 hours (when the prevailing atmospheric temperature is at or below 20°C) of adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the aggregate, whichever is earlier.

Temperature - The temperature of the concrete at the place and time of delivery shall be not less than 5°C. Unless otherwise required by the purchaser, no concrete shall be delivered, when the site temperature is less than 2.5°C and the thermometer reading is falling.

The temperature of the concrete shall not exceed 50C above the prevailing shade temperature, when the shade temperature is over 200C. The temperature of concrete mass on delivery shall not exceed 400C.

Sampling and testing: Adequate facilities shall be provided by the manufacturer for the purchaser to inspect the materials used, the process of manufacture and the methods of delivery of concrete. He shall also provide adequate facilities for the purchaser to take samples of the materials used.

Sampling and testing - Unless otherwise agreed to between the purchaser and the supplier, the sampling and testing of concrete shall be done in accordance with relevant requirements of IS: 456-, IS: 1199-and IS: 516-

Consistency or workability - The tests for consistency or workability shall be carried out in accordance with requirements of IS: 1199- or by such other method as may be agreed to between the purchaser and the manufacturer.

Strength Test - The compressive strength and flexural strength tests shall be carried out in accordance with the requirements of IS: 516- and the acceptance criteria for concrete whether supplied on the basis of specified strength or on the basis of mix proportion, shall conform to the requirements of Table 5 and other related requirements of IS: 456-.

Cost of Testing - Unless otherwise agreed to between the purchaser and the manufacturer, the cost of the tests carried out in accordance with the requirements of this specification shall be borne as follows:

By the manufacturer if the results show that the concrete does not comply with the requirements of this standard.

By the purchaser if the results show that the concrete complies with the requirements of this standard.

Manufacturer's Records and Certificates - The manufacturer shall keep batch records of the quantities by mass of all the solid materials, of the total amount of water used in mixing and of the results of all tests. If required by the purchaser, the manufacturer shall furnish certificates, at agreed intervals, giving this information.

The concrete quality shall meet all requirements and Specifications of concrete as stated hereof. Contractor shall be allowed to use own Batching Plant or procure concrete, but Quality Tests will be the responsibility of the Contractor and off-site Batching Plants shall be open for inspection to the Construction Manager throughout the Project.

Admixtures

General

Admixtures may be used in concrete only with the approval of Consultant / Construction Manager based upon evidence that, with the passage of time, neither the compressive strength not its durability get reduced. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement, or embodied steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to percent of the weight of the cement in each batch of concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixture shall be used as per manufacturer's instructions and in the manner and with the control specified by Consultant / Construction Manager.

Air Entraining Agent

Where specified and approved by Consultant / Construction Manager, neutralized vinsol resin or any other approved air entering agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM Standard 6 - 260, Air Entering admixtures for concrete. The recommended total air content of the concrete is 4% plus or minus 1%. The method of measuring air content shall be as per IS 1199.

Retarding Admixtures

Where specified and approved by Consultants / Construction Manager retarding agents shall be added to the concrete mix in quantities specified by Consultants / Construction Manager.

Water Reducing Admixtures

Where specified and approved by Consultants / Construction Manager water reducing lignosulfonate mixture shall be added in quantities specified. The admixtures shall be added in the form of a solution

Water Proofing Agent

Where specified and approved by Consultants / Construction Manager, chloride and sulphide free waterproofing agent shall be added in quantities specified.

Other Admixtures

The Consultants / Construction Manager may at his discretion instruct the Contractor to use any other admixtures in the concrete.

If the Contractor so wishes to use admixtures, then the following should be adhered to (subject or Construction Manager's approval).

No reduction will be allowed to target mean strength when compared to admixture free concrete of the same class.

Dosage of admixture shall be strictly in accordance with IS 456 and the manufacturer’s instruction.

The following information about the admixture shall be submitted to the Consultants / Construction Manager for record and approval.

Long and short term effects of the admixture in the concrete.

Effect of admixture of concrete permeability.

Effects of over and under dosage.

Shortage life and special storage requirements.

The Contractor when requested shall provide the services of a full time field technician of the admixture manufacturer to advise the proper addition of the admixture to the concrete or adjustment of concrete mix proportions to meet changing conditions.

The Contractor shall furnish a statement of responsibility from the admixture manufacturer for their products.

If the use of admixture is approved by the Consultants / Construction Manager, I t shall be constructed as a constructing part of the concrete without any extra payment.

Measurement

Formwork and reinforcement shall be paid separately. Volume of concrete measured shall include that occupied by:

Reinforcement of other metal sections

ast in components more than 0.01 m3 in

Rebates or internal each less than 0.005 m2 is 0005 sectioned area

Pockets and holes not exceeding 0.01 m3 in volume All works shall be measured in the Decimal system.

Dimensions shall be measured to the nearest 0.01 meter except for thickness of slabs that shall be measured to the 0.005 meter.

Areas shall be worked out to the nearest 0.01 Sqm.

Cubic contents shall be worked out to the nearest 0.01 cum.

Formwork and reinforcement shall be paid for separately.

The price of concrete shall include all labour, material, equipment, mixing, pumping, gangways, tools, transporting, hoisting to any height and lowering to any depth, pouring or laying, consolidating, leaving pockets, holes, disconnecting them till the next operation or completion of work, hacking the surface, to provide key for providing further work including cleaning wetting surfaces, etc. preparing construction joints as described, and all other activities required as per good construction practice.

Unit rates shall allow for chamfers, grooves, lines etc. in reinforced concrete members as well as necessary slope, drops, drip models etc.

No deductions shall be made for:

Ends of dissimilar materials (for example beams, posts, girders, corbels, purlins and steps) up to 500 sq. cm. in section.

Opening up to 0.1 sq. m.

Volume occupied by drainage, water, pipes, conduits, etc. not exceeding 100 sq. cm. each in cross-section.

Small voids not exceeding 40 sq. cm. in cross-section.

Small moulds, drip moulds, chamfers, splays, rounded or covered angles, beads, grooves, rebates up to 10 cm in depth and width.

Minimum cement content per cubic meter of cement concrete has been specified in each item of cement concrete work, However, if cement is required to be used so as to obtain the minimum

strength specified for the grade of cement concrete, the Contractor will not be paid for extra cement used.

Scope of Works

The following item are not intended to exclude any other items of works required by the Design Consultants, or that may be required by local code or good construction practice. The following work shall be included by the Contractor in its Tender and Contract Sum as they may not have been detailed specifically on the architectural and engineering drawings and specifications but we required in order that a complete job in every respect can be.

The supply, maintenance and removal of all temporary rungs, and ramping as necessary on the site

Placing of concrete will be pumps only or as approved by the Construction Manager.

All finishes and to the concrete work as shown or specified.

Allowed for the removal of constructions encountered.

he excavation and concrete construction of all sump pits, manholes, drains under slabs, etc. as described in the specifications and shown on the drawings.

Formwork, reinforcing, embedded items and layout for concrete tank cradles.

All roof mechanical and other building services equipment pads and kerbs at the HVAC and Electrical openings, concrete including dowels, formwork and roughing of concrete

All fire grading and removal of standing water before the placing of concrete.

Included for all below slab, surface water and drainage, including brick fill, within the Tender.

Points and in steel below slabs lightening protection systems as detailed. The Contractor, in the preparation of his Tender, is to allow for watertight construction.

Allow for keeping the works clear and tidy at all times and for the removal of debris arising from the works, and to be disposed off at locations designated by the Construction Manager, and frequent removed off the site. Any surplus concrete deposited at the work front of on the site (concrete droppings) must be removed by the Contractor at its own expense.

Provisions, hoisting, distribution and fixing of all embedded items required.

Leaving all necessary holes and pockets for steel work beams for lifts and for making good after installation by other Contractors. Casting in all slots and inserts for fixings to guides and runners to lift shafts.

All trench drain box-cut with necessary recesses and casting in all anchor bolts and providing and installing trench drains and other embedded items as shown on the drawings.

Include design mix weight and storage box for samples and test cylinders.

Levelling of the floors to proper elevations as shown on the drawings to the tolerances and cambers and slopes specified including all changes of slab elevation.

All means of transportation of concrete.

Providing and casting into concrete slots to receive masonry or block work ties to support all such walls as shown on the drawings or as directed by the Construction Manager.

Forming holes to riser ducts.

Forming necessary cut-outs at pipe locations to accommodate electrical, plumbing, sprinkler and electrical services.

Forming in the concrete member's chases for any asphalt "track-in" and/or flashing and the like.

Provide grout for lift saddle and floor closures prior to setting (setting by others).

Grout pumps and other mechanical equipment as required.

Provide temporary shoring and strutting as required due to the operations of the Contractor.
Provide and maintain ladders until stairs are usable.
Provide adequate lighting at all areas
Erect sufficient safety signs, posters and maintain high level of safety during the entire construction period.

END OF SECTION

3.0 DOOR HARDWARE

Hydraulic floor spring

1.0 Hydraulic floor spring shall be of approved make, high quality and required capacity as per manufacturer's specification and as directed by engineer in charge.

(1) The closing time of the floor spring shall be easily adjustable between 3 and 20 seconds for which a suitable device to adjust the speed shall be provided.

(2) After being fitted in position the door leaf shall be opened through 90º plus 5º and released. When opened to an angle less than a right angle the door shall swing back automatically.

(3) Closing force complying with EN 1154 2 - 4

1.1Workmanship

The floor spring shall be free from all mechanical defects, sharp edges and other surfaces defects.

The Contractor shall have to give a guarantee bond for the floor spring, on appropriate Stamp paper for a period of 1 year. In this period he shall attend to and rectify all complaints without causing any inconvenience to the client. The form of Guarantee Bond shall be as prescribed below:
"I/We ..... (Contractor) hereby guarantee that the hydraulic door closers or Floor Spring shall remain unaffected and shall not be in any way damaged by normal usage, pulls and pushes, for a period of 1 year after the completion of the work of supplying & fixing the Hydraulic Door Closers to aluminium doors as per the terms and conditions of the contract and guarantees to redo the affected work without claiming any extra cost."

1.2Fixing

Suitable recess of the required size shall be cut in floor and the floor spring with all its components viz. cover plate, outer box with slide plate etc. shall be embedded in floor.

The rate shall be include the cost of labour and material involved in all the operations described above and making good the floor.

Hydraulic rack and pinion door closer

Hydraulic door closer shall be of approved make, high quality and required capacity as per manufacturer's specification and as directed by engineer in charge. Closing force of door closer shall be complying with EN 1154 2 – 4.

The Contractor shall have to give a guarantee bond for the Hydraulic door closer and floor spring, on appropriate Stamp paper for a period of 1 year. In this period he shall attend to and rectify all complaints without causing any inconvenience to the client. The form of Guarantee Bond shall be as prescribed below:
"I/We ..... (Contractor) hereby guarantee that the hydraulic door closers or Floor Spring shall remain unaffected and shall not be in any way damaged by normal usage, pulls and pushes, for a period of 1 year after the completion of the work of supplying & fixing the Hydraulic Door Closers to aluminium doors as per the terms and conditions of the contract and guarantees to redo the affected work without claiming any extra cost."

Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Dead lock

Dead lock with 55mm setback, 60/70mm Euro profile Pin Cylinder with pair of Escutcheons of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. SS 304 satin finish standard dead lock with 60/70 mm Euro profile Pin Cylinder with both side key/one side key - one side knob/ one side knob - one side slot with one pair of Escutcheons (key hole plate) for wooden/aluminium doors.

Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Mortise lock

Mortise lock with 60/ 70mm Euro profile Pin Cylinder, pair of tubular mortise handle with pair of Escutcheons of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. SS 304 satin finish standard mortise lock with 60/70 mm Euro profile Pin Cylinder with both side key/ one side key - one side knob operation and SS 304 grade hollow tubular pipe pair of Mortise handle of 22mm dia 150mm long with one pair of Escutcheons (key hole plate) for wooden/ aluminium doors.
Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Mortise shaft dead bolt with key (Alen Key lock)

Mortise shaft dead bolt with key (Allen Key lock) with BS 57mm and 25mm square forend in SS satin finish shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Push-pull pair of handle

Push – Pull Handle of approved make, shape and finish shall be made out of 1.5mm thick hollow pipe of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Tower bolt

Tower Bolt of approved make and shape with minimum rod dia 10mm shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Door Stopper

Wall mounted magnetic Door Stop or Door stopper of required size as per door opening condition of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Adjustable sliding friction windows stays

Stainless steel (SS 304 grade) adjustable sliding friction windows stays (for easy cleaning) 16" size having maximum width 900mm, max weight capacity - 30 kg of approved make shall be of high quality with necessary stainless steel 304 grade screws as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

END OF SECTION

4.0 FIRE RATED DOOR HARDWARE

SS Ball Bearing Butt Hinges

SS ball bearing Butt hinges of size 100mm x 75mm x 3 mm CE marked for fire rated or non-fire rated metal door of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Fire rated Mortise sash lock

Mortise lock with 70mm Pin Cylinder thumb turn with lever CE marked for fire rated or non-fire rated metal door of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

Fire rated (120 minutes) Rack and pinion non-handed door closer

Relevant specifications shall be followed as per item no 8.16 & 8.17 except 120 minutes fire rated door closer with backcheck and standard arm with two independent closing valves and latching speed adjustable by arm instead of door closer for normal door.

One-point panic device

1 point panic device in Contur design, carry bar for single door for fire and smoke check doors, with steel latch, security anti thrust latch CE marked for fire rated or non-fire rated metal door of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

External trim with design lever handle

External trim with design lever handle of Dorma PHT 05 or approved equivalent make suiting the panic bar for maximum 60mm thick door prepared for half euro profile cylinder CE marked for fire rated or non-fire rated metal door of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

EPDM open cell sponge seal

Self-adhesive EPDM open cell sponge seal of size 7 mm x 9 mm for fire and smoke protection in fire rated metal door of approved make shall be of high quality as shown in the drawing and as per manufacture's specification. Rate should be inclusive of material, labour for fixing and necessary consumable hardware as per specification for all height, all floors and all level.

END OF SECTION

4.0 METAL DOOR (NON-FIRE RATED)

MATERIAL
Door Frames and Leaves are made from Galvanized Steel.

DOOR FRAMES
Door frame shall be double rebate profile of size 147 x 57 mm made out of 1.20mm thick galvanised steel sheet (18 gauge). Frames should be Mitered and field assembled with self-tabs. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Once frame installed should be grouted with cement slurry if recommended on the clear masonry opening.

DOOR LEAVES
Constructed from 0.80mm Thick Galvanized Steel Sheet formed to provide a 46mm thick fully flush, double skin door shell with Lock Seam joints at stile edges. In-fill of Honeycomb Kraft Paper is used to give the required rigidity and effective acoustic and thermal insulation.
Door leaf should be 46mm thick fully flush double skin door with or without vision lite. Door leaf shall be manufactured from 0.8mm (22 gauge) minimum thick galvanised steel sheet. The internal construction of the door should be rigid with steel stiffeners/ pads and reinforcement. The infill material shall be resin bonded honeycomb core. All doors should be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be as per joinery details with a screw on glass beading on the inside. The glass should be 5mm clear toughened glass. Louvers when recommended should be site proof and shall be flush fixed on the external surface.

VISION GLASS
Vision Glass with 5 MM clear toughen glass can be provided in Circular, Square or Rectangular with a screw on glass beading on the inside. Size of glass shall be as per relevant IS code and as recommended by manufacturer's specification.

LIMITATIONS ON VISION GLASS (FOR NON-STANDARD SIZES):
Height not exceeding 1550 MM, Width to at least 300 MM less than that of the shutter width.

FINISH
The doorframes and door shutters are coated with Zinc Phosphate Primer to receive paint on site or finished with Thermosetting Polyurethane paint of Aliphatic Grade of approved shade providing high levels of scratch resistance and durability. The door leaf and frame shall have passed minimum 250 hours of salt spray test.

- The rates quoted shall be inclusive of manufacture, supply and installation at Site, and inclusive of all the necessary accessories, EPDM rubber strips, consumable, vision panel etc.

6.0 METAL FIRE RATED DOORS (DOUBLE/ SINGLE LEAF) OF APPROVED MAKE WITH FIRE RESISTANT 120 MINUTES

1.0 SCOPE:

This specification covers the design, preparation of shop drawings, supply of materials, Manufacture and installation of factory made fire rated Doors from ISO 9001-2000 Certified Company and approved by the Engineer-in-Charge with all accessories.

2.0 APPLICABLE CODES:

1. IS : 277 Galvanised steel sheet (plain and corrugated) with Z 120 Coating
2. IS : 2062 Steel for General Structural purpose
3. IS : 4351 Specification for Steel Door Frame
4. IS : 4376 Hot Dip Zink Coating on Mild Steel Clips
5. IS : 3613 Metallic & Metallic Fire Check Doors, Resistant Test & Part – II Performance Criteria

3.0 MATERIAL:

3.1 Frame

Frame to be manufactured from 1.60 mm galvanised steel sheets complying with latest IS 277 Code with Z 120 sheet to the specified profiles and dimensions.
Door frame profile to be double rebated of dimensions 143 mm X 57 mm (+ / - 0.3) with bending radius of 1.4 mm.
Door frame profile to be single rebated 143mm x 57mm (+/- 0.3) for two hour rated door.
Frames to be provided with a 3 mm thick Soffit bracket plates on all jambs with provision for anchor bolt fixing to wall openings.
All frames to have reinforcement pads for fixing of door closer, at appropriate location as per manufacturer's details.
Frames to be provided with hinge plates 3 mm thick pre-drilled to receive hinges for screw mounted fixing. All cut outs including hinge plates, strike plates to have mortar guard covers from inside to prevent cement, dust ingress into cut outs at the time of grouting.
Frames to have factory finish-pre-punched cut outs to receive specific hardware and ironmongery.
Frame shall be filled with foam concrete as shown in the drawing and as directed by the Engineer-in-Charge.
Individual frames members to be protected with Co-extruded PE film, with low tack adhesive. PE film to be minimum 56 micron thick, abrasion resistant with 6 months UV resistance Capability. (Manufacturers Test Report to be submitted) and placed in individual card board boxes. Individual boxes to be sealed.

3.2 Shutter

Fire door shutter to be manufactured from min 1.2 mm galvanized sheets conforming to latest IS: 277 Code with Z 120 coating.
Shutters to be press formed not less than 46 mm thick double skin hollow door with lock seam joints at stile edges. Shutters to have no visible screws or fasteners on either face. Internal reinforcement to be provided at top bottom and stile edges for desired fire rating.
Shutters to be provided with Mineral Wool to be bonded to the inner faces of the shutter.
Shutters to be factory prepared with pre-punched cut-outs and reinforcements to receive ironmongery as per final finish hardware schedule. The shutter should have an interlocking arrangement at this stile edges for flat surface on either side.
Shutters to have pre-drilled hinge plates with hinge guard covers. Shutters with locks to have concealed lock box with lock fixing brackets with pre-tapped holes.
For shutter with door closer reinforcement pads to be provided at appropriate location as per manufacturer's design.

3.3 Vision panel for Fire rated door –

Vision panel to be provided with Bore Silicate Clear Fire Rated Glass of the thickness 6 mm for upto two hours fire rating. Glass to be fixed with clip on frames for square and rectangular vision panels and with spin turned rings for vision panels and Glazing Tape with one side adhesive. Vision Panels to be fixed with clip-on frames for square and rectangular Vision Panels with no visible screws.

Shutters to be protected with Co-extruded PE film, with low tack adhesive. PE film to be minimum 50 micron thick, abrasion resistant with 6 months UV resistance Capability. (Manufacturers Test Report to be submitted) and packed in card board and strapped. All frames and shutters duly marked as per door schedule for easy identification at site.

4.0 WORKMANSHIP:

4.1 General

The Contractor shall furnish all materials, labour, operations, equipment, tools & plant, scaffolding and incidentals necessary and required for the completion of all metal work in connection with steel doors, as called for in the drawings, specifications and bill of quantities which cover the major requirements only. Anything called for in the tender documents shall be considered as applicable to the items of work concerned. The supply and installation of additional fastenings, accessory features and other items not specifically mentioned, but which are necessary to make a complete functioning installation shall form a part of this contract.

All metal work shall be free from defects, impairing strength, durability and appearance and shall be of the best quality for purposes specified made with structural proprieties to withstand safety strains, stresses to which they shall normally be subjected to.

All fittings shall be of high quality and as specified and as per approval.

The Contractor shall strictly follow, at all stages of work, the stipulations contained in the Indian Standard Safety Code or its Equivalent British Standard and the provisions of the safety code and the provision of the safety rules as specified in the General Conditions of the Contract for ensuring safety of men and materials.

Any approval, instructions, permission, checking, review, etc., whatsoever by the Engineer-in-Charge, shall not relieve the Contractor of his responsibility and obligation regarding adequacy, correctness, completeness, safety, strength, quality, workmanship, etc.

All knocked down frames shall be stacked flat and shutters vertically on wooden runners and suitably covered as per the instructions of manufacturer to prevent rust and damage.

4.2 Installation

4.2.1 Door Frame

It is to be ensured that all threaded preparations are covered from the back of the frame using self-adhesive strip to prevent penetration of mortar back-fill into screw threads. The head member of assembled frame shall be positioned against jambs ensuring correct alignment and secured using M8 x 20 long plated bolts together with nuts spring and flat washers.

The assembled frame shall be kept in position within the opening by means of bracing. In order to correctly position the frame against finished floor level or equalise on adjustable floor anchors where specified, shim shall be used under jambs. The frame shall be checked for squareness, alignment, twist etc. With carpenters' bevel and plumb.

A tie rod shall be fixed to the frame during installation to ensure the correct dimensions between the frame rebated and the same may be removed after installation.

4.2.2 Door Shutters

The shutter is to be then fixed to the frame which is already installed. Align the shutter to match the hardware to the cut-outs in the frame. Tighten the hinge screws.

5.0 TESTING:

Testing shall be as per IS:3614 Part-II 1992 and tested by CBRI Roorkee or any other accredited laboratory and certificate issued.

The rates shall be including the cost of labour, material involved in all the operations including filling the frame with grout/concrete described in Bill of Quantities.

END OF SECTION

7.0 ANTI-FUNGAL, ANTIBACTERIAL, GLAZED VITRIFIED / CERAMIC TILES

Relevant specification shall be followed as per CPWD specification Vol – I clause no – 11.15 except Anti-fungal, anti-bacterial hygienic series glazed vitrified/ ceramic tiles shall be used instead of normal ceramic tile.

Tile shall be fixed on existing baking coat (wall and floor) of water tank with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477 as per CPWD specification Vol – I clause no – 11.17. Grouting the joints of tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of approved make and shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling/ grouting etc as per manufacturer's specification.

Actual laid area of tile shall be measured for payment without considering any wastage. Rate shall be excluding the cost of grouting and backing cost plaster.

END OF SECTION

8.0 *20 MM THICK MULTICELL UV PROTECTED POLYCARBONATE PANEL SYSTEM*

MATERIAL:

Polycarbonate sheet roofing system shall be approved make, shade and as per approved sample.

Polycarbonate Sheets

Polycarbonate sheet shall be 20 mm thick with 3 cells and 4 walls and 900mm wide multicell panel Co-extruded UV protected panels and conform to IS 14443. The sheets shall be free from cracks, split edges, twists, surface flaws etc. They shall be clean, bright and smooth. Panel shall be co-extruded with special anti-glare compound to make it anti-glare/soft light to prevent glare and sun streaks. Panels shall be manufactured with vertical standing seam at both sides of the panel. Welding or gluing up of standing seam is not acceptable.

Purlins

Purlins of the specified material or M.S. rolled sections of requisite size shall be fixed over the principal rafters. These shall be spaced as per manufacturer's specifications.

Slope

Roof shall not be pitched at a flatter slope than 1 vertical to 5 horizontal. The normal pitch adopted shall usually be 1 vertical to 3 horizontal.

Laying and Fixing

The sheets shall be laid and fixed as per manufacturer's specifications, unless otherwise as per approved shop drawings or directed by the Engineer-in-Charge.

The sheets shall be laid on the purlins to a true plane, with the lines normal to the sides of the area to be covered unless otherwise required as in special shaped roofs.

Panels shall be fixed on purlins with Stainless steel retention clips and connectors as per approved shop drawings. Snap-on connectors to interlock the panels shall have a grip-lock single tooth locking mechanism to ensure maximum uplift capability. Panels shall have End-cap/ Aluminium U-profile/ Glazing bar for ends as per requirement.

The weight of the system shall not be less than 2.46 kg per square meter. Panel shall be co-extruded with special anti-glare compound to make it anti-glare/ soft light to prevent glare and sun streaks.

The laying operation shall include all scaffolding work involved.

Panels shall be fixed over structural steel/ MS purlins (will be paid extra) conforming to the detail technical specifications and as per drawings and as directed by engineer in charge.

Finish

The roof when completed shall be true to lines, and slopes and shall be leak proof.

The rate shall include the cost of all the materials, labour, scaffolding and equipments involved in all the operations described above including Stainless steel retention clips and connectors, Snap-on connectors but exclude the cost of MS frame work.

END OF SECTION

9.0 HYDROPHOBIC SILANE - SILOXANE COATING

1.0 Materials: Hydrophobic Silane - Siloxane coating shall be of approved quality like Wacker, GE silicon, Pidilite, Dow Corning, or equivalent (water repellent paint) as approved by the Architect and Engineer-in-charge. It shall conform to M-74.

2.0 Workmanship:

2.1 The silicone paint shall be diluted with water (benzene or toluene) in proportion as per manufacturer's specifications; the paint shall be sprayed with spray gun as directed. As far as possible ready-mix paint shall be used.

2.2 Concentration of silicon content shall be in proportion so that after the application, surface is clear and as it is. The sample shall be approved by architect. Normally 5% concentration is sufficient for not to have change in parent colour.

2.3 The concrete surfaces should also be thoroughly cleaned of dust, dirt, rust, concrete slurry or any other foreign material sing appropriate method so as not to damage the RCC work, as approved by the EIC.

2.4 Rate shall be inclusive of moping, cleaning, masking the door windows/floor/plants etc during and after the execution for protection

2.5 A guarantee bond on appropriate stamp paper shall be given by the Contractor to the Client in the manner form prescribed below:

FORM OF GUARANTEE BOND

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other humid conditions, for a period of 5 years after completion of the work of Silicone painting as per the terms and conditions of the contract and Contractor hereby indemnifies and agrees to save the Institute from any loss and or damage that might be caused on account of exposure to water and hereby Guarantees to make good any loss or damages suffered by the Institute and further guarantee to redo the affected work without claiming any extra cost."

2.6 This guarantee shall remain force for the period of 5 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 5 years.

END OF SECTION

10.0 HEXAGONAL CHICKEN MESH

1.0 Material: GI Hexagonal Chicken wire mesh having openings 20 mm. x 20mm of 22 gauges shall be used with 200mm minimum width as directed.

2.0 Workmanship:

2.1 The mesh is to be fixed with nails and cement paste at the junctions of different materials (column and brickwork, at beam bottom level- on the face of beam and brickwork to avoid cracks in the plaster.

1. Chicken mesh shall be fixed in advance of the plasterwork. Chicken mesh shall be fixed in such a way that it is totally concealed in the plaster. Chicken mesh shall be fixed in such a way that minimum 100mm mesh is provided on either side of the joint. The mesh shall be fixed with both the elements with the help of "U" nail/ screws/ washer with cleats. Drilling shall be carried out if required in RCC member.

2. The mesh shall be over lapped by 15 cms in the length while joining the two pieces of mesh and also at corners.

END OF SECTION

11.0 TOILET CUBICAL SYSTEMS

1.0 Materials:

1.1 As per manufacturer's specification and shall be of approved make and texture.

2.0 Workmanship:

2.1 Contractor shall be submitted shop drawings for the approval before installation**.**

2.2 Partitions shall be fixed in best workman ship manner as per manufacturer's specification. The Contractor shall be responsible for the partitions and doors being set straight, in plumb level and for their satisfactory operations after completing the installation.

3.1 The rates quoted shall be inclusive of all necessary accessories for unit of same manufacture, supply and installation at Site.

3.2 Toilet cubical systems of approved equivalent make and manufactured in standard dimensions of 600mm ± 10mm width door size with 12mm thick solid Compact Laminate panels made of KRAFT paper impregnated with Phenolic resins under high pressure and temperature, including doors, pilasters & intermediate panels, which should be resistant to heat, bacteria, water, chemical, scratch and impact. Finished product should be as per approved texture, shade & drawing, detailing and developed according to IS-2046 and BS-476/97 standards. The toilet cubicle setup shall include necessary hardware fittings, made out of stainless steel (Grade-304), as per manufacturer's specifications and approved by Engineer-in-charge

3.3 Hardware fittings should consist of

3.4 (1) Stainless steel Adjustable foot/ pedestal of SS 316 grade to give 150mm clearance from bottom and of weight not less than 600grams

3.5 (2) Stainless steel U-channels of 20 gauge and 12 x 20mm size

3.6 (3) Stainless steel Top rail pipe (OD:24mm of 18 gauge) with corner connectors

3.7 (4) Stainless Steel Head Rail Tubular Holder

3.8 (5) Stainless steel Gravity hinges (3 nos.) not less than 75mm length and weight not less than 210 grams

3.9 of weight not less than 200 grams.

3.10 (6) Stainless steel Coat hook with nylon door stopper

3.11 (7) Stainless steel Door knob

3.12 (8) Stainless steel Thumb-turn lockset with occupancy indicators

3.13 (9) Wall bracket SS 304

3.14 (10) Corner Connector

3.15 (11) Rubber noise deafening tape

3.16 (12) Stainless steel 304 Screws and PVC wall plugs.

3.17 The top fitting arrangement shall comprise of stainless steel (round) top rail, fixed to pilasters and stainless steel tubular holder. Stainless steel wall fixing roses shall be used on the wall to hold the top rail. In absence of brick walls, stainless steel corner bends (connected to the top rail) will be used on the corners of the cubicle. All screws should be of stainless steel (Grade-304). All pilasters will be supported by stainless steel adjustable foot. The base of the stainless steel bottom cladding will be anchored to the floor with a clearance height of 150mm.The intermediate panel shall be of one continuous panel without any joint. All visible edges will be chamfered.

END OF SECTION

12.0 LIGHT WEIGHT AAC BATS FILLING

Materials :
Relevant specifications shall be followed as per CPWD specification Vol – I clause – 4.1 & 4.2 except that the Autoclave Aerated Concrete Block chips/bats shall be used as coarse aggregates instead of stone aggregates.

Workmanship
Relevant specifications shall be followed as per CPWD specification Vol – I clause – 4.1 & 4.2 except that the Autoclave Aerated Concrete Block chips/bats shall be used as coarse aggregate instead of graded stone aggregate. The concrete shall be compacted with iron rammer.

In total thickness of sunk, 25mm thick top layer shall be consist of cement concrete mix 1:1.5:3 (1 cement: 1.5 coarse sand : 3 stone grit of size 6 mm and below by volume) admixed with approved integral water proofing compound in recommended proportion.
And remaining bottom thickness shall be AAC block filling.
Total quantity (of both layers) shall be measured and paid in Cum.

END OF SECTION

13.0 ALUMINIUM WORK

All Specifications of Aluminium work shall be as per CPWD Specifications Section No. 21except following

All aluminium sections will be Euro Profile sections capable of being used of Euro profile Hardwares
All aluminium sections will be at least 1.8 mm in thickness.
All aluminium sections will be finished with Polyester powder coating

Polyester Powder coating
Polyester Powder coating should be confirming to AAMA 605.2

1. Resin : 70 percent Polyester Power coating

2.Substrate : Cleaned and pre-treated.

3.Primer : Manufacturer's standard epoxy or acrylic coating.

Dry film thickness : minimum 0.005 [0.020] mm [(0.20[0.80]mil)].

4. Topcoat : Polyester Powder coating, Dry film thickness :

a. Coil : 0.020 mm [(0.80 mil)].

b. Extrusion : 0.025 mm [(1.0 mil)].

5.Colour : As specified by the Architects.

END OF SECTION

14.0 WATERPROOFING

1.0 GENERAL

1.1 Standards

Indian and other International Standards followed for this section shall be as listed below. Any discrepancies or ambiguities seen shall be brought to the notice of the PM and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

IS 269	Specification for 33 grade ordinary Portland cement.
IS 383	Specification for coarse and fine aggregates from natural sources for concrete.
IS 2645	Specification for integral cement water proofing compound.
IS 6494	Code of practice for water proofing of underground reservoirs and swimming pool.
IS 8112	Specification for 43 grade ordinary Portland cement.
IS 12118	Specification for two part polysulphide based sealant :
	Part – I general requirements.
IS 13826	Method of Test.

1.2 Submittals

1.2.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.2.2 Informational Submittals

a. Certifications specified in quality assurances
b. Manufacturer's instructions

1.3 Waterproofing compounds

1.3.1 Waterproofing compounds shall be cementitious (cement based) non-shrinking, self curing mixtures. These shall be

- Free from sodium and chlorides
- Free from material detrimental to concrete and reinforcement.
- Able to create a membrane in one or multiple coats as per manufacturer's instruction.
- Membrane capable to prevent infiltration when applied to interior faces and ponded.
- Permeability, shear bond strength, compressive strength, volume changes meets minimum requirements of codes.

1.3.2 Accessories

All other accessories materials such as primers, bonding agents, polymers etc. shall be as recommended by waterproofing manufacturer.

1.4 Warranty

A. Special Warranty:

1.Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of ten years.

2.Provide warranty that covers labour and workmanship, including labour for access to waterproofing, for watertight warranty.

A Warrant penetrations, terminations, changes of direction, and membrane.

B Warranty shall include removing and reinstalling superimposed work covering waterproofing.

2.0 SCOPE OF WORK

2.1 Work shall include design, supply, install and test proprietary waterproofing systems to Landscape areas. This shall be guaranteed for 10 years on Rs.100/- stamp paper in proforma to be approved by the EIC

a)Waterproofing of terrace inclusive of grouting, sealing rainwater down takes outlets, other services outlets, junctions of walls, slab, beam, columns, parapet wall etc., where required expansion joints all as per approved terrace proprietary treatment.

2.2 Work shall include supply, install and test proprietary systems for basement, terrace sloped/flat roofs as approved by the EIC. This shall be guaranteed for 10 years on Rs.100/- Stamp paper in proforma to be approved by the EIC.

Work shall conform to minimum standards specified. Systems detailed hereunder are to clarify type of water proofing system expected. Contractor is at liberty to suggest and submit equivalent system with products meeting / exceeding standards.

2.3 Sub-Contractor / Specialist shall be from the approved list and shall be approved by the EIC in writing before being employed by the Contractor.

2.4 The Contractor shall submit

1.Statement giving detailed brief of work he proposes to carry out.

a. Name of agency with his experience certificate and quantum of work carried out.
b. Technical Specifications
c. Product data sheets of material to be used
d. Shop drawing detailing
    - Sections co-ordinated with typical installation details
    - Vertical termination and sealing
    - Laps needed if any
    - Typical expansion, construction and control jointing details with minimum requirement.
    - Horizontal fixing and laying details.
    - Typical finishing arrangement.
    - Flashings if required.
e. Protective measures to be taken.
f. Installation guidance

g. Samples of each product in duplicate fixed over plywood boards or similar to enable proper cross sections.

h. Manufacturer's certificate that product and material to be used is correct and shall give intended results when applied through authorized agency.

3.0 WORKMANSHIP

3.1 Preparation of Surfaces

a) The surfaces to receive the treatment shall be thoroughly cleaned of

- Laitances, scales, loose material on surface.
- Grease, oil or other contaminants by etching with 10-15% of solution of muriatic acid using commercial grade alkaline cleaner, flushing with clean water drying and vacuuming.

b) Surfaces shall be examined and well-defined cracks grouted by making 'V' groove / notches with cement slurry, shall be cured and dried well before treatment.

c) Any honeycombs shall be carefully cut and plugged and cured well before treatment.

d) Examination of surface shall account for the fact that,

- Surfaces are cured for 14 days and no condensation has taken place.
- Horizontal and vertical surfaces have smooth finish, free from defects.
- Surfaces are dry, clean, free of grease, oil, dirt, rust, corrosion, other coatings and contaminants which could affect bond of water proofing system.

CEMENTITIOUS AND REACTIVE WATERPROOFING-WET AREAS

PART-1: GENERAL

Work Included:

Surface Preparation and primer application.
Application either by brushing or spraying.
Protection screed and slope making.
Surface finishing and end terminations.
Water Ponding/Testing for leakages.

Submittals:
Waterproofing material test report.
Method of Statement & shop drawing.
Schedule of Work.
Safety report and indicators.
Applicable Codes and specifications.
Warranty Certificate/Manufacturer report, flood testing report.
Product Data sheets
QA/QC-procedure

Sustainability Requirements

Contractor is required to implement practices and procedures to meet the environmental performance goals for the project. .Contractor shall ensure that the requirements related to these goals, defined in this section and in related sections of the Contractor documents are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the contractor or his subcontractors, shall not be allowed if such changes compromise the stated criteria.

PART-2: PRODUCTS / WORKS / SCOPE

Cleaning the surface.
Cementitious and reactive with waterproofing admixtures as per approved specification.
Concrete screed.
Bonding agent.
Geo fabric or polypropylene woven fabric.

PART-3: EXECUTION

The manufacturer shall preferable holder of the ISO 9001:2000 quality certificate with a validity period of at least two years.

Provide products of manufacturers with not less than 10 years of successful experience in supplying the principal materials for the required work

Installation Company

Before starting the installation the contractor shall deliver a certificate, recognizing the installation company as an approved applicator.

Before awarding the works, the contractor must present all necessary certificates that allow the company to perform waterproofing works.
Waterproofing of details is in conformity with the instructions and detail drawings issued.

At the delivery of the works, the owner will receive an original and signed 10 year, insurance-backed warranty for waterproofing and root resistance.
Requirements of Cementitious waterproof coats

Retains flexible when submerged

Good chemical resistance against soft water, domestic waste water, manure or other liquids moderately aggressive to mineral substrates.

Resist to occasional foot traffic

Water vapour permeable

CO2 barrier, provides anticarbonation benefits

Excellent adhesion. Bonds to porous and non-porous surfaces.

Nontoxic-suitable for contact with potable water.

Saves time - Can be applied to 24 hour-old concrete

Surface Method Treatment

Wet areas like toilet, sunken portion, internal side of closed water retaining structures

First layer cementitious shall be laid after cleaning, brushing the concrete surface after pre dampening the surface.

Second layer of waterproofing coating mixed mortar shall be applied on laying Geofabric layer when the first coat is still green.

Grouting shall be done at selected points with cement slurry mixed with waterproof admixture.

Bonding agent shall be applied prior to start of the protection screed.

Bore packing of all pipe outlets and openings shall be done using cementitious grouts prior to start of the waterproof coating

Weep holes/ floor drains to be inserted prior to the start of the waterproof coatings.

Construction joints shall be treated with water swelling bars, pressure grouting using cementitious grouts.

Vertical Surface

Treatment shall be done in two layers of waterproof coating with plastering leaving 2 hours gap between each coat.

Total thickness shall not exceed 35mm or 1.5" thick.

Water proof admixture to be used as per manufacturer's specification with CM 1:3.

Grouting wherever necessary and at construction joints shall be carried out.

Curing shall be done till 7 days.

Flood testing shall be carried out at intervals.

Protection Screed or Slope making for horizontal surface

RCC surface to be cleaned brushed and watered.

Cement slurry with waterproof compound shall be provided over the cleaned surface.

Brick Bat Coba Method (BBC):
All existing treatment, coatings on roof slab top is to be removed and surface cleaned by hard wire brush and washed with water. The surface should be free from any oil, grease, dust etc. Remedial measured by provided to all structural cracks. Expansions joints should be treated as per standard practice.

All non-structural cracks more than 0.5 mm wide and construction joints if any, should be cut in "V" shape, cleaned with wire brush and washed and filled with suitable crack filler. Cement slurry mixed with recommended water proofing compound is spread uniformly.

Application

Over this 15 mm thick cement, sand mortar,1:4 admixed, with water proofer is laid on the above green mortar, a layer of brick bats, soaked overnight in water, is laid, having an average thickness of about 110 mm, about 70 mm near rain water pipe and 150 mm at ridge and slopes as required are provided.

The gaps between the brick bats are generally kept between 15 and 20 mm. These gaps are filled with cement sand mortar,1:4, admixed with water proofing compound either in liquid or powder form. It is preferable to mix the water proofing compound with the water prior to mixing it with mortar mix. In hot and dry weather, the surface should be covered with wet gunny bags immediately after finishing. Curing should start next day and continued for 7 days. The top surface is then finished smooth with 20 mm thick cement sand mortar, 1:4, admixed with water proofer. The surface when green is marked with 300 mm false squares. Curing is to be done by ponding.

The system provides an excellent slope for the water to drain away and since water does not accumulate there is no leakage. Also it has a certain water retaining capacity and

water is absorbed by the brick when it rains and released when it stops. Of course overloading results in leakages.

This system has some inherent disadvantages as below;

Cracks Due To Temperature Variations- The BBC treatment through successful in the damp heat of coastal regions cracks up completely on contact with the variations of temperature faced in North India between day and night temperature.

Imposes Unnecessary Load- This system has the disadvantage of imposing an unnecessary load on the system. Once cracks appear they are almost impossible to repair and water as in the case of the tar felting travels below the coba and exits wherever it finds a path. It is impossible to trace the inlet point let alone repair it.

Almost Impossible to Dismantle for Repairs- Some parts of the coba stick so well to the concrete that even if an attempt is made to dismantle the system the slab gets damaged.

END OF SECTION

15. VINYL FLOORING

PVC based vinyl Tiles and Rolls set with adhesive on to a concrete or masonry base shall conform to latest IS : 3462.

Materials

Tiles

The tiles should be calendered laminated solid resilient unbreakable and homogeneous flexible quartz reinforced PVC

Vinyl tiles composed of 100% vinyl from face to back with alkaline resisting colour pigments and other plastic compounds in different shades and designs and in different sizes and thickness and shall conform to IS : 3462. Unless otherwise mentioned the tiles shall be squares of approved dimensions. Tiles shall have properties of a high wear resistance and resilience, designed to withstand high traffic and abrasion. The face of these tiles shall be free from porosity, blisters, cracks, embedded foreign matter, or other physical defects, which affect the appearance or impair the service ability of the tiles. All edges shall be cut true and square. The colour shall be non-fading and uniform in appearance, insoluble in water and resistant to alkalies cleaning agents and usual floor polishes.

Cove base shall be extruded PVC (100% putty) with moulded top set cove colour and the height of the base shall be as indicated on the drawings, scheduling and / or as approved by Engineer – in- Charge.

Samples of tile and cove base shall be submitted to the Engineer –in- Charge along with test certificate for approval.

Rolls

It should be calandered laminated solid resilient unbreakable and homogeneous quartz reinforced flexible PVC Vinyl Flooring in different shades and designs and in different width and thickness with inherent characteristics of wear resistance, dimensional stability, elegance etc and shall conform to IS : 3462.
Each packet of tile or roll shall be legibly and indelibly marked with the manufacturer's trade mark, thickness, size batch number and date of manufacture.
Tiles shall be delivered securely packed and store in clean, dry, well ventilated places.

a) **Adhesive**

Synthetic rubber based adhesive to be used for fixing tiles shall be Dunlop S-758 or Fevicol SR-998 or equivalent or as recommended by the manufacturer. The adhesive shall have a short drying time and long life. Each container shall show the self life, date of manufacture and over age container shall be immediately removed from the site.

d) **Sub-floor**

The surface of sub-floor to receive this finish shall be firm, hard, smooth even textured, without undulations and other deficiencies.

The surface shall be thoroughly cleaned. All loose dust particles shall be removed. Oil grit and grease, if any shall be removed completely by the use of detergent and sub-floor should be carefully dried prior to laying.

e) **Laying**

The tiles shall be stored in the room to be tiled for at least 24 hours to bring them to the same temperature as the room. In air conditioning spaces, the air conditioning shall be fully operational before the tiling is laid.

The adhesive shall be applied uniformly at the rate recommended by the Manufacturer to the fully dry surface in the desired thickness. The adhesive shall also be applied to the backs and edges of the tiles and surface shall be allowed to "touch dry" before fixing. The tiles shall then be placed neatly on the surface exactly to the approved pattern and set firmly with a suitable tool. After it has adhered, vinyl tiles shall be rolled in two directions with a roller weighing 45 Kg. or more. If the edges tend to curl up, weights are to be applied to keep the edges down. Special care shall be taken to avoid the formation of air pockets under the tiles. The joints shall be very fine. Any adhesive squeezed out through the joints shall be removed and cleaned immediately.

Rolls are to be stacked on the sub-floor following the grain directions of the rolls. Joint welding can be provided where ever the PVC Rolls are installed in order to avoid dust accumulation leakage of water and prevention from wear and tear in joints. In this, a PVC cord is put into the joint after making grooves with machine and is welded with hot thermo welding machine.

Adhesives and other materials used must have resistance against the corrosive chemicals. Any defective surface must be capable of easy replacement. Joints shall be finished smooth and will not be a source of accumulation of dust, pool of liquid etc.

Tile shall be fitted to and around all permanent fixtures. Borders shall be fitted accurately. Exposed edges or tile at door sills etc. shall be protected with metal moulding.

Cove base shall be firmly cemented to the walls and accurately scribed to trim and plinth.

f) **Finishing**

Any adhesive marks on the surface shall be removed by wiping with a soft cloth soaked in solvent. The surface shall be cleaned with soft soap, dried and then polished with approved type of acrylic base emulsion polish using a soft cloth. A time interval of atleast 60 minutes must be given between the application of each coat of polish. After the polishing is done a duration of eight hours must be provided for the adhesive and polish to set before the area is put into regular use.

Protection – The surface shall be protected by covering with a plastic sheet over which, Gypsum powder / POP shall be provided. The same shall be removed before handing over the area for use of work.

16.00 **ACCEPTANCE CRITERIA**

The finish shall be checked specially for :

a) Level, slope, plumb as the case may be (The surface of the finish shall be smooth and within +/-5 mm of the specified level or position. Local irregularities shall be within +/-3 mm when measured against a 3 metre straight edge. Abrupt changes of alignment shall not exceed 2 mm).

b) Pattern and symmetry

c) Alignment of joints, dividing strips, etc.

d) Colour, texture

e) Surface finish

f) Thickness of joints

g) Details of edges, junctions, etc.

h) Performance

i) Precautions specified for durability

17.00 **MODE OF MEASUREMENT**

The method of measurement for various items shall be generally in accordance with the IS : 1200 subject to the following :

i) **Floor**

Flooring shall be measured from skirting to skirting and where the wall surfaces are plastered or provided with dado it shall be measured from plaster to plaster or dado to dado. The measurements shall be in square metre.

ii) **Skirting:**

The measurement for skirting shall be in running metre. The height of skirting shall be specified in bill of quantities.

iii) **Dado:**

Dadoing shall be measured from finished floor level to specified height in the Bill of Materials. The measurements shall be in square metre.

END OF SECTION

16.0 HARDWARE FOR ALUMINIUM WORKS

Description	Technical Description
Mortice Handle	Mortise Handle With 8x80mm spindle length. Suits deep profiles of up to 75mm with robust spring loaded gearing mechanism. Handle moves to original position and when not pressed down. Material is of Aluminium & Zamak and tested upto 200000 cycles.
Multipoint Locking Mortice Lock	Multipoint Locking Mortice Locking Body. Materials composition is Nickel & stainless steel and tested upto 200000 cycles.
Cylinder	60mm(30mm+30mm) long cylinder with latch halfway through.Standard cylinder that suits most profile depths. It has security of 5 spring loaded pins.
Lock Shield for Cylinder	Cover cap for cylinders. Made up of Zamak material.
Locking Point	Eurogroove compatible locking point. Materials composition is Zamak & stainless steel and tested upto 15000 cycles.
Locking Strip	Made made up of polymide material. Comes in 20mm width and compatible with 20mm groove on façade vents and Eurogroove profile.
Butt Hinge	Designed for 20mm & 18mm groove i.e. Eurogroove compatible. Designed for use on up to 120 kg side hung windows and doors. Tested up to 200000 cycles.
Shoot Bolt	Eurogroove compatible, slides into 20mm width groove on sash. Less force required to operate. Material composition is Zamak & Aluminium and tested upto 15000 cycles.
Lock Meeting	Eurogroove compatible, fixes into 18mm width groove on frame. Material composition is Zamak & Aluminium and tested upto 15000 cycles.
Sliding Handle With Key	Manual lock with key for secured locking and restrcited access. Material composition is Zamak & Aluminium and tested upto 25000 cycles.
Sliding Handle	Automatic sliding lock with spring loaded mechanism. Key materials are Aluminium & Zamak and tested upto 25000 cycles.
Multipoint Espag	Espagnolette for use with manual sliding handle. Hooks are adjustable in this. Material composition is Zamak & Stainless Steel and tested upto 20000 cycles.
Nib	Nibs for use with Espagnolette sliding locks. Has Stainless steel finish nd tested upto 20000 cycles.
Nib	Nibs for use with sliding locks. Has Stainless steel finish nd tested upto 20000 cycles. Higher corrosion resistance
Counterplate	Counterplate for use with any sliding lock and nib.Has Stainless steel finish nd tested upto 20000 cycles. Higher corrosion resistance

Roller	Roller of Plastic and metallic casings. Has hard plastic nyloon wheels. It comes in fixed and adjustable range. Wheel angle can be customized
Roller	Roller of Plastic and metallic casings. Has hard plastic nyloon wheels. It comes in fixed and adjustable range. Wheel angle can be customized
Multipoint Handle	Multi-point locking handle with key and 21mm fork Fork. Width of 14mm. 3 fork lengths available in this handle 21mm, 27mm & 37mm. Material composition is Aluminium,Zamak & Stainless Steel and tested upto 15000 cycles.
23mm Extensor Pin	23mm pin included.No drilling of hole required and so ease of installation.
Pull In Block	Adjustment point set. Designed for 20mm & 18mm groove i.e. Eurogroove compatible.Increases weather sealing of window. Material composition is Zamak & Stainless Steel and tested upto 200000 cycles.
Friction Hinge	10" Friction hinge, 16mm stack height for side hung application. 304 Austenitic stainless steel material. Flat surface required for installation.High gust load rating. Opens to 80 degrees.Tested up to 30000 Cycles.
Multipoint Espag	Espagnolette for use with manual sliding handle. Hooks are adjustable in this. Its material composition is Zamak & Stainless Steel and tested upto 20000 cycles.
Friction Hinge	8" Friction hinge, 13mm stack height for Top/Side hung application.304 Austenitic stainless steel material. Flat surface required for installation.High gust load rating. opens to 80 degrees.Tested up to 30000 Cycles.

17.0 ALUMINIUM STANDING SEAM ROOFING SYSTEM

1.1 Standing Seam Roofing System Specification

a) The general roof-construction shall comprise from bottom to top:

i. Liner - Kalbau 35/200 bare Galvalume steel liner sheet, 0.47 mm tct 1000 mm total cover width x 35mm deep ribs. The panel effective cover width of 980 -1015 and height 28-35mm rib height, manufactured out of Galvalume sheet.
ii. Clips - Aluminium ST clips to be used for the roofing system.
iii. Insulation - Rockwool insulation of 150mm thickness non – combustible grade confirming to IS 8183:1993 of density 60kg/m3 density with thermal conductivity of K=0.04 W/mk.
iv. VCL - A single layer of double sided aluminium foil vapour barrier or polyethylene film of minimum thickness 0.20mm should be laid.
v. Top Sheet - The topmost sheet comprise of profiled sheeting of aluminium self-supported standing seam roof system manufactured from aluminium alloy AlMnlMg1 as specified in BS EN 1396: 2007 (comparable AA 3004), minimum material thickness of 0.9 mm and PVDF2 Coating on the exposed surface. The colour is to be approved by the relevant authorities.

The material properties shall be as follows:
Ultimate Tensile strength: minimum 200 N/mm2
0.2% Proof Stress: minimum 185 N/mm2
Modulus of Elasticity: 70000 N/mm2

b) Aluminium elements to be supplied in single length with no laps with a sheet element cover width of 400mm and a standing seam height of 65mm. Sheets are to be laid to meet the requirements of the building geometry. The aluminium roof elements will be supported by and joined longitudinally with an electrically operated closure machine over concealed aluminium clips integrated into the longitudinal element flange thereby allowing for the possibility of transmitting reaction forces resulting from positive and/or negative loads and also accommodating unobstructed thermal movements resulting from the specified ambient temperature range.

c) The clips shall be capable of transmitting all reaction forces to the purlin without the aid of any other material, thus resulting in an overall “Self-supporting standing seam roof system”.

d) The clips shall be capable of transmitting all reaction forces to the purlin through the G.I saddle, thus resulting in an overall “Self-supporting standing seam roof system”.

e) The clips used should be aluminium clips. The clips used should be designed to further enhance the performance of the overall roofing system by improving the thermal, acoustic and movement performance of the system.

f) Sheets are to be laid to meet the requirements of the building geometry.

g) In order to meet the complex curves of the roof design & building geometry the sheets used must be smooth machine curved and not crimped curved. To achieve smooth curved sheets dedicated Curving machine to be used.

Fluorocarbon (PVF2) Coating System

The fluorocarbon coating to Aluminium roof and aluminium panel shall be in 2 coat of fluorocarbon coating system.

The fluorocarbon coating (2-coat system) shall consist of:-
First coat - Inhibitive primer, with a dry film thickness averaging 5-7□m
Second coat - Fluorocarbon colour coat, with a minimum dry film thickness of 20 microns.

The total minimum dry film thickness of the fluorocarbon coating shall be 25±5 □m.

1.2 Details at Flashing, Capping and Fascia

a) Flashing and Capping
Flashing and capping to the roof will be manufactured from the same quality grade and colour of material as the roofing elements.

b) Fasteners
All fasteners connecting liner to purlins, GI Brackets to sub purlins / top hats and subpurlins to clips shall be of austenitic stainless steel 304 series or higher in order to prevent corrosion / galvanic action with the components fastened.

c) Fascia
All external fascias to the roof will be manufactured from minimum 0.9 mm thick aluminium, workshop fabricated and supplied complete with required supports. An approved non staining silicone sealant should be used on all joints. The fascia will be finished in two coat PVDF paint finish. The colour shall be approved by the relevant authorities.

d) Warranty period
The 65/400 Aluminium Standing Seam Roofing System shall be guaranteed for 10 years by the manufacturer with regards to its material composition, surface properties and Physical Properties. In addition, the specialized executing agency undertaking the installation work shall provide workmanship warranty for a period of 12 months from the date of handover of the said work for any defective installation.

2.0 MATERIALS

2.1 Insulation

a) The insulation used in the Aluminium Self-Supported Profile/ Flashings shall be inert, durable, rot and vermin proof, shall not be degradable by moisture or water vapour and shall be protected from moisture and water vapour.

b) The insulation shall satisfy the fire proofing and acoustic requirements.

c) The selected material and its method of attachment to the supporting components shall eliminate the risk of bulging, sagging, delamination or detachment.

2.2 Fillers

1. Profile Fillers

a) The type (s) supplied by the cladding manufacturer shall accurately match the sheet profile.

b) Where shown on the Design Drawings and wherever necessary, corrugation cavities shall be closed off from the outside and inside of the building. Ensure a tight fit and leave no gaps.

c) The material shall be cross cell cross linked polyethylene foam faced with a density of 40+3 kg/m3.

2. Fire Resisting Profile Fillers

a) The type(s) supplied by the cladding manufacturer shall accurately match the sheet profile.

b) In positions shown on Contractor's Drawing fillers shall be fixed, leaving no gaps and using an adhesive recommended by the profile filler manufacturer.

2.3 Accessories

1. Generally

Cappings, closure pieces, flashings, trims sills, gutters, fillers, spacers, tapes, sealant, fixing etc. where not specified shall be types recommended by the manufacturer.

2. Purpose Mask Cold Formed Metal Accessories ;
a) The material shall be aluminium alloy to match roof sheet.
b) The thickness/gauge shall be minimum of 0.9mm.
c) The finish/colour shall be PVF2 finish (2 coats).
d) The cladding shall be fixed as per the Manufacturer's recommendations.

3. Flashing/Trims
Joints in flashings and trims shall be installed to fully accommodate thermal movement. Flashing joints generally shall comply with the Cladding Manufacturer's recommendations and recommendations contained within the Profiled Sheet Metal Roof and Cladding.

4. Gutters (if required)

All Gutters shall be fully supported at each joint and at intermediate positions not more that 900mm apart. Spigot ends shall be fixed up the slope with all joints fully watertight. Sheeting shall be positioned to leave a clear width across the gutter of not less than 600mm.Gutter shall be manufacture from 3mm thick aluminium solid panel in mill finish. Expansion joints shall be provided at every 12 meters to prevent cracks being developed in gutter welds.

5. Fixings to Structure / Suitability of Structure:
a) The Contractor shall survey the structure, checking line, level and fixing points before commencement and report immediately to the Employer if the structure is unsuitable

b) The Works shall include the detailing of all interfacing connections to the structure.

c) Fixings shall conform to all statutory requirements in respect of strength and type. They shall be fully protected to prevent corrosion and contact between dissimilar materials shall be avoided or detailed to prevent galvanic corrosion.

d) Only suitable materials shall be used.

2.4 Tolerances for Manufacture
a) The design tolerances shall be rigidly adhered to.

b) The provisions intended to accommodate the construction tolerance and surround elements shall be stated and shown on the Contractor's Drawings and further information required to formulate the design should be obtained from the Employer.

3.0 FINISHES

1. General
a) Samples of all finishes including stainless steel finishes and polyester powder coatings shall be inspected by the Employer prior to commencement of the Works. Colour and finish uniformity shall be established on the basis of reference samples.

b) All paint finishes shall be stable fade resistant and not affected by ultra-violet or natural day and sunlight. If this cannot be achieved then the client shall submit all available data and samples on the likely effects for review.

c) All finishes shall be durable of uniform texture and colour and be resilient to environmental and pollution effects. This shall include human effects like scratching and cigarette smoke and burns, etc. If

this cannot be achieved then the client shall submit all available data and samples on the likely effects for review.

d) Minor scratches and blemishes shall be repairable with the Coating Manufacturers recommended product and system, matching original finish for colour and gloss. Repair coatings shall match original finish.

e) All finishes shall be uniform in texture colour and appearance within the limits of the agreed samples and without irregularities or distortions. Welds rivets, screws, and stiffeners etc. which are not intend to be visible shall be treated so that there is no discontinuity of the finished surface appearance.

2. Finishes/Colours
PVDF finish shall be used as approved by coil manufacturer. Manufacturer's standard colour chart shall be used and subject to selection by the Employer's Representative.

4.0 INSTALLATION

4.1 Roofing Generally

1 A full shall be laid, making due allowance for the sequencing of the whole and all interfaces. A secure free draining and completely weather tight roof shall be provided.

2 Any ancillary products, including steel liner, flashing & accessories provided as part of the Works shall be of the approved types recommended by the manufacturer.

3 The installation team shall be fully trained and approved by the manufacturer. In the event that, contractor employ the installer team not approved by the manufacturer, the manufacturer reserve the right to reject the inspection for the roof and manufacturer will not provide warranty for the entire roof system to the client. All installation team must obtain the training certificate from the manufacturer and also certify that the installation team is qualified to install approved roof system.

4 The roof system provider shall have completed building project of area more than 100,000m2 in one single project in India within the past 5 years

All installation is carried out by approved trained roofing contractor. The printed instructions; installation manual shall be strictly adhere to.

4.2 Spare Roll forming machines
Minimum one each of Straight roll forming machine shall be allowed for this project and the roofing manufacturer shall have at least one more alternative straight machine in India for immediate replacement in case the operating machine breaks down or needs maintenance during the roll forming process.

6.0 Project references for the roof system
The approved roofing system shall have at least 5 -year's history in India. Project list of this roofing system shall be submitted as a proof of the above at the tender stage.

18. ACOUSTIC WALLS AND CEILING

Refer as per BOQ Specifications.

Product: -Classic Axiom Perimeter Trim manufactured and supplied by Armstrong World Industries

Components: -

Axiom Trim Channel : Classic Axiom trim (AX2STR42/ AX4STR42/ AX6STR42): 50mm/100mm/150mm wide face with 19.3mm(+/-0.50mm) horizontal legs, straight sections with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip, extruded Aluminum, factory finished (minimum 50 microns factory - applied baked polyester paint).Aluminum Extrusions formed with distinct architectural detail groove on top and bottom flanges and special bosses to receive the tee bar connection clips and splice plates, to provide positive mechanical lock with no visible fasteners.

Axiom Splice Plate (AX4SPLICE/AXSPLICE): Formed to fit into special bosses in the Axiom and locked in place with factory-installed screws. These Steel splice plates (AX4SPLICE) are used to align and secure all joints between sections of Axiom trims. Each joint in the 50mm section height/ Knife Edge will require one splice plate whereas 100 mm & 150mm Axiom trims will require 2 splice plate at each joint. Corners are to be formed by mitering the end of axiom and splice plate (AXSPLICE) to be bent at right angle for connecting the end pieces.

1. Axiom Tee-Bar Connection Clip (AXTBC): Commercial quality G.I formed to fit into special bosses and locked in place by factory-installed screws and attached to Armstrong (XL-24 / XL-15/Silhouette/Interlude) suspension system members. T-Bar connection clips are used to attach the Axiom to the supporting Suspension system members. These two-piece Aluminum clips are supplied as an assembled unit with the steel locking screw factory installed. One clip is required at each location where the grid system intersects the Axiom trim.

4. Hanging Grid clips(AXHGC):Classic axioms to be hung independently to the structural soffit by engaging the Hanging Grid Clip into the bosses of the Axiom trim channel and securing it to structural soffit using aircraft cables/GI wire.

C) Installation Procedure:

1. Hang the sections of Axiom Trim onto the grid system by engaging the top ear of the connection clip under the boss of the channel trim. Slide the lower leg downward to engage the lower boss on the trim and secure by tightening the locking screw.=

2. Complete the installation of all channel trims sections. Install and secure the splice plates, corner pieces, alignment plates etc.

3. Make adjustments as necessary to properly align the complete installation.

18. LIST OF MAKES

Preferred makes given below are to be considered by the bidder while quoting, as these make reflect the selected products and would remain first choice during execution also. However under some instances, Client / Architect may choose the "other make"

MATERIALS	PREFERED MAKE	OTHER MAKE
CIVIL WORKS		
Anti-termite treatment		PCI / Godrej / Bayer / BASF /
Cement		ACC / Ultratech / Gujarat Ambuja /
White Cement		Birla / J K /
Chemical Admixtures		BASF / CICO / Fosroc / STP /
PVC Concrete Cover		Lafarge / Prepared at site using M20 concrete /
Reinforcement steel		SAIL / TISCO / RINL /
Structural Steel		SAIL / TISCO / RINL /
M.S. Pipe, Tubes, Bar, Flats,Angle, Tee Sections		SAIL / TISCO / JINDAL /
Stainless Steel		Jindal / SAIL /
Anitcorrosive Paint		Asian / Berger /
Non-shrink Compund		BASF / CICO / Fosroc / STP / Sunanda Chemicals /
AAC blocks		Ultratech-Xtralite / Aerocon / Siporex India limited / BILT Industries Pvt. Ltd, /
Exposed Brick	Jaya jalaram	
Normal Brick		MK / BR / JBC /
Epoxy		BASF / CICO / Fosroc / STP / Sunanda Chemicals /
Anchor & Dash Fasteners / Bolts / Clamp, Rebar, Chemcial fastner / Coupler		Hilti / Fischer / Halfen /
Waterproofing-Compunds & chemicals		Pidilite / CICO / Fosroc / SIKA /
Water stops		Fosroc / BASF / Hydroswell /
Insulation by Spray		BASF / Lloydfoam /
Color Pigmint for Concrete works		JBA Concrete solution / Bomanite India / Lanxess /
Architectural Exposed Concrete Shuttering	Peri	Doka /
Elevators		Schindler / Thysen Krup / Otis / Mitsubishi /
Polyurethane Sealant/ Coat for Exposed brick work & Exposed Concrete (Hydrophobic Silane - Siloxane coating)	Wacker	DOW CORNING / Guard Hardner /

Silicon Sealant for windows		Alstone / DOW CORNING / WACKER /

FINISHING		
Gypsum Plaster	St. Gobain (gyproc)	Permaboard / Buildcon /
Paint/primer/oil bound distemper / Acrylic paint		Asian Paints / Dulux professional / Nerolac / Berger /
Fire Retardant paint		Akzonobel / Jotun /
Anti Corrosive Bitumastic Paint		STP / Berger / Asian /
Grid False Ceiling	AMF	Armstrong / Gyproc /
Baffle False Ceiling	Armstrong	
Polycarbonate panel system	Danpalon	PALRAM /
Rubber Column guards	YNM Safety	
Speed breakers	YNM Safety	
Convex Mirror	YNM Safety	
Wall Guard	YNM Safety	
Car Wheel Stoppers	YNM Safety	
Manhole DI covers	Neco	
DI Grating for trench	Neco	
Toughened Glass/ Mirror	Saint Gobain	MODIGUARD / ASAHI INDIA GLASS /

FLOORING		
Concrete pavers - FOR EXTERNAL	Basant betons	Hindustan Tiles / Nimco Prefab. / VYARA /
Anti-fungal Vitritifed tiles for medical center - 600 X 600	Johnson	Somany / NITCO / Kajaria /
Anti-fungal Cermaic tiles for water tank (Wall & Floor)	Johnson	Somany / NITCO / Kajaria /
Glazed Ceramic Tiles - Toilet Floor - 300 X 300	Johnson - Lenox Gris (300X300)	Somany- Baston Light / NITCO- RC Dune / Kajaria / RAK /
Toilet Wall - 300 X 450	Johnson - Grainlfow LT (300X450)	Somany- Trellis Light / NITCO-Lavanche LT / Kajaria / RAK /
Kitchen Wall - 300 X 300	Johnson - Grainlfow LT (300X450)	Somany- Trellis Light / NITCO-Lavanche LT / Kajaria / RAK /

Rubber Tile Flooring (samples to be approved by Architect/Client) For Gym Flooring	Ebaco Supreme 67	Rudi Sports Surfaces /
Turf Flooring (samples to be approved by Architect/Client) For outdoor Sports	Ebaco Durabolt Cushion ITF1	Rudi Sports Surfaces /
Tiles/ Stone Adhesive & Grouts	Pidilite	MYK- Latricrete / ARDEX /

INTERIOR WOOD WORK		
Waterproof Ply wood (BWP grade IS: 710)		MerinoPly / Green Ply / Century /

Veneer		Duro / ARCHIDPLY / Greenlam /
Pre-laminated waterproofing plywood		ARCHIDPLY / Merino / Greenlam /
Telescopic channels & Hinge & Handles & Magnet	Hettich	Hafele /
Kitchen Baskets	EVERYDAY	Sleek / EBCO-KITCHENS / Hettich /

DOOR/WINDOW/GLAZING/ HARDWARE / TOILET PARTITIONS		
Press metal Steel door (Fire & Non Fire)	Shakti Met	Navair /

Acessories for Metal Door	Dorma	Geze / Hafele /
Buttt Hinge 90 Deg	BS 3090F	
Sash Lock with level handle	271a + PURE 8100	
D type Pull Handle (300mm)	TGDI-D300	
Dead Lock (Fire-rated)	288a	
Allen Key	8681	
Tower Bolt SS - 300mm with dust excluding socket	3101-1 + 3124	
Tower Bolt SS - 900mm with dust excluding socket	3101-1 + 3124	
Baby Latch	TDB 300	
Door Stopper (wall mounted)	4012	
Robe Hook	3106	
Magic Eye	1200-1	
Door Closer	TS 71, 3/4, Std arm	
Door Cordinator	SR 490	
Panic Bar with External Trim (single point)	PHCR1-1200 + PHCRT 2905 + 3005 + RP 8Si - 48"	
Panic Bar with External Trim (double point)	PHCR 1200 1&2 + PHCRT 2905 + 3005 + RP 8Si - 48"	
Electromagnetic Hold Open	EM500A + MAW	
Electromagnetic Lock (with free release)	EM 3000 AH	
Fire Seal	RP 120- Long Double Doorset	

Window & Door Aluminium Europrofile Sections	indo alusys / Baruka/	Bhoruka / Indal / Jindal / domal / Alumak India /
Window & Door Aluminium Sections PVDF		Axonoble / indo alusys / Bhoruka / Indal / Jindal / domal /

Window & Door Aluminium Hardware	Alu Alpha	Geze
Mortice Handle	Alu Alpha - 305	
Multipoint Locking Mortice Lock	CVL- 3I2/35/6L	

Cylinder	Tesa -50303030N	
Lock Shield for Cylinder set	Alu Alpha - 33042	
Locking Point set	Alu Alpha - 18222	
Locking Strip set	Alu Alpha - Divbarra	
Butt Hinge	Alu Alpha - CE2F	
Shoot Bolt	Alu Alpha - 33034	
Lock Meeting	Alu Alpha - 33023	
Sliding Handle Key-Lock System	Alu Alpha - 248i	
Sliding Handle (for mesh if in design)	Alu Alpha - 267i	
Multipoint Espag	Alu Alpha - MAE10	
Multipoint Espag	Alu Alpha - MAE16	
Nib	Alu Alpha - GMA	
Nib	Alu Alpha - G1A	
Roller	Polismar - 99999.3SF60S	
Roller	Polismar - 99999.1SF40S	
Multipoint Handle With Key	Alu Alpha - 610K	
Extensor Pin	Alu Alpha - 23mm Extensor Pin	
Pull in Block	Alu Alpha - 18230	
Friction Hinge	Securistyle - STORMBS10	
Friction Hinge	Securistyle - ED8A	

Toilet Cubical (HPL)	Merino- TITAN SS SERIES	Greenlam Sturdo /
Rolling Shutter	Shakti Met	

LANDSCAPE		
STREET FURNITURE	OTLO	MANIBHADRA
LIGHT POLES	Wipro	Philips /

LIST OF MOCKUP & SAMPLES FOR APPROVAL
SCC exposed part wall mockup
Mirror Polished Kota
All Stone Finishes
Concrete pavers
Single slab Granite stone 75mm thick for Seats in Stilt Floor
Single slab Granite stone 50 mm thick for window cill
Vinly Flooring as per Spec
Dado tile with Chemical adhesive
Vitrified Tiles

Glazed Ceramic floor Tiles
Metal Doors full asembly with hardwares
Aluminium Door full assembly with hardwares -PVDF finish
Aluminium Window full assembly with PVDF Finish and with hardwares
Polycarbonate Sheet
Manhole DI covers
DI Grating for trench
MS Railings,
MS Grill Doors
MS Pergola
Toilet Cubical (HPL)
Window Toughened Glass & Mirror
Access Control /Magnetic Locks
Grid False Ceiling
Precast Lintels
Electrical Fixtures and fittings
Sanitary Fixture and Fittings
HVAC works Fixtures and fittings
Sample Flooring
Painting Shades
Grass works
Signage Works
LIST OF METHODOLOGY (TO BE SUBMITTED BY THE CONTRACTOR)
Sleeves alignment
Exposed Concrete
Repair of concrete works

II) ELECTRICAL

UPS SYSTEM

1.0 GENERAL

This specification covers the requirements of three-phase, UPS System units as per configuration defined in the Schedule of Quantities.

2.0 DESIGN PREREQUISITE

THE UPS SHALL BE DESIGNED TO MEET THE FOLLOWING PARAMETERS

INCOMING POWER SUPPLY - 3 phase 3 Wire TP

OUTGOING POWER SUPPLY - 3 phase 4 wire TP and N

IN CASE THE STATIC BY PASS IS REQUIRED TO BE ENABLED A SEPARATE INCOMING POWER SUPPLY FOR ONLY THE BY PASS AT 3 PHASE 4 WIRE TP and N SHALL BE PROVIDED.

THE NEUTRAL FOR THE UPS OUTPUT SHALL BE CREATED AT THE UPS AND SHALL NOT BE INTERCONNECTED OR CARRIED FORWARD FROM THE MAINS NEUTRAL.

3.0	**Standards and Codes**	The equipment/ system shall conform to the latest version of following Standards and Codes • Indian Electricity Act 2003 • Indian Electricity Rules 1956 • IEC Standard 62040 for UPS Safety: • Europe : EN 500091-1 • USA/Canada: UL1778 - Standards for Uninterruptible Power Supply Equipment. Emission and Immunity: • Europe: EN 500091-2 • USA/Canada: FCC Class

4.0	**Environmental Requirements**		
4.1		Storage ambient temperature.	(-) 50 to (+) 70^0
4.2		Operating Ambient temperature Continuous operation	Zero to (+) 30^0C
4.3		Relative Humidity	0-95%, non condensing
4.4		Humidity clause	IEC 7212-1

5.0	**UPS Operation**	**The UPS shall be suitable for the following operational modes** • **Normal operation:** The rectifier/ inverter combination shall operate to continuously regulate and supply power to the critical load. The Inverter/battery charger shall derive power from the AC Input source and supply DC Power to float-charge the battery. • **Battery:** Upon failure of the AC Input source, the critical load shall continue to be supplied by the Inverter and battery without any switching. The Inverter shall obtain its power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the AC Input source. • **Recharge:** Upon restoration of the AC input source, the Inverter/battery charger shall simultaneously recharge the battery and regulate and supply power to the critical load. • **Energy Economy Mode : -** In the event of partial load, energy management software shall switch off the required number of module to maintain the efficiency of complete system at more than 75%. When load increases upto full demand required number of modules shall be switched ON automatically without affecting the operation. • **Static By pass Mode** Transferring the load to mains supply and vice versa without interruption in power to the critical load. No re-booting of microprocessor shall take place after transfer and retransfer of critical load. • **Maintenance By Pass mode** For service and maintenance only and shall be used for supplying the load directly from the mains supply, while the UP1S is isolated for maintenance. • **Parallel operation:** UPS modules shall be capable of running in parallel operation for increased capacity or for redundant operation. The parallel board shall ensure proper control of parallel units and proper load sharing. One parallel board shall be provided for each unit connected in parallel and each load should have dual data cable to avoid single point of failure.

6.0	UPS safeties	**Low Battery Voltage Protection:** To prevent total discharge or damage to the battery, the UPS shall transfer to standby operation when the battery voltage reaches a set minimum voltage level (programmable). If AC input source has not returned within 10 minutes after "low battery" shutdown, the UPS shall electronically disconnect DC Power from the battery to avoid deep discharge.
7.0	**Technical Parameters**	
7.1	**General**	The UPS Systems shall operate in conjunction with the building electrical system to provide power conditioning, back-up power protection, and power distribution for the critical loads. The UPS shall comply to the following parameters • Double conversion online, • Space vector modulation based technology as defined in IEC standard continuous operation, • Solid-state • The system shall be classified as VFI-SS-III as per IEC 62040such that UPS output is independent of supply mains voltage and frequency variations • Suitable for parallel redundant system operation on a common DC bus or with separate DC for each unit, and shall provide proportional load sharing.
7.2	**Technical performance**	Technical parameters of the system are listed in Annexure-I. Tenderers' confirmation of compliance or otherwise shall be filled in against each item in this annexure.
8.0	**Construction and Design Specifications**	
8.1	**Rectifier**	a. Power supply - public mains supply or from the standby generating set. b. Function to rectify input AC to DC and supply both the inverter and the battery system. c. The power section is constructed using SCR/ IGBT technology to achieve system technical specifications as specified. d. Residual ripple of the battery charging current shall be reduced to < 1% as per EUROBAT tolerances by appropriate smoothing devices in the battery link circuit. e. All rectifier regulation and control functions hall be digital to perform the following functions: • Voltage regulation of the DC voltage link circuit with a constant voltage • Rectifier blocking during a mains failure and automatic restart on restoration of the mains supply or after starting the standby generating set; with adjustable soft start characteristic • Rectifier current limiting **Battery Charging and monitoring** • Automatic charger with I/U characteristic in accordance with DIN 41773 • Battery charging current limiting

		• Battery boost charge: changeover from 10-hour charging current to 5-hour charging current • Automatic equalizing charge stage when the battery voltage falls below the set value • Temperature-dependent final charging voltage using an additional temperature sensor on the battery unit • Battery trip characteristic to prevent exhaustive discharge with very small battery currents • Continuous battery- and battery-fuse-automatic • Monitoring of the battery and the mains voltage • Temperature-controlled battery charging extends the life of the battery • Battery management and monitoring • The integral battery trip characteristic provides reliable protection against exhaustive discharge • Cyclical battery tests indicate the current status **Manual Controls** • Manual switch-off of battery charging from the operator control panel should be possible when Running the standby generating set • Manual equalizing charge stage for a period that is individually adjustable by the user in the LC Display of the operator control panel **Indications** • The battery monitor indicates residual battery capacity and establishes for how long the load can be supplied. A message is generated if this is less than an adjustable residual run time.
8.2	**Inverter**	a. Power Supply from rectifier in normal operation and battery in the event of a mains failure. b. The inverter generates a three-phase system with controlled voltage and frequency and supplies the load. c. The power section shall be constructed using IGBT technology and output stages of the inverter shall be pulse-width modulated at high variable frequency in order to obtain an exact sinusoidal output voltage, even with a non-linear load, with a frequency accuracy of ± 1% for line commutation and ± 0,001% for self-commutation. d. Regulation shall be microprocessor-controlled achieve voltage tolerance as specified during 100% load changes. e. It shall be ensured that synchronicity between the reference sine signal and the bypass network is continuously available in the parallel standby position. f. The inverter comprises the following main components: • Fully-transistorised three-phase inverter bridge employing IGBT technology • Output filter capacitors for reducing the distortion factor to < 1% for a linear load and < 3% for a non-linear load. • Outgoing contactor for connecting and disconnecting the inverter output • Inverter controller for monitoring and control
8.3	**Static Switch**	a. Function automatically transfer load without a break to the

	(automatic bypass)	mains supply in the event of a UPS rectifier/inverter failure or maloperation such that set tolerances are exceeded in any predefined parameter. b. On recovery to normal conditions, the bypass shall automatically return to inverter operation without a break . c. The static switch consists of dual thyristor modules for uninterruptible changeover from inverter operation to bypass operation. d. Manual changeover shall be selectable if required and this too shall be without a break e. The rated output of the automatic bypass shall correspond to the total output of the UPS system. f. In the parallel mode with other UPS modules, each module shall have its own automatic mains bypass. g. The bypass mode must be capable of being disabled if required. h. It shall be possible to provide a separate in feed to the by pass circuit.
8.4	**Maintenance Bypass**	The maintenance bypass shall supply the load from the bypass source while the UPS is isolated for maintenance. A UPS input, output maintenance bypass and bypass switch shall be housed in the UPS cabinet. Each switch shall be monitored and controlled by the UPS.
8.5	**Display and Controls**	
8.5.1	**Displays**	• A 4 x 20 character microprocessor-controlled LCD display unit shall be located at the front of the UPS cabinet. • The display unit shall consist of an alphanumeric display with backlight, an alarm LED, and a touch key pad. • The display unit shall display the following UPS operational status ➢ Normal operation, load power xxx% ➢ Battery operation, time xxx minutes. ➢ Bypass operation. ➢ Standby The display unit shall provide following indications • LED indications for load level battery autonomy.
8.5.2	**Metered parameters**	The unit shall display the metered parameters as listed out in serial no. 10.1 of Technical Parameters And Compliance Statement enclosed as annexure-I
8.5.3	**Alarms**	The unit shall display a log of all active alarms.
8.5.4	**Event Log**	The unit shall display a time and date-stamped log of the 250 most recent UPS status and alarm events.
8.5.5	**Controls**	• Controls as listed out in serial no. 10.3 of Technical Parameters and Compliance Statement enclosed as annexure-I shall be provided on the display unit: • UPS On and Off push Buttons: Momentary UPS on and off push buttons shall be provided in a user accessible compartment. Upon activation of the on push button, the UPS shall automatically connect to UPS output to the critical load. Upon activation of the off push button, the UPS shall remove

		power from the critical load.
8.5.6	**Potential Free Contacts**	The UPS shall be equipped with two potential free contacts: Additional potential free contacts as specified in the Schedule of Quantities shall be provided.
8.5.7	**Communications Interface**	Communication ports listed out in serial no. 10.6 of Technical Parameters And Compliance Statement enclosed as annexure-I. It shall be possible to use two or more ports simultaneously.
8.5.8	**Battery Charger temperature compensation**	For units with external batteries, the battery charger temperature compensator shall monitor the temperature in the battery cabinet.
8.5.9	**Remote UPS Monitoring**	It shall be possible to remotely monitor the UPS via either RS-232 / RS-485 or contact closure of the UPS and an existing computer system. The UPS manufacturer shall have available interface kits to support remote monitoring systems listed out in serial no. 10.8 of Technical Parameters And Compliance Statement enclosed as annexure-I.
8.5.10	**CNMP Adapter**	A Web-Enabed SNMP adapter shall allow one or more network management systems (NMS) to monitor and manager the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS & UNIX formats, The SNMP interface adapter shall be connected to the UPS via the RS232 serial port.
8.6	**Battery**	
8.6.1	**Battery Capacity and calculations**	The battery capacity shall be as per Schedule of Quantitues. Tenderer shall provide support design calculations for selection of battery sizing and capacity.
8.6.2	**Batteries type**	• Batteries shall be VRLA type • Design Lifetime: minimum 5 years • DC ripple : Max. 2 %
8.6.3	**Battery Function Monitor**	Battery function monitor shall monitor and define battery capacity. It shall be possible to program the unit to perform an automatic battery test every 90 days to test the condition of the battery.
8.6.4	**Battery disconnect**	For units with external batteries, a external MCCB Box shall be provided for protection and isolation of the battery bank from the rest of the system.
8.6.5	**Quality Control**	During manufacture, each battery cell shall be clearly identified as to the cell type, voltage, and capacity. All cells in the battery should have been tested during manufacture to verify 100% system capacity. Design and manufacture of the batteries shall be done under a quality assurance program controlled and documented by written policies procedures or instruction.
8.7	**Fault Diagnosis**	For rapid and efficient fault diagnosis an electronic diagnostic system shall be provided comprising • Event recorder which stores the last 1200 events in plain text in chronological order with date and time • Status LEDs on the controller board • DSO (digital storage oscilloscope) software provides the service engineers with a graphical display of all relevant input and output variables at optional test points.

		The information shall remain permanently stored, even with the power supply switched off.
8.8	**Enclosure**	The UPS shall be housed in a freestanding enclosure with provision for cable entry for all incoming and outgoing cables from top only. All service accesses shall be from the front. The UPS cabinet shall be powder coated with the manufacturers standard colour. The cabinet shall be equipped for fork truck lifting.
8.8.1	**Forced Ventilation**	Details of forced ventilation if required shall be furnished alongwith the tender.
8.8.2	**Dimensions and weights**	Overall dimensions of the UPS systems as also the battery banks shall be furnished. The weight of the UPS units and battery banks shall also be furnished for checking structural floor loading.
9.0	**General Specifications**	
9.1	**Mean time between failures**	MTBF shall be Field-proven minimum of 200,000 hours. MTBF calculation for parallel redundant system shall be furnished alongwith the tender.
9.2	**Modular Sub-assemblies**	For ease of maintenance and service, UPS units shall have field replaceable modular sub-assemblies.
9.3	**Materials**	All materials comprising the UPS units shall be new, of current manufacture, and shall not have been in prior service except as required during factory testing. The UPS unit shall not contain any PVC components
10.0	**Testing at Manufacturers Works**	The tests indicated below but not limited to shall be carried out on the final product at the manufacturers works. The Owner/ Consultant reserve the right to witness these tests and appropriate notice shall be given by the manufacturer. The UPS shall be give specific dispatch clearance by the Owner. Consultant after satisfactory completion of all desired tests **10.1 Load Tests** Measurement of the following parameters para 10.1.1 under varying loads para 10.1.2 indicated below **10.1.1 Parameters** • Voltage Regulation Output Line to Neutral voltages (R, Y, B) • Voltage Regulation Output Line to Line voltages (R-Y, Y-B, B-R) • Line Currents (R, Y, B) • Phase Shift (R, Y, B) • Voltage Distortion (R, Y, B) • Input Power and power factor (R, Y, B) • Output Power and Power Factor (R, Y, B) • Percentage Efficiency

		10.1.2 Load Conditions • Load 10% Power factor Unity • Load 25% Power factor 0.9 lagging • Load 25% Power factor 0.9 leading • Load 50% Power factor 0.9 lagging • Load 50% Power factor 0.9 leading • Load 100% Power factor 0.9 lagging • Load 100% Power factor 0.9 leading **10.2 Transfer Power from Mains to Inverter and vice versa** • Output Voltage, Output Current and Bypass current oscillograms during Full load **Manual** Transfer from Mains to Inverter • Output Voltage, Output Current and Bypass current oscillograms during Full load **Manual** Transfer from Inverter to Mains • Output Voltage, Output Current and Bypass current oscillograms during Full load **automatic** Transfer from Mains to Inverter • Output Voltage, Output Current and Bypass current oscillograms during Full load **Automatic** Transfer from Inverter to Mains **10.3 Dynamic Step Loads** • Output Voltage and Current oscillograms during dynamic step load from 0% to full load 100% • Output Voltage and Current oscillograms during dynamic step load from full load 100% to 0% load **10.4 Overload Test** The following overload tests shall be carried out • Load Rate 110% - Duration 60 minutes • Load Rate 125% - Duration 10 minutes • Load Rate 150% - Duration 1 minute
10.0	**Installation and After Sales Service**	The tenderer shall have a service organization available consisting of factory trained field service personnel to • Perform installation, testing, commissioning and startup of the equipment at the site. • Perform preventive maintenance, and servicing • offer service support 24 hours a day, 7 days a week, 365 day a year

		• provide spare parts 24 hours a day, 7 days a week, 365 days a year SLA shall be 2 hr response time and 4 hr resolution time for all the UPS units.
11.0	**Annual Maintenance Contract**	The tenderer shall offer a comprehensive routine, preventative and breakdown maintenance contracts (AMC) for the UPS and the battery system as defined in Schedule of Quantities.
12.0	**Training**	The tenderer shall provide training of the Clients operating and maintenance staff at no extra price. A UPS training workshop shall be conducted at the customers site by the tenderer and shall include a combination of lecture and practical instructions. The service training workshop shall include instruction about safety procedures, UPS operational theory, subassembly identification and operation, system controls and adjustment, preventive maintenance, and trouble shooting.

Annexure-I

UPS SYSTEM

TECHNICAL PARAMETERS & COMPLIANCE STATEMENT
(To be filled up and enclosed alongwith the tender)

Sl No.	Parameter	Requirement as per tender	Compliance or otherwise shall be confirmed against each item by the tenderer
1	Manufacture of UPS	Name & Address of manufacturing units to be indicated.	
2(a)	Technology	Double conversion, pulse width modulated with SCR rectifier and IGBT based Inverter and digitally controlled.	
2(b)		Compliance to IEC 62040	
2(c)		Compliance to classification VFI-SS-III IEC 62040	
2(d)		Insulation group (over voltage) category 2 as per DIN / VDE 0110	
2(e)		Radio interference suppression as per EN 50091-2	
3(a)	Environmental requirement	Storage ambient temperature (-)50 to70deg C	
3(b)		Operating ambient temperature 0 to 30 deg C	
3(c)		Relative humidity	
3(d)		Air requirement with 100% load	
3(e)		Protection class IP 20 as per DIN/VDE 0470 Part-II / IEC 529	
4.	**System rating**		
4.1	System Configurations	As per schedule of quantities	
4.2	Upgradeable	Provision of adding additional UPS units in parallel redundant mode with existing units. Tenderer to indicated maximum number of similar rating of units that can be provided in parallel	

		redundant mode.	
5	**Operating Parameters**		
5.1	Input voltage rating	380/400/415 V (user selectable) 3 phase, 4 wire + ground (site adjustable)	
5.2	Input voltage range	+15% to (-) 20%	
5.3	Input frequency	50 Hz ± 10%	
5.4	Input power factor	Greater than 0.9	
5.5	Power Walk in	0-100% within 20 milli sec.	
5.6	Input current distortion	Less than 5% THD If not, please confirm inclusion of cost of active filter	
5.7	Output voltage rating	380/400/415 V user selectable 3 phase 4 wire + ground	
5.8	Output voltage regulation		
5.8.1		±1% steady state for a static 100% unbalanced load	
5.8.2		Unbalanced load and dynamic at load step 0-100% (±) 3%	
5.9	Output frequency	± 0.05 Hz	
5.10	Output power factor	0.8 minimum	
5.11	Output harmonic distortion		
5.11.1		1% THD maximum and 1% any single harmonic for a 100% linear load.	
5.11.2		2% THD maximum for a 100% non-linear load	
5.12	Crest Factor:	3 : 1	
5.13	Maximum non linear loading	100%	
5.14	Voltage Transient Response		
5.14.1		± 1% for a 50% load step.	
5.14.2		±3% for a 100% load step.	
5.14.3		Recovery Time < 20 msec	
5.15	Phase Displacement		
5.15.1		120 degrees ±1 degree for balanced load	

5.15.2		120 degrees ±1 degree for 50% unbalanced load.	
5.15.3		120 degrees ±2 degree for 100% unbalanced load.	
5.16	Overload Capability		
5.16.1		110% for 60 minute in normal operation.	
5.16.2		125% for 10 minutes in normal operation.	
5.16.3		150% for 30 seconds in battery operation.	
5.16.4		125% continuously in bypass operation.	
5.16.5		1000% for 10 milliseconds in by pass operation.	
5.17	AC to AC efficiency including isolation transformer at nominal input voltage with batteries fully charged in double conversion mode		
5.17.1		At 100% linear load,	
5.17.2		At 75% linear load	
5.17.3		At 50% linear load	
5.18	Operating cost	Calculation for round the clock (7x 24x 365) @Rs. 6/kWH to be furnished.	
5.19	Acoustical Noise with 50% /100% load	< 70 dB(A) of noise, typical, measured at 1 meter from the operator surface.	
5.20	Output wave form	Pure sine wave	
5.21	Heat loses	To be furnished.	
5.22	MTBF of the system	Minimum 200,000 hours	
6.0	Automatic integral static bypass	To be provided	
7.0	Maintenance by pass	To be provided	
8.0	Automatic restart	Upon restoration of mains AC power, after a mains AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load and the battery charger shall automatically recharge the battery.	
9.0	Output Isolation	To be provided. Rating of transformer	

	Transformer	to be indicated.	
10.0	Display and control		
10.1	Metered parameters		
10.1.1		Input AC voltage (line-to-line, three-phase simultaneous).	
10.1.2		Input AC Current (line-to-neutral, three-phase simultaneous).	
10.1.3		Output AC voltage (line-to-line, three-phase simultaneous).	
10.1.4		Output AC Current (line-to-neutral, three-phase simultaneous).	
10.1.5		Output frequency	
10.1.6		Battery voltage	
10.1.7		Battery Current (charge/discharge).	
10.1.8		Battery temperature	
10.1.9		Output Peak current.	
10.2	Event log	Display a log of status and alarm events to be provided.	
10.3	Controls		
10.3.1		Set the alphanumeric display language to English	
10.3.2		Display or program the time and date	
10.3.3		Enable or disable the automatic restart feature.	
10.3.4		Transfer to or from static bypass operation.	
10.3.5		Transfer or to from forced battery operation.	
10.3.6		Program the unit for economy operation.	
10.3.7		Program the battery charger	
10.3.8		Calculate battery back-up time	
10.3.9		Test battery condition on demand	
10.3.10		Program the unit to periodically test battery condition.	
10.3.11		Program voltage and frequency windows	
10.3.12		Calibrate metered parameters	
10.3.13		Enable or disable adaptive slew rate. Set maximum slew rate.	
10.3.14		Adjust set points for different alarms.	
10.3.15		Program the remote shutdown contact (enable/disable remote shutdown, polarity display).	
10.3.16		Set the delay for the common fault contact.	

10.3.17		Program the unit for soft start for use with a generator.	
10.4	Push buttons	ON/OFF push buttons to connect or disconnect critical loads to be provided	
10.5	Potential free contacts	Two contacts to be provided.	
10.6	Communication interface board	For following ports. • RS232 serial port. • RS485 serial port. • COM-PORT with the following normally open or normally closed potential free contacts: - UPS on. - Static bypass operation. - Battery operation - Battery low	
10.7	Charger temp. compensator.	To be provided	
10.8	Remote UPS monitoring kits	To support following systems to be provided • Microsoft windows 3.1, 3.11 • Microsoft Windows 95 • Microsoft Windows NT • OS/2 • Netware 3.12, 4.1, 4.11 • Apple • DECVMS • DG-UX • Silcon Graphics • DEC OSF/1 • SCO UNIX • SCO XENIX • SVR4 • Interface • Unix Ware • SUN Solaris • SUN OS • IBM AIX • HP-UX	
10.9	Protection	Output fully isolated from input	
		Built in overload	
		Built in short circuit	
		MCCB protection at input	
		Over temperature sensing circuit	

10.10	Alarms	Mains fail	
		Low battery	
		Over load	
		UPS on bypass	
		UPS on battery	
10.11	Software capability	The UPS shall be capable to communicate with network operating system and shall be capable of doing safe shutdown of critical load by means of a auto shutdown software.	
10.12	SNMP / Web management	To be provided as standard	
11.0	**Battery parameters**		
11.1	Type	Valve Regulated Lead Acid (VRLA) SMF	
11.2	Make	Exide / Panasonic / Global Yuasa / Amar raja	
11.3	Battery charger	Current limiting max voltage 2.33 volts per cell	
11.4	Battery backup	For each unit as per Schedule of Quantities	
11.5	Max. charging current	10% of AH rating.	
11.6	Battery rating for each UPS in VAH	To be furnished Calculations in support of rating selected to be provided.	
12.0	**Overall weight and dimensions**		
12.1	Overall dimensions		
	UPS system	To be furnished	
	Battery bank	To be furnished	
	Floor loading kg/m^2	To be furnished	
12.2	Overall Weight		
	UPS system	To be furnished	
	Battery bank	To be furnished	
13.0	**Cable connections**		
13.1	Cable cross section	• Input • Bypass • Battery	

		• Output	
13.2	Cable connection	From above	
13.3	Accessibility	From front	
14.0	**Service and After sales service**		
14.1		Availability in city of site location	
14.2		Service support available round the clock.	
4.3		Spare parts available round the clock.	
14.4	SLA	Response time 2 hr time	

LT SWITCHBOARDS

1.0 GENERAL

CPWD Specifications to be followed for LT SWITCHBOARDS, however, in general following specification also to be followed while design and selection of switch gear.

Any descripency in Specifications and Schedule, schedule to be followed.
This section covers specification of LT Switchboards

2.0 STANDARDS AND CODES

The Standards and Codes applicable to the works are listed in Annexure I of the tender document and may be referred to.

3.0 SWITCHGEAR

3.1 LT Moulded Case Circuit Breakers

3.1.1	Type	Air Break
3.1.2	Operating voltage	415 volt 3 phase 50 Hz
3.1.3	Insulation Voltage	660 volts
3.1.4	Current rating	As per Schedule of Quantities
3.1.5	Fault Level withstand Ics	As per Schedule of Quantities
3.1.6	Icu	100% Ics
3.1.7	Isolation function	As per IEC 60947-2 Section 7.12
3.1.8	Insulation	class II insulation between the front panel and internal power circuits
3.1.9	Cubicle mounting	Fixed unless otherwise specified
3.1.10	Operating mechanism	Trip free Independent Manual spring closing (IMS) or motor wound spring closing mechanism (MWS) as per Schedule of Quantities
3.1.11	No of Poles	3 or 4 as required
3.1.12	All current carrying parts	Silver plated
3.1.13	Arcing contacts	Shall be provided to protect the main contacts and shall be separate from the main contacts and easily replaceable.
3.1.14	Arc chutes	Shall be provided for each pole, and shall be suitable for being lifted out for the inspection of the main and the arcing contacts.
3.1.15	Common Operating handle	Required for Three phase MCCBs for simultaneous operation and tripping of all the three phases.
3.1.16	Indications and Operations integral with ACB on front	• Mechanical ON/OFF/ Tripped indication • Operating handle • mechanical trip push button
3.1.17	Accessories	Following accessories shall be provided as required • Under voltage trip • Shunt trip • Alarm switch • Auxiliary switch

3.1.18	Circuit Breaker Interlocking	Interlocks shall be provided to ensure the following: • Handle interlock to prevent unnecessary manipulations of the breaker. • Door interlock to prevent door being opened when the breaker is in ON position • Deinterlocking device to open the door even if the breaker is in ON position. • Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker in "ON" and "OFF" position.
3.1.19	Protection	Microprocessor based releases and/or thermal magnetic releases shall be provided for the Circuit Breakers as stipulated in the Schedule of Quantities
3.1.20	Electrical endurance	Shall be as per IEC
3.1.21	Type test certificates	Submit Certificates from a recognised test house for the Circuit Breakers offered.

4.0 SWITCHBOARDS

4.1	Supply System	Three phase 4 wire, 415 volt, 50 Hz, Indian TN-S system
4.2	Short circuit level withstand	As per Schedule of Quantities
4.3	Ingress protection	IP 42 unless otherwise stated Metal based neoprene gaskets between all adjacent units and beneath all doors and covers shall be provided to render the joints dust and vermin proof
4.4	Pressure relief devices	Shall be provided to minimize danger to operator during internal fault conditions.
4.5	**Panel Compartmentation**	
4.5.1	Compartment	The Panel shall be Form 3B formation.
4.5.2	Circuit Breaker Metering	Separate segregated compartment shall be provided for accommodating instruments, indicating lamps, control contactors and control MCB etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
4.5.3	Control wiring compartment	A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
4.6	**Panel Configuration**	
4.6.1	Panel configuration	MCCB's arranged……. multi-tier formation Air Circuit Breakers……. Single or Double tier formation
4.6.2	Spare Space provision	**The Switchboards shall have a provision of 20% spare space to accommodate possible future additional switch gear.**
4.6.3	Extensible	**Shall be extensible on both sides**
4.7	**Panel Construction**	

4.7.1	Panel construction	• Metal clad totally enclosed, • Dead front • floor mounted • free standing type • modular extensible design • suitable for indoor mounting.
4.7.2	Switchboard cubicles, doors and covers	Fabrication with.... CRCA Sheet Steel Cubicles……. thickness not less than 2.0 mm …….……..folded and braced ……to ensure rigid support for all components. Doors/ covers….. thickness not less than 1.6 mm. Joints ……seam welded Welding slag ……ground off Welding pits ……..wiped smooth with plumber metal.
4.7.3	Switchboard frames	Fabrication with ….electro galvanized MS sheets 'U' Channel switchboard frames……. **2.5 mm** thick All joints…….. neatly formed and ……finished flush with adjacent surfaces No joints shall be located in corners. Bare edges shall be lipped. Structural members and bracings where ever required shall be welded or bolted to the frame. The frame shall be of modular design and extensible.
4.7.4	Cable compartment	Rear Access switchboards……all cabling from rear Front access switchboards……Separate vertical cable Accessible from front only Adequate space shall be provided for ease of installation and maintenance with safety for working without coming into contact with any live parts. The cable chambers shall be complete with • Adequate support for cables. • tinned brass cable sockets, • tinned brass compression glands, • 3 mm thick gland plates, • supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor XLPE/ PVC/ PVCA cables.
4.7.5	Door handles	Good quality door handles fitted with toggles to operate rods to latch with suitable slots in both top and bottom of switchboards shall be provided. Latching rods and associated brackets shall be cadmium plated.
4.7.6	Operating handles	All operating device shall be located in front of switchgear only.
4.7.7	Fixing Screws	Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in switchboards.

4.7.8	Dimensional Limitations	• Base channel 75 mm x 5 mm thick shall be provided at the bottom. • Minimum 200 mm blank space between the floor of switchboard and bottom most unit shall be provided. • Overall height shall be limited to 2300 mm unless otherwise stipulated. • Height of the operating handle, push buttons etc shall be restricted between 300 mm and 1700 mm from finished floor level.				
4.8	Rating of Bus Bars, interconnections and to feeders	These shall be designed as per requirements in Schedule of Quantities to • Carry full load current for phase and neutral bus bars • withstand the stresses of fault level The following indicative sizes of Aluminium and Copper links be used for ACB Ratings upto 3150 A. Please note that these are for reference only and actual sizes shall be determined to withstand full load current, stipulated temperature rise and fault levels.				
	Switchboard Bus Bars, Interconnections etc rating					
		Range of current	**Copper bars as per IEC 60947-2**		**Aluminum bars as per IS 13947- 2**	
			No of Runs	Dimensions (mm)	No of Runs	Dimensions (mm)
		400 – 500	2	30 x 5	2	32 x 8
		500 – 630	2	40 x 5	2	40 x 8
		630 – 800	2	50 x 5	2	50 x 8
		800 – 1000	2	60 x 5	2	50 x 10
		1000 – 1250	2	80 x 5	2	63 x 12
		1250 – 1600	2	100 x 5	4	50 x 8
		1600 - 2000	3	100 x 5	3	100 x 10
		2000 – 2500	4	100 x 5	4	100 x 10
		2500 – 3150	3	100 x 10	4	150 x 10
4.9	**Switchboard Bus Bars**					
4.9.1	Bus Bar material	High conductivity, high strength aluminium alloy, complying with requirements of grade E 91E of IS 5082 – 1981 Alternatively Electrical grade 99.99% pure copper/aluminium bar as per Schedule of Quantites				

4.9.2	Bus Bar Insulation	Heat shrunk PVC sleeving of 1.1 kV grade and bus bar joints provided with clip-on shrouds.	
4.9.3	Bus Bar supports	Non-breakable, non-hygroscopic epoxy resin or glass fiber reinforced polymer insulated supports able to withstand operating temperature of 110^{O} C at regular intervals, to withstand the forces arising from a fault level as stipulated in schedule of quantities. Cross –section of busbars The cross section of the neutral busbar shall be same as that of the phase busbar for busbar of capacities upto 200A for higher capacities, the neutral busbar must not beless than half cross secion of that phase busbar.	
4.9.4	Colour Coding	All bus bars shall be colour coded.	
4.9.5	Auxiliary Bus	Electrolytic copper Auxiliary buses for control power supply, space heater power supply or any other specified service shall be provided. These shall be insulated, adequately supported and sized to suit specific requirement.	
4.10	**Switchboard Interconnections**		
4.10.1	Interconnection material	Unit ratings upto 100 amps,	FRLS PVC insulated copper conductor wires with crimped terminations.
		Rating of 100 amps and above	Solid copper/ aluminium connections PVC sleeved
4.10.2	Interconnection joining	All connections, tappings etc • Shall be made to ensure minimum contact resistance. • shall be firmly bolted and clamped with even tension. Before assembly • joint surfaces shall be filed or finished to remove burrs, dents and oxides and silvered to maintain good continuity at all joints. All screws, bolts, washers shall be cadmium plated. Approved spring washers shall be used with cadmium plated high tensile steel bolts with BSF threads.	
4.10.2	Instrument and control wiring	All wiring for relays and meters shall be with ZHFR PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 2.5 sq. mm.	
4.11	**Earthing**	Continuous earth bus sized for prospective fault current shall be provided with arrangement for connecting to station earth at two points. Hinged doors / frames shall be connected to earth through adequately sized flexible braids.	
4.12	**Ventilation Fans**	Panel mounting type ventilation fans shall be provided in each panel with switchgear rated for 2500 amp and above. The fan shall be interlocked with switchgear operation.	
4.13	Space Heaters	Anti- condensation heaters shall be fitted in each cubicle together with an ON/OFF isolating switch suitable for	

		electrical operation at 230 volts A.C 50 Hz single phase of sufficient capacity to raise the internal ambient temperature by 5^{O}C operation interlocked with switchgear.
4.14	**Sheet Steel Treatment And Painting**	Sheet steel used in the fabrication of switchboards shall undergo a rigorous cleaning and surface treatment seven tank process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process after which a coat of primer paint compactively with the final paint shall be applied over the treated surface. Final paint coat of oven baked powder coating, of minimum 50 micron thickness, of sheet approved by Engineer-in-Charge shall then be provided.
4.15	Labels	Suitable engraved white on black metal identification labels shall be provided for each switchgear cubicle in front and back identifying the circuit, switchgear type, rating and duty.

CELING FAN

1.0 GENERAL

The Ceiling fans shall be as Schedule of Quantities and Five Star BEE rating fans.

LIST OF MAKES

S. No	Detail of Material		Makes
1	415 V GRADE PANELS (MAIN LT PANEL, CAPACITOR PANELS, VENTILATION PANELS & ALL OTHER LT PANELS)	-	TRICOLITE
		-	ADLEC SYSTEMS PVT. LTD.
		-	SPC ELECTROTECH
		-	ADVANCE PANEL & SWITCHGEAR
		-	CONQUERENT
2	MCCB	-	SCHNEIDER (COMPACT NSX)
		-	L&T (D-SINE)
		-	SIEMENS (3VA)
		-	LEGRAND
		-	MITSHUBISHI
		-	ABB (T-MAX)
3	CAST RESIN CURRENT TRANSFORMERS	-	MATRIX
		-	PRECISE
		-	VISHAL
		-	ECS
		-	JYOTI
4	POTENTIAL TRANSFORMERS	-	MATRIX
		-	PRECISE
		-	VISHAL
		-	ECS
		-	JYOTI
5	LT XLPE CABLES / CONTROL CABLES/CRCUIT INTEGRITY CABLES	-	POLYCAB
		-	UNIVERSAL
		-	RALLISON
		-	RR KABEL
		-	GLOSTER
6	CABLE LUGS	-	DOWELLS
		-	JAINSONS
7	CABLE DOUBLE COMPRESSION GLANDS	-	COMET
		-	PEECO
8	CABLE TRAYS / RACEWAYS AND	-	SLOTCO

S. No	Detail of Material		Makes
	RACEWAY ACCESSORIES.	-	STEELWAYS
		-	PROFAB
		-	OBO
		-	MEM
9	MULTIFUNCTION METERS/ AMMETER/VOLTMETER (ALL DIGITAL TYPE)	-	L&T RISHAB
		-	SCHNEIDER
		-	SECURE
		-	ENERSOL
		-	NEPTUNE
10	ENERGY METERS (KWH METER) (DIGITAL TYPE)	-	SECURE
		-	NEPTUNE
		-	ELMEASURE
11	INDICATING LAMP (LED) / PUSH BUTTON / PUSH BUTTON ACTUATORS/ SELECTOR SWITCHES	-	L&T
		-	KAYCEE
		-	SCHNEIDER
		-	TEKNIC
12	TERMINAL BLOCK	-	ELEMEX
		-	CONNECT WELL
13	BATTERIES (MAINTENANCE FREE)	-	EXIDE
		-	PRESTOLITE
		-	STANDARD
		-	FURUKAWA
14	RUBBER MATS/ EARTH MAT	-	JYOTI
		-	SAFE VOLT (RMG)
15	ANCHOR FASTNER	-	HILTI
		-	FISHER
16	WELDING RODS	-	ADVANI OERLIKON
		-	L&T
17	FIRE EXTINGUISHER	-	MINIMAX
		-	CEASEFIRE
		-	SAFEX
18	MS CONDUIT ISI EMBOSSED BLACK ENAMELED /GALVANIZED CONDUIT	-	BEC
		-	STEELCRAFT
		-	AKG

S. No	Detail of Material		Makes
19	MS/GI CONDUIT ACCESSORIES SUPERIOR TYPE AS APPROVED SAMPLES	-	SHARMA SALES CORP.
		-	BEC
		-	HINDUSTAN ELECTRIC CORP
		-	RAMA
20	GALVANIZED STEEL FLEXIBLE CONDUIT	-	TRINITY TOUCH
21	PVC RIGID CONDUIT AND ACCESSORIES ISI EMBOSSED	-	BEC
		-	AKG
		-	PRECISION
		-	POLYPACK
		-	AKG
22	PVC FLEXIBLE CONDUIT & ACCESSORIES	-	BEC
		-	PRECISION
23	1100 VOLT GRADE FR/FRLS PVC INSULATED MULTISTRANDED COPPER CONDUCTOR WIRES	-	POLYCAB
		-	RAGANIGANDHA
		-	RR KABEL
		-	FINOLEX
		-	RALLISON
24	ELV CABLES	-	EXCEL,
		-	FINOLEX,
		-	D-LINK
25	MODULAR GRID PLATE WIRING ACCESSORIES (SWITCHES SOCKET OUTLETS ETC.)	-	NORTH WEST(PLATIA),
		-	SCHNEIDER (ZEN CELO),
		-	LEGRAND (ARTEOR)
		-	MK(BLENZE)
26	HEAVY DUTY METAL CLAD SOCKET OUTLET BOXES	-	SCHNEIDER
		-	LEGRAND
		-	NEPTUNE
27	WEATHER PROOF SOCKET OUTLET WITH MCB	-	SCHNEIDER
		-	LEGRAND
		-	NEPTUNE
28	MCB/RCCB/RCBO/ELCB/TIMER / CONTACTORS MOUNTED IN DB	-	L&T
		-	LEGRAND
		-	MITSHIBISHI
		-	SCHNEIDER, HAGER, EATON

S. No	Detail of Material		Makes
29	MCB DISTRIBUTION BOARDS IN 18 SWG SHEET STEEL HOUSING (DOUBLE DOOR)	-	L&T
		-	LEGRAND
		-	MITSHIBISHI
		-	SCHNEIDER, HAGER, EATON
30	UPS	-	EMERSSON
		-	APC SCHENIDER
		-	SOCOMAC, EATON
			NUMERIC
31	INTELLIGENT ADDRESSABLE MULTI CRITERIA PHOTO AND HEAT SMOKE DETECTORS	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
32	INTELLIGENT ADDRESSABLE MANUAL PULL STATION / GLASS BREAK TYPE CALL POINT	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
33	INTELLIGENT ADDRESSABLE CONTROL MODULE	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
34	INTELLIGENT ADDRESSABLE MONITOR MODULE	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
35	INTELLIGENT ADDRESSABLE MAIN PANEL/REPEATER PANEL	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
36	ADDRESSABLE HOOTERS/ FLASHERS	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
37	ADDRESSABLE BEAM DETECTOR	-	EDWARDS
		-	SIEMENS(FIRE FINDER),
		-	HONEYWELL (NOTIFIER)
38	LIGHT FIXTURE		PHILIPS
			WIPRO
			BAJAJ
39	CEILING FAN		CROMPTON
			BAJAJ
			HAVELLS

S. No	Detail of Material		Makes
40	OCCUPANCY/DAY LIGHT SENSOR		HAGER
			SCHNEIDER
			PHILIPS

NOTE: The list of approved materials is for guideline. However the client reserve the right to choose any of the indicated makes.

Signature of Tenderer

III) FIRE FIGHTING SERVICES

SECTION – I

1. **SCOPE**

1.1 The scope of work covers design & engineering, supply, erection, painting, testing, commissioning, and handing over of complete Fire Protection System envisaged for all the buildings covered under the current phase of the project in line with stipulations of National Building Code – 2016.

Work under this sub-head consists of furnishing all Labour, Material, equipment and accessories necessary and required to completely install the Fire Fighting equipment etc., specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the work of Fire Fighting System shall include the followings:

a) Providing M.S. black steel pressure pipe line main including Valves, Fire Hydrants, Excavation for Pipes, Laying of pipes, Painting of pipe and Making Connection to supply system.
b) Black Steel Pipe, Mains Laterals, Branches, Valves Hangers and Appurtenances.
c) Hose Reels, Rubberized fabric lined hose pipes, Hose cabinets & Landing Valves.
d) Portable Fire Extinguishers.
e) Hydrants (Internal, External & related accessories).
f) Fire Fighting Pumps, Suction Delivery Lines, Control Panels & all other related accessories (as per requirements).
g) All civil and structural works, electrics, control & instrumentation, site & shop painting for fire fighting system.

2. **APPLICABLE / REFERENCE CODES**

➢ IS: 1239 (Part 1 & 2)	-	M.S. Pipe Heavy duty
➢ IS: 14846		Sluice valves (PN 1.6)
➢ IS: 6392-1971	-	Steel Pipe Flanges
➢ IS:554	-	Pipe threads where pressure tight joints are Required
➢ IS:909	-	U/G fire hydrants, sluice valve type
➢ IS:5312 (P-1)	-	NRV
➢ IS:778	-	Gunmetal full way valves with wheel tested to 20kg/cm^2 class II
➢ Butterfly valves	-	They shall be of specified quality conforming to IS:13095 or BS:5155
➢ IS:5290	-	Internal hydrant shall comprise "Single Headed Single Outlet GM Landing Valve" conforming to Type "A".
➢ IS:12585	-	Hose tubing (Thermoplastic)

➢ IS:884	-	Hose tubing, Globe valve, Stop cock & Nozzle
➢ IS:636	-	Hose pipes rubber lined woven jacketed (RRL) & 63mm dia, conforming to type "A"
➢ IS:903 pipe, nozzle, Coupling etc]	-	The couplings shall be of instantaneous [Branch spring lock type
➢ IS:15683	-	Portable fire extinguishers
➢ Pendant Sprinkler	-	UL Listed, Temperature Rating 68°C (155 °F)
➢ Upright Sprinkler	-	UL Listed, Temperature Rating 68°C (155 °F)
➢ Sidewall Sprinkler	-	UL Listed, Temperature Rating 68°C (155 °F)

3. Designs, Drawings and technical submittal

a) After Award of the Work :

The Contractor shall submit 03 (Three) sets of designs & shop drawings for the entire pumping installations to be provided under this contract along with supporting design calculations, charts etc, and proposed General Arrangement drawings for major equipments for Fire Hydrant Systems within 30 (Thirty) days of award of work for approval before proceeding with the work. He shall also furnish all clarifications and explanations as may be desired by CPWD promptly for early finalization of the design.
The work to be executed as per approved shop drawings & technical submittal by the contractor.

b) On Completion of Work :

The contractor shall submit soft copy and 6 (Six) sets of O & M manuals for Hydrant System including pumps, motors, diesel engines, MCC panels, Circuit Diagram, Manufacturers technical catalogues, detailed specification of items provided along with As-built drawings and copies of Test Certificates of all major equipments duly bound in neat and presentable booklet forms within 30 days of completion of the work.

4.0 Approval by Local Fire Service

It shall be the responsibility of the contractor to get the approval in stages from the Local fire Service as required. This shall be without any liability to the Engineer-in-charge .

On successful completion of work, the contractor shall prepare as built drawings which have been so approved by the Fire Service incorporating all changes that might have been effected during execution of the work.

The contractor shall also bring to the notice of the Engineer-in-charge any deviations from Local Fire Service/Building Bye Laws Norms and requirements in the systems that he shall install as well as architectural features that will affect approval from the Fire Service. No extra charges shall be paid on account of interaction with the Fire Service.

5.0 Coordination

The Contractor shall be required to co ordinate his activities with all other services such as Air Conditioning, Electrical and Civil (Interiors) etc.

6.0 Civil Works

All civil works are included in Contractor's scope of work unless otherwise specified. Civil works like excavation for pipe laying underground with pedestal supports or chasing in the wall/ceiling or making hole in the RCC floor/ceiling or in brick wall for piping, grouting etc. including making good after completion, small size pedestals or any other minor civil works required in connection with the installation of the system are included in the scope of work of this contract and it shall be deemed to be included in the contractor's scope of work.

The Contractor shall however furnish all details and relevant data required for design and detailed engineering of all civil works included in this design.

7.0 PIPING

SCOPE

The scope of this section comprises the Supply, Laying, Erection, Testing and Commissioning of pipes required for this project.

7.1 All piping laid shall be black steel unless otherwise stated. Pipes shall be given one primary coat of red oxide paint before being installed. Pipes and jointing shall be as follows:

Pipe Size	**Material**	**Jointing Method**
Upto 50mm	MS tube heavy class as per IS-1239	Fittings with threaded / screwed joints
65mm to 150mm	MS tube heavy class as per IS-1239	Fittings with Welded Joints
		Slip on flanges
200mm to 350mm	Welded MS class-2 as per IS-3589 Thickness-6.35mm	Fittings with Welded Joints
		Slip on flanges

Pipe threads and flanges shall be as per IS.

7.1.1 All Fittings shall be new and from approved /reputed manufacturers, Fittings shall be of malleable castings of pressure ratings suitable for the piping system. Fittings used on welded piping shall be of the weld-able type.

7.1.2 Flanges shall be new and from standard manufacturer as per I.S.6392-1971, Table 17 with appropriate number of G.I. Washers, Nuts and Bolts, half threaded of GKW make or equivalent with 3 mm insertion neoprene gasket complete.

7.1.3 Tee off connection shall be through reducing tees, wherever possible. Otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.

7.1.4 All equipment and valve connections shall be through flanges (Welded or screwed for galvanized steel)

7.1.5 All welded piping is subject to the approval of the Engineer in charge. Sufficient number of flanges and unions shall be provided.

7.2 PIPING INSTALLATION

7.2.1 The Tender drawings to have Cross reference and indicate schematically the size and location of pipes. Pipes runs and sizes may, however, be changed to meet the site conditions. The Contractor on the award of the work shall prepare detailed working drawings showing the cross section, longitudinal section, detail of fittings, locations of isolating drain and air valves etc. They must keep in view the specific openings in buildings and other structures through which the pipes are designed to pass.

7.2.2 Piping shall be properly supported on or suspended from stands, clamps, hangers etc, as specified and as required. The tenderer shall adequately design all the brackets, saddles, clamps, hangers etc. and be responsible for their structural integrity. Shop Drawings of all proposed supports to be submitted for approved before execution of work.

7.2.3 Pipe supports shall be of steel, adjustable for height and primer coated with rust preventive paint and finish coated black. Where pipe and clamp are of dissimilar material, a gasket shall be provided in between. Spacing of pipe supports on main headers shall not exceed 3.0 meters in any case, and additional supports shall be provided on all bends, tees, valves etc as per requirements.

Pipe hangers shall be fixed on walls and ceiling by means of metallic rawl plugs.

7.2.4 Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe and with a 12mm thick rubber pad or any other approved resilient material. Where pipes pass through the terrace floor, suitable curbing shall be provided to prevent water leakage. Risers shall also have a suitable concrete pipe support at the lowest point.

7.2.5 Pipe sleeves of 50mm larger diameter shall be provided wherever pipes pass through wall and the annular space filled with lead wool and finished with retaining rings.

7.2.6 Piping work shall be carried out with minimum disturbance to the other works being done at the site. A program of work shall be chalked out in consultation with the Engineer-in-charge.

7.2.7 Piping layout shall take due care for expansion and contraction in pipes.

7.2.8 All pipes using screwed fittings shall be accurately cut to the required sizes and threaded in accordance with IS: 554 and burrs removed before laying. Open ends of the piping shall be locked as the pipe is installed to avoid entrance of foreign matter. Wherever reducers are to be made in horizontal runs, eccentric reducers shall be used if the piping is to drain freely, in other locations, concentric reducers may be used.

7.2.9 Contractor shall provide suitable cement concrete, anchor blocks of adequate dimensions as per spacing mentioned above & at all bends, tee connection and other places required and necessary for overcoming pressure thrusts in pipes wherever pipes are installed on-ground/underground. Anchor blocks shall be of cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size).

7.3 PIPE PROTECTION

7.3.1 All pipes above ground and in exposed locations shall be painted with one coat of Red Oxide Primer immediately after bringing the pipes to site and shall be painted with one coat of red oxide primer after erection and proper hydraulic testing, and two or more coats of Synthetic Enamel Paint of approved shade on finishing.
All black steel pipes under floors or below ground shall be provided with protection against corrosion after proper hydraulic testing by application of 100mm wide and 4mm thick layer of anti-corrosive protection tape over the pipe, with overlap of 25mm minimum as per manufacturers specifications.

7.3.2 Where pipes are buried under ground, after treated, the same shall be back filled with the excavated soil. The top of the pipes shall not be less than 100cms below the ground level. Where this is not possible, the permission of Engineer-In –charge shall be obtained for burying the pipes at lesser depth. Underground pipe shall be laid at least 2M away from the face of the building preferably along the roads and foots paths.

7.3.3 Vibration Elimination:

Piping installation shall be carried out with vibration elimination fittings wherever required.

7.4 TESTING

7.4.1 All piping shall be tested to hydrostatic test pressure of minimum 14 kg/cm² or 1.5 times the design pressure whichever is higher for a period of not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-charge.

7.4.2 Piping required subsequent to the above pressure test shall be re-tested in the same manner.

7.4.3 System may be tested in sections and such sections shall be securely capped.

7.4.4 The Engineer-in-charge shall be notified well in advance by the contractor of his intention to test a section of piping and all testing shall be witnessed by the Engineer-in-charge or his authorized representative.

7.4.5 The Contractor shall make sure that proper noiseless circulation of fluid is achieved through the system concerned. If proper circulation is not achieved due to air bound connections, the contractor shall rectify the defective connections. The Contractor shall bear all the expenses for carrying out the above rectification including the tarring - up and re - finishing of floors, walls etc. as required.

7.4.6 Complete Flushing out Test of Sprinklers installation shall be carried out to clean the sprinkler pipes for foreign materials before fixing the sprinkler heads to avoid obstruction in the sprinklers

7.4.7 The Contractor shall provide all materials, tools, equipment, instruments, services and labour required to perform the test, and shall ensure that the plant room and other areas are cleaned up and spill over water is removed.

7.5 PAINTING

7.5.1 After the piping has been installed, tested and run for at least ten days. The piping shall be given two finish coats, 3 mils each of approved color.

7.5.2 The direction of flow of fluid in the pipes shall be visibly marked in white arrows or as directed by the Engineer-in-charge.

8.0 VALVES & ACCESSORIES

8.1 SLUICE VALVES

Sluice Valves above 65 mm shall be of Cast Iron body and Gunmetal seat. They shall conform to type PN 1.6 of IS:780. Sluice valves upto 65mm shall be of Gunmetal Full way Valve with wheel tested to 20 Kg./cm2 class-II as per I.S: 778. Valve wheels shall be of right hand type and have an arrow head engraved or cast thereon showing the direction for turning open and closing.

8.2 BUTTERFLY VALVES

8.2.1. The Butterfly Valve shall be suitable for waterworks. The Valves conforming to IS : 13095 shall be provided. All valves shall be suitable to withstand the pressure in the system and rating shall be PN 1.6. All valves shall be right handed (i.e. handle or key shall be rotated clock wise to close the valve).

8.2.2 The direction of opening and closing shall be marked and an open / shut indicator fitted.

8.2.3 The material of valves shall be as under:-

Body	-	Cast iron
Disc	-	Ductile Iron
Seat	-	EPDM / nitrile rubber
Shaft	-	Stainless Steel

8.2.4 The Valve shall be fitted between two flanges on either side of pipe flanges. The Valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

8.3 NON-RETURN VALVE

Non-return valves shall be of Cast Iron body and Stainless Steel seat. They shall conform to API-594 and have companion flanges. They shall be Dual Plate Type suitable for both horizontal and vertical installation. An arrow mark in the direction of flow shall be marked on the body of the valve.

8.4 AIR RELEASE VALVE

Air valves shall be provided at all high points in the piping system for venting valves shall be of the double float type, with G.M. body, vulcanite balls, rubber sealing, etc. Air valves shall be of the sizes specified and shall be associated with an equal size forged ball valve.

8.5 BALL VALVE

8.5.1 The Ball Valve shall be made from forged brass and tested to 16 Kg/ cm^2 pressure. The valve shall be internally threaded to receive pipe connections.

8.5.2 The Ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body bonnet gasket and gland packing shall be of Teflon.

8.5.3 The handle shall be of chrome plated steel with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the teflon packing shall be sealed to prevent water seeping upto 14 Kg / cm^2 pressure.

8.5.4 The handle shall also be provided with a lug to keep the movement of the ball valve within 90 degree.

8.6 SUCTION STRAINER

Strainers shall be preferably of the approved type with fabricated steel bodies designed to the test pressure of 16 Kg/ cm^2 . Strainers shall be fabricated by minimum 1.2 mm thick stainless steel sheet with 3 mm dia. perforation holes. Strainers shall be provided with flanges or threaded sockets as required. They shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of screen without disconnection of the main pipe.

8.7 PRESSURE GAUGES

Pressure gauges shall be of 150mm dia. dial and of appropriate range and be complete with shut off gauge valve etc. duly calibrated before installation. Care shall be taken to protect pressure gauges during pressure testing.

8.8 FLEXIBLE CONNCTION FOR PUMPS

All suction and delivery lines shall be provided with double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump. Length of the connector shall be as per manufacturer's details.

9.0 EXTERNAL YARD HYDRANTS

9.1 The Contractor shall provide Single headed External Fire Hydrant in the Ring or on External Fire Line, as per specifications as specified in Schedule of Quantities and as shown in drawings. The spacing of the hydrants and the distance from the building shall be maintained as per relevant requirements of latest relevant codes, unless specified herewith.

9.2 Each External Fire Hydrant shall be provided with an External Fire Hose Cabinet of MS / Fiber reinforced plastic (FRP), as specified in Schedule of Quantities of size 75 x 60 x 25 cms, as approved by the Engineer-in-Charge to equip 2 nos. of 63 mm dia , 15 mtr long non percolating reinforced rubber line (RRL) hoses, one no. branch pipe and accessories as required. The cabinet shall be installed near the Hydrant as per details, approved by the Engineer-in-Charge. The fire hose cabinet shall have with glass fronted double door with lock and keys and break glass recess for keys, all complete. The glazed glass shall be of minimum 6mm thickness, or as specified in the bill of quantities.

The FHC shall be red painted. The words "yard hydrant", "hydrant" etc. shall be painted in white (or red on the glass) in 75mm high letters. The hose box shall be lockable with socket spanner. Top surfaces shall be slopped for water discharge. Vents shall also be located on sides of the Hose Box.

A brick pedestal with brick wall complex with plaster shall also be constructed for supporting the hose box. All surfaces shall be plastered with 1:4 ratio (1 cement: 4 fine sand) mortar.

Sample of one installation to be approved before proceeding with execution.

10.0 INTERNAL HYDRANTS

10.1 The Single headed Internal Hydrant outlet shall be as per IS: 5290 (Type-A), and as specified in the bill of quantities.

10.1.1 A cap with chain is provided on the head of the outlet. The hydrant will have an instantaneous pattern female coupling for connecting to Hose Pipe.

10.1.2 The Landing Valve shall be fitted to a Tee connection on the wet riser at the landing.

10.1.3 The Hydrant shall be constructed from gun metal and finished to a smooth polish on screwed ends. The Hydrant shall have screwed inlet of 80mm dia. flanged type with 4 nos. holes. The Hydrant shall have a PVC plug with chain fixed to the main body of the Hydrant. The Hydrant shall be tested to minimum 16 kg / cm^2 test pressure. The Hydrant shall not leak at any screwed joint.

11.0 FIRST-AID HOSE REEL EQUIPMENT

11.1 First aid hose reel equipment shall comprise reel, drum which can swing upto 170 degrees, with hose, guide fixing wall bracket, hose tubing, globe valve, stopcock and nozzle. This shall conform to IS: 884 - 1969. The hose tubing shall confirm to IS: 444-1980 or IS: 12585 (Thermoplastic). The drum shall be fabricated from GI sheet of minimum 18 gauge thickness or as specified in the bill of quantities.

11.1.1 The hose tubing shall be 20 mm dia and 30 m long, or as specified in the bill of quantities. The G.M nozzle 5mm and shutoff valve shall be of 25 mm size to shut off the water supply to the Hose Reel, or as specified in the bill of quantities.

11.1.2 The fixing bracket shall be of swinging type. Operating instructions shall be engraved on the assembly. This heavy duty mild steel and cast iron brackets shall be conforming to IS: 884 - 1969. The first-aid hose reel shall be connected directly to the M.S. pipe riser through a 25mm dia pipe.

11.1.3 A MS bracket shall be fixed on the wall to which the first aid hose reel shall be bolted. The bracket shall be of 40x40x5mm thick MS angle to form a square of 400x400 mm approx. This shall be fixed on the wall. After approval of sample by Engineer-in-charge further units shall be fabricated in factory and all joints shall be finished with grinder and shall be spray painted after single coat of primer.

12.0 HOSE PIPES, BRANCH PIPES AND NOZZLES

12.1 HOSE PIPES

12.1.1 Two numbers Hose Pipes for Single headed External and Internal hydrants shall be rubber lined woven jacketed (RRL) and 63mm in dia. 15m long, (non percolating Reinforced rubber lined) conforming to IS:636 (Type A), or as specified in the bill of quantities. The hose shall be sufficiently flexible and capable of being rolled.

12.1.2 Each run of hose shall be complete with necessary Male & Female SS coupling at the ends to match with the landing valve or with another run of hose pipe or with branch pipe. The couplings shall be of instantaneous spring lock type. This shall be conforming to IS: 903.

12.2 BRANCH PIPES

12.2.1 Standard short sized Branch pipe shall be constructed from alloy of Gunmetal material/SS, 63 mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle conforming to IS: 903. The branch pipe shall to be tested to 20 kg/ cm^2 pressure.

12.3 NOZZLES

12.3.1 The nozzle shall be of SS, 20 mm internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe. The inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

12.3.2 End Couplings, Branch pipe, and Nozzles shall conform to IS:903 - 1985.

13.0 ORIFICE PLATE

13.1 The pressure in a Fire Fighting system varies from point to point. The pressure will be maximum in the pump house and minimum at the farthest hydrant at TOP level. To reduce pressure to operating pressure at every internal /external hydrant, orifice plates are provided before connection of landing valve between the flanges of landing valve and pipe flange.

14.0 HOSE CABINET (INTERNAL)

14.1 The internal hose cabinet shall accommodate the Hose Pipes, Branch Pipe, Nozzle and Hydrant Outlets and shall be fabricated from FRP as specified in Bill of Quantities. The overall size shall be 2100x1200x900 mm, or as specified in the Architectural details and as per BOQ. This shall have lockable centre opening glazed doors / glass front door of min. 6mm thickness as per the requirement and as per Architectural details. Where the niche for wet riser is provided with shutters, separate hose cabinet as above may be dispensed with. Sample of the fire door shall be approved by Engineer-in-charge.

14.1.1 The hose cabinet shall be of color / shade as approved by Engineer-in-charge.

15.0 FIRE BRIGADE INLET CONNECTIONS

15.1 Fire Brigade Inlet connection shall be provided near the pump house and to the external fire ring system as specified and as described in the BOQ, for the following purposes:

(a) Fire Brigade suction draw out connection for fire static tank with provision of foot valve.

(b) Fire brigade inlet connection to fire static tank.

15.2 Fire brigade inlet connection to the external ring main. Each connection shall be in accordance with similar dia of Sluice valve and Non return valve.

15.2 The locations of these fire brigade connections shall be suitably decided with the approval of Engineer-in-charge and with a view that these are easily accessible to the fire brigade, without any possible hindrance.

16.0 VALVE CHAMBERS

Contractor shall provide suitable Brick Masonry Chamber in cement mortar 1:4 (1 cement: 4 coarse sand) on cement concrete foundations 150 mm thick in 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size) 12 mm thick plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling complete.

17.0 PORTABLE FIRE EXTINGUISHER

Portable fire extinguishers shall be provided as per Bill of Quantities and shall conform to IS: 15683 and distribution of extinguishers in each buildings shall be in conformity with IS: 2190 - 2010.

18.1 ABC TYPE DRY POWDER EXTINGUISHER

18.1.1 The Extinguisher shall be filled with ABC Grade 40, Mono Ammonium Phosphate (MAP base) from approved manufacturer.

18.1.2 The Capacity of the extinguisher when filled with Dry Chemical Powder (First filling) as per IS 4308, part II 8/ IS 15683, shall be 6 kg +/-2 % or 10 +/-3 %.

18.1.3 It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety city, fitted with a pin, to prevent accidental discharge. It shall be pressurized with Dry Nitrogen, as expelling. The Nitrogen to be charged at a pressure of 15 kg / cm^2.

18.1.4 Body shall be of mild steel conforming to relevant IS Standards. The neck ring shall be also mild steel and welded to the body. The discharge valve body shall be forged brass or leaded bronze, while the spindle, spring and siphon tube shall be of brass. The nozzle shall be of brass, while the hose shall be of braided nylon. The body shall be cylindrical in shape, with the dish and dome welded to it. Sufficient space for Nitrogen gas shall be provided inside the body, above the powder filling.

18.1.5 The Neck ring shall be externally threaded the threading portion being 1.6 cm. The filler opening in the neck ring shall not less then 50 mm. Discharge nozzle shall be screwed to the hose. The design of the nozzle shall meet the performance

requirement, so as to discharge at least 85 % of contents upto a throw of 4 meters, continuously, at least for 15 seconds. The hose, forming part of discharge nozzle, shall be 500 mm long, with 10 mm dia internally for 6 kg capacity and 12 mm for 10 kg capacity. It shall have a pressure gauge fitted to the valve assembly or the cylinder to indicate pressure available inside. The extinguisher shall be treated with anti corrosive paint, and it shall be labeled with words ABC 2.5 cm long, within a triangle of 5 cm on each face. The extinguisher body and valve assembly shall withstand internal pressure of 30 kg / cm^2 for a minimum period of 2 minutes. The pressure Gauge shall be imported and suited for the purpose.

18.2 WATER TYPE EXTINGUISHER (GAS PRESSURE TYPE)

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

18.2.2 The capacity of Extinguisher, when filled upto the indicated level, shall be 9 liters.

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

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

18.2.5 The extinguisher shall be treated for anti corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enameled / powder coated. The cartridge shall be as per IS, and have 60 gm. Net carbon dioxide gas for expelling. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 kg/cm^2. It shall have external marking with letter A, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground, and discharge tube with nozzle held in one hand to give a throw of not less than 6 meter, and continue so for at least 60 sec. The extinguisher body shall be clearly marked with ISI stamp (IS 15683).

18.3 CARBON DIOXIDE EXTINGUISHER

18.3.1 The Carbon Dioxide Extinguisher shall be as per IS: 15683.

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

18.3.3 The discharge mechanism shall be through a control valve conforming to IS: 3224. The internal siphon tube shall be of copper or aluminum conforming to relevant specifications.

18.3.4 Hose pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 14 kg/cm², and shall be approximately 1.0 meters in length having internal dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The handgrip of Discharge horn shall be insulated with Rubber of appropriate thickness.

18.3.5 The gas shall be conforming to IS: 307 and shall be stored at about 85 kg/cm². The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times and total discharge time shall be minimum 10 sec. and Maximum 25 sec.

18.3.6 The extinguisher shall fulfill the following test pressures:
a. Cylinder: 236 kg/cm²
b. Control Valve: 125 kg/cm²
c. Burst pressure of Hose: 140 kg/cm² minimum.

18.3.7 It shall be an upright type. The cylinder, including the control valve and high pressure Discharge Hose must comply with relevant Statutory Regulations, and be approved by chief Controller of Explosives, Nagpur and also bear IS marking.

18.3.8 The Extinguisher including components shall be ISI Mark.

19.0 FIRE FIGHTING PUMPS

This chapter covers the general requirement of water pumps for Terrace fire pump..
CAPACITY: The discharge and head of the pumps shall be as mentioned in Bill of Quantities.

19.1 Pumping sets shall be multi stage horizontal centrifugal single outlet with cast iron body and bronze dynamically balanced impellers.

- Connecting shaft shall be stainless steel with bronze sleeve and grease lubricated bearings. The centrifugal pump shall conform to IS: 1520.
- Pumps shall be connected to the drive by means of spacer type love-joy coupling / flexible coupling, which shall be individually balanced dynamically and statically.
- The coupling joins the prime mover with the pump shall be provided with a sheet metal guard.
- The shaft seal shall be mechanical type, so as to allow minimum leakage. A drip well shall be provided beneath the seal.

19.2 The bearings shall be heavy duty ball / roller type suitable for the duty involved. These shall be grease lubricated and shall be provided with grease nipples/cups. The bearing shall be effectively sealed against leakage of lubricant or entry of dust or water.

19.3 Main / Diesel Engine driven Fire Pumps shall be capable of delivering not less than 150% of the rated capacity of water at Engine rating shall be at least 30% more then input BHP of the Pump. The shut-off head shall not exceed 120% of the rated head.

19.4 MOTORS FOR ELECTRIC DRIVEN PUMPS

19.4.1 Electrically driven pumps shall be provided with totally enclosed fan cooled induction motors. For fire pumps, the motors should be rated not to draw starting current more than 3 times normal running current.

19.4.2 Motors for Main fire pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.

19.4.3 Motors shall be suitable for 415 volts ± 10%, 3 Phase, 50 Hz, A.C supply with class –F insulation, TEFC and conform to IS: 325.

19.4.4 Motors shall be capable of handling the required starting torque of the pumps.

19.4.5 Contractor shall provide heating arrangements (Space Heaters) for the main fire pump motor to ensure that motor windings shall remain dry.

19.5 ACCESSORIES AND FITTINGS

19.5.1 The following accessories shall be provided with each pump among other standard accessories required:

a) Coupling guard for horizontal split casing pumps.
b) Lubrication fittings and seal piping.
c) Test and / or air vent cocks

19.5.2 Following fittings shall be provided with each pump among other standard fittings required:

a) Suction and discharge pressure gauges not less than 150 mm dia. dial size and of the appropriate rating with gauge valves etc. Suction gauge shall be of compound type.

b) 25mm GI gland drains.

19.6 INSTALLATION

19.6.1 Pump and motor assembly shall be installed as per manufacturer's recommendations. Pump sets shall be mounted on machinery isolation cork or any other equivalent vibration isolation fittings. Concrete floating foundation shall be provided as per approved shop drawings and specifications. The isolation pads, foundation bolts etc. shall be supplied by the Contractor. Contractor shall ensure that the foundation bolts are correctly embedded. Angle iron frame of size 35mm X35mm X 3mm shall be provided on the top edges of the foundation. The length & width of the foundation shall be such that 100mm space is left all around the base frame.

19.6.2 Pump sets shall preferably be factory aligned, wherever necessary, site alignment shall be done by competent persons. Before the foundation bolts are grouted and the couplings are bolted, the bed plate levels and alignment results shall be submitted to the Engineer-in-charge. The suction / discharge pipe shall be independently supported and their weight shall not be transferred to the pump. It should be possible to disconnect any pump for repair without disturbing the connecting pipe line.

19.7 TESTING

19.7.1 Tenderers shall submit the performance curves of the pump supplied by them. They shall also check the capacity and total head requirements of each pump to match piping and equipment layout.

19.7.2 On completion of the entire installation, pumps shall be tested, wherever possible, for their discharge, head, flow rate, B.H.P. Where it is not possible at least the discharge, head and B.H.P. (as measured on the input side) shall be field tested. Test results shall correspond to the performance curves.

19.8 PAINTING

19.8.1 After complete installation and testing, pumps accessories and fittings shall be given two coats of approved finishing paint.

20.0 AIR VESSEL FOR FIRE PUMPS

- Provide an air vessel fabricated from M.S. sheet with dished ends and suitable supporting legs, air vessel shall be provided with a 100mm dia flanged connection from pump, one 50mm dia drain with valve, one gunmetal water level gauge and 25mm sockets for pressure switches. the vessel shall be 250mmx2000mm dia high and tested to 1.5 times of the working pressure.

21. Power cabling :

Contractor shall provide all power /control cables from the motor control centre to various motors, level controllers and other control devices. All power cables shall be aluminum conductor XLPE insulated armored and PVC sheathed and control cables of copper conductor PVC insulated armored and PVC sheathed. All cables shall have stranded conductors of 1100 Volt grade. The cables shall be in drums as far as possible and bear manufacturer's name.

Cables shall be laid as per standard practice conforming to relevant Indian Standards by providing proper cable supports and clamps as required. Cables and wires in conduits shall be laid on the metallic trays.

Fire Survival Control Cable

Fire Survival Control Cable with Class -2 copper conductor twin twisted with ceramifiable Silicone insulation along with drain wire , Aluminium Tape and Low Smoke Zero Halogen (LSZH) outer sheath as per BS-7629 Part -1. Outer sheath should be Anti Rodent. Fire test in accordance with BS: 6387-1994 CWZ.

22. CABLE TRAYS

Contractor shall provide G.I. perforated cable trays of sizes as given in the bill of quantities, with G.I. sheet thickness of 2.0mm. Cable trays shall be supported from the bottom of the slab at intervals of 60cms at both ends by welding support rods with insert plates OR Anchor fasteners including clips, bolts, nuts, support rods and any other materials required to fix the trays.

The jointing between the sections shall be made with coupler plates of the same material and thickness as the channel section. Two coupler plates, each of minimum 200mm length, shall be bolted on each of the two sides of the channel section with 8 mm dia round headed bolts, nuts and washers.

Factory fabricated bends, reducers, tee/ cross junctions etc shall be provided as per good engineering practice. The radius of bends, junctions etc. shall not be less than the minimum permissible radius of bending the largest size of cable to be carried by the cable tray.

23. Measurements

Measurements of Fire Fighting work shall be on following basis:-

- Piping for hydrant lines, headers & branches for sprinkler system, risers, suction & delivery header and mains shall be measured along the center line of installed pipes including all pipe fittings and accessories but excluding valves and other items for which quantities are specifically indicated in the schedule of work. No separate payment shall be made for fittings and accessories.

  The rates for piping work shall include all wastage allowances, flanges pipe supports, hangers, excavation, refilling, testing, nuts and check nuts, vibration isolators, suspension where specified or required, and any other item required completing the pipe installation. None of these items will be separately measured and paid.

- Pumps and equipment shall be measured by numbers and shall include all items as given in the bill of quantities.

- Cable trays and cables shall be measured per linear meter.

- No separate payment shall be made for making connections of the existing service lines to the pumps. Vibration eliminator pads are included in the scope of this work.

24. <u>COMMISSIONING</u>

After successful testing of the different items in parts, the Contractor shall provide all facilities including necessary piping, labour, tools and equipments etc. for carrying out testing and commissioning of the entire fire fighting system complete as per requirement in the presence of Engineer-In-charge or his representative and during the visit of the Fire Officer whenever and as may be required. Generally, the following test/inspection has to be carried out:

(a) For checking the Pressure available at the farthest and highest point in fire wet riser / down comer system.

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PROJECT
IISER TIRUPATI

SUBJECT
FIRE FIGHTING SYSTEM

LIST OF APPROVED MAKES OF MATERIALS

S.No	Materials	Brand & Manufacturer
1.	M.S /G.I. Pipes	TATA/JINDALHISSAR /SURYA ROSHNI
2.	Forged Steel Fittings	SS/MEC (JAINSONS)/VS
3.	Butt Welded Fittings	DRP/TRUE FORGE/SS
4.	Ball valve	SANT/LEADER/AUDCO/ZOLOTO
5.	Butterfly Valve (upto PN 16)	KIRLOSKAR/SANT/KSB/ZOLOTO
6.	Air Release Valve	SANT/ARCO/LEADER/ZOLOTO
7.	C.I Double flanged sluice valves	KRILOSKAR/SANT/LEADER/ZOLOTO
8.	C.I Double Flanged Non-return valve	KRILOSKAR/SANT/KARTAR/ZOLOTO
9.	Dual Plate / Wafer Type Non-return valves (upto PN 16)	ADVANCE/KSB/AIP/ZOLOTO/SANT
10.	Fire Extinguishers	MINIMAX/LIFEGUARD /SUPEREX
11.	First-aid Hose Reel Drum	NEWAGE/SAFEGUARD/SUPEREX
12.	Rubber Hose Reels for Drums	PADMINI/MITRAS/SUPEREX
13.	Thermo Plastic Hose Reels for Drums	KESARA PLAST/MITRAS/EVERSAFE
14.	R.R.L. Hose & C.P. Hose	NEWAGE/SAFEGUARD/SUPEREX
15.	Branch Pipe, Nozzle, Coupling etc.	NEWAGE/SAFEGUARD/SUPEREX
16.	Landing Valves	NEWAGE/SAFEGUARD/SUPEREX
17.	Fire Brigade Connections	NEWAGE/SAFEGUARD/SUPEREX

18.	Fire Fighting Equipment not covered else where	NEWAGE/SAFEGUARD/SUPEREX
19.	Hose Box	Reputed make as per IS: specification subject to approval of Samples/Technical Details.
20.	Motors for Fire Pumps	KIRLOSKAR/ABB/CROMPTON GREAVES
21.	Fire Pumps	KIRLOSKAR/MATHER PLATT/WILLOW/GRUNDFOSS
22.	Electrical Switch Gear	SIEMENS/L&T/ABB
23.	Cables	GRANDLAY/GLOSTER/HAVELLS/RR CABLE/POLYCAB
24.	Y-Type Suction Strainer	AIP/LEADER/SKS
25	Pre-Fabricated Structural supports and clamps	CHILLY/EASYFLEX/CAMRY
26	Pressure Gauge	FIEBIG/H.GURU/DANFOSS
27	Alarm Valve	HD/MATHER+PLATT/NEWAGE
28	Pipe Coat Material (Pipe Protection)	PYPKOTE/POLYCHEM
29	Dash fasteners	HILTI/FISHER
30	Paint / Primers	ASIAN/JENSON NICHOLSON/BERGER
31	Weld. Electrodes	ADVANI/ESSAB
32	Anti-vibration Pads & suction & delivery flexible connectors	EASYFLEX/RESISTOFLEX
33	Nuts/ Bolts	LAKSHMI/UNBRAKO
34	Conduit ERW	BEC/AKG
35	Contactors & overload relays, fude links and indicating lamps	L&T/SIEMENS/GE POWER
36	CTTransformer	AE/KAPPA/C&S
37	MCCB / ISOLATOR	LEGRAND/SCHNEIDER/ABB
38	AMETER/VOLT METER	AUTOMATIC ELECTRIC/IMP/L&T

39	Pressure Switch	HONEYWELL/SWITHZER/POTTER/DANFOSS
40	Cable Tray	PILCO/SLOTCO/VENUS
41	Weather proof hose cabinet	PADMINI/OMEX/NEWAGE
42	Air Vessel	PADMINI/LG/NEWAGE

IV) HVAC TECHNICAL SPECIFICATION

LIST OF CONTENTS

TECHNICAL SPECIFICATIONS

A. REFERENCE CODES & STANDARDS

The applicable Standards/Codes are:

- American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE)
- American National standards institute (ANSI)
- American society of mechanical engineers (ASME)
- American society for testing and materials (ASTM)
- American wire gauge (AWG)
- Air-conditioning and refrigeration institute (ARI)
- Air-Moving and conditioning association (AMCA)
- National fire protection association (NFPA)
- National Electrical manufacturers association (NEMA)
- National electric code (NEC)
- The following IS codes shall be applicable:

S. No.	Material/item of Work	Standard/Code
1.	Ducting Fabrication	IS : 655 (Latest Rev.)/ SMACNA
2.	Galvanized Sheets/Wires	IS : 277-1977
3.	Aluminium Sheets/Wires	IS : 737
4.	Horizontal Centrifugal Pumps	IS : 13537
5.	Mild Steel, ERW Pipes	IS : 1239, IS : 3589
6.	Pipe Fittings	IS : 1239
7.	Steel Pipe Flanges	IS : 6392
8.	Gate, Globe & Check Valves	
	a) Upto 40 mm gun metal	IS : 778
	b) Butterfly valves of 50 mm and above (cast iron)	IS : 13095
	c) Balancing Valves	IS : 778
	d) Non Return Valves	IS : 5312
9.	Colour Code for Identifications of pipes	IS : 2379-1963
10.	3 Phase induction motors	IS : 325
11.	Burden type pressure gauges	IS : 3624
12.	PVC insulated electric cables	IS : 1554
13.	HRC cartridge fuse links	IS : 2208

14.	Specific requirements for direct switching of motors	IS : 4064 (Part II)
15.	Code of practice for electric wiring	IS : 732 (Part III)
16.	Glossary of terms used in refrigeration and air-conditioning	IS : 3615
17.	Hot die zinc coated steel pipes	IS : 4736-1968
18.	Expanded polystyrene	IS : 4671
19.	Glass wool	IS : 8183

Safety codes

The following safety codes as laid down by ISI shall be followed:

a)	Safety code for mechanical refrigeration	IS : 660
b)	Safety code for air-conditioning	IS : 659
c)	Safety code for scaffolding and ladders	IS : 3696
d)	Code for practice for safety and health requirements in electrical and gas welding & cutting operations	IS : 818
e)	Code of safety procedures and practices in electrical works	IS : 5216

B. BASIS OF DESIGN

The proposed **IISER (PEB)** is coming up at **TIRUPATI, Andhra Pradesh**. The design data has been considered as given below.

1. Outside Design Conditions:

The outside design conditions of **Tirupati, Andhra Pradesh is considered** based on ISHRAE outdoor design data:

Summer	**Monsoon**	**Winter**
108 ^{0}F DB	94 ^{0}F DB	65 ^{0}F DB
83 ^{0}F WB	82 ^{0}F WB	57 ^{0}F WB

2. a) Inside Design Conditions:

All air-conditioned area except labs

SUMMER	**MONSOON**
24± 1^{0}C DB	24± 1^{0}C DB
<60% RH	<60% RH

All labs

SUMMER	**MONSOON**
28± 1^{0}C DB	28± 1^{0}C DB
<60% RH	<60% RH

b) Occupancy

As per seating/ Furniture layout. Details given in **Air Conditioning Load Calculation** sheet.

c) Lighting and Equipment Loads:

Lighting and Equipment Loads as per electrical. Details given in **Air Conditioning Load Calculation** sheet.

d) Fresh Air:

Adequate fresh air quantity shall be provided to air-conditioned spaces to maintain indoor air quality (IAQ) generally as per **ASHRAE 62.1** standard.

e) Noise Levels:

To be checked & confirmed by acoustic consultant.

3. Heat transfer values proposed:

External walls with following configuration at different locations

400 mm AAC Wall	U-Value-0.37 W/Sq.m.C
300mm AAC Wall	U-Value-0.48 W/Sq.m.C
150mm Concrete Wall	U-Value-3.41 W/Sq.m.C
200mm Concrete Wall	U-Value-3.10 W/Sq.m.C
150mm Concrete Wall+250mm AAC Wall	U-Value-0.53 W/Sq.m.C
150mm Concrete Wall+50mm Gap+200mm AAC Wall	U-Value-0.61 W/Sq.m.C

Exposed Roof 'U' Value : 0.27 W/Sq.m.C with insulation.

External Glazing 'U' Value : 1.5 W/Sq.m.C
External Glazing SHGC : 0.25
Sky light Glazing 'U' Value : 3.9 W/Sq.m.C
Sky light Glazing SHGC : 0.2

4.0 Design Parameters:

a) Design Parameters for duct design shall be:

Maximum Flow Velocity (Air Conditioning System) = 1500 ft/min
= 450 mtrs/min

Maximum Friction Drop = 0.1 inch WG per 100ft run.

= 1cm WG per 100mtrs run

Maximum Velocity at Supply Air Outlet = 500 ft/min
= 150mtrs/min

Maximum Velocity at Supply Air Diffusers = 500 ft/min.
= 150 mtrs/min.

5.0 DESIGN PARAMETERS FOR DUCTING DESIGN:

a) DUCTING:

Duct Design Criteria The following maximum duct design velocities will be used in the design of ductwork systems. Where a range is indicated, it is intended to represent velocities over a range of flow volume.

	Metres/Second
Low Pressure Systems	
- Main Duct	7.5
- Primary Branch	5.0
- Secondary Branch	2.0-3.5
Medium Pressure Systems	13.0

The following maximum friction losses are to be used in conjunction with the velocities noted above.

	Pascals/metre
Low pressure systems	1.0
Medium pressure systems	3.3

6.0 DESIGN PARAMETERS FOR INSULATION MATERIALS:

Material : Nitrile rubber
Thermal conductivity : 0.035 W/m^{o}k
Surface spread of flame as per BS476 Part 7 : CLASS O
Density : 50 KG/cub.m

7.0 DESIGN PARAMETERS FOR DUCT ACOUSTIC:

Material	: Open cell Nitrile rubber
Thermal conductivity	: 0.030 W/m^{o}k
Surface spread of flame as per BS476 Part 7	: CLASS 1
Density	: 140-160 KG/cub.m

8.0 System Proposed:

The air conditioning system will be VRV system for all the AC areas except selected IT rooms, UPS room and faculty room-15.

9.0 Drawings:

The drawings provided to the bidder with the tender documents give a general scheme of the system and are not meant to be the working drawings. The contractor shall furnish the shop drawings to be sent to the Consultant through the Project Manager, of all the equipment/ layouts within fifteen days of the award of the contract and the same shall be approved by the Consultant. No work shall be allowed to be executed without the approved shop drawings. However, the contractor may alter the scheme for improving the layout and meeting the site conditions. All such changes shall however be subject to the consultant's approval.

10.0 Testing:

All the equipment and the system shall be tested as specified and all the test data shall be furnished to the Consultants in the prescribed format.

11.0 Deviations:

Any deviations from specifications may be acceptable, provided such deviations are found necessary and appropriate for fulfilling the overall intent and purpose of the system and must be clearly spelled out and have to be submitted and attached along with tender.

12.0 Technical Data:

The contractor shall furnish complete technical data of the equipment offered by him as required under the heading "technical data".

13.0 Guarantee (12 months):

13.1 The contractor shall guarantee the system to be free from any vibrations and noise and to perform satisfactory as per required capacity for minimum 12 months from the date of handing over.

13.2 The contractor shall guarantee that the capacity of various components as well as the whole system shall not be less than specified.

14.0 Noise Criterion:

All air conditioning equipment and materials (like ventilation fans, ac units, ducts, grilles, acoustic lining etc.) will be selected, designed and installed in such a manner that the inside noise criterion for all conditioned spaces will be in the range NC-30 to NC-35. The noise levels in conditioned occupied spaces due to all air conditioning equipment will not exceed 40 DB when measured at any point in the occupied spaces less than 1.5 meter above floor level and not closer than 1.5 meter from any supply air register or 60 cm from any return air grille.

When taking noise level measurements, the background noise level without the equipment operating shall be at least 7 DB below the actual background noise level when the equipment is in operation.

C. EXCLUSIONS

Following associated civil/Electrical works with HVAC installation are excluded from the scope of this contract. These shall be executed by other agencies in accordance with approved shop drawings under direct supervision of HVAC contractor.

i) PCC foundations for VRV outdoor units/ Scrubbers/ Air washers etc.

ii) Drain traps for drainage of ac units including water proofing of floors.

iii) Supply and fixing of G.I./Wooden frames for fixing of grilles/Diffusers in false ceiling/ Boxing and Masonary walls.

iv) Over deck insulation of terrace above air conditioned area exposed to sun.

v) Providing 415+10% 3 phase 4 wire 50HZ power supply with double loop earthing including terminations for VRV outdoor units on terrace.

vi) Providing 15 Amps single phase power outlets within 2 meters from each indoor unit at locations as indicated in HVAC contractor's shop drawing.

vii) Providing 15 Amps single phase power outlets within 2 meters from each propeller/ Inline fans at locations as indicated in HVAC contractor's shop drawing.

D. AC EQUIPMENTS

This chapter covers the detailed requirements of factory built double skin air handling unit (AHU), High-wall mounted split unit and VRV air-conditioning system.

1.0 FACTORY BUILT AIR HANDLING UNIT (AHU) & TFA

a. TYPE

The air handling unit shall be of double skin construction, draw through type in sectionalized construction consisting of blower section, coil section, humidification section (where specified), filter section and drain pan. Unless otherwise specified, the unit shall be horizontal type.

b. RATING

- The capacity of the cooling coil, the air quantity from the blower fan and static pressure of blower fan shall be as laid down in the tender documents. Where these parameters as calculated by the tenderer exceed the specified values, the coils and the blower fan shall satisfy these calculated values.
- Each unit shall be a factory built, modular type with field assembled (as per requirement) casing sections, complete with High Efficiency SISW Plug Fan with EC motors or DIDW fan with TEFC motor (AS SPECIFIED IN BOQ), wire guard (N/A for CSU), cooling/ heating coils, drain section, structural mountings, vibration isolators and all other related accessories as required under BOQ/ Schedule.
- The unit shall be of the type and size suitable for ensuring a performance and capacity not less than the minimum required for the design when operating under the specified conditions. The physical size of the selected unit shall be suitable for the space allocated on the drawings and in Equipment schedule.
- The coil shall be designed for a face velocity of air not exceeding 155 m/min.
- The requisite static pressure demanded by the air circuit shall be developed by the fan at the selected operating speed. The fan motor HP shall be suitable to satisfy these requirements and the drive losses.
- The air outlet velocity from the blower fan shall not exceed 610 m/min.
- Noise level at a distance of 2M from AHU shall not exceed 75dBA.

c. MATERIAL AND CONSTRUCTION

1. HOUSING / CASING

- The housing/ casing of the air handling unit shall be of double skin construction. The housing shall be so made that it can be delivered at site in total semi knocked down conditions depending upon the requirements. The main framework shall be of suitable structural sections. The entire framework shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Framework of all air handling units shall be made of thermal break hollow extruded aluminum profile. In case of AHU casing design with no contact between inner and outer surface, thermal break profiles can be avoided. The entire framework shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Entire framework shall be made of extruded aluminum profile.
- Double skin panels shall be minimum 40mm thick made of 0.8mm pre-plasticized and pre-painted with PVC guard, GSS sheet on outside and 0.8mm galvanized sheet inside with HFC/ CFC free polyurethane foam insulation of density not less than 38 kg/cum injected in between by injection moulding machine. These panels shall be joined and connected to the framework/ supports with soft rubber gasket in between (if necessary) to make the joints airtight and low air leakage potential. The gaskets shall be inserted within groove in extruded aluminum profile of the framework.

- Suitable doors with nylon handles, aluminum die cast hinges & hatches shall be provided for access to various panels for maintenance. Units shall be required with access door(s) for maintenance purpose. The entire frame shall be mounted on rolled / formed GSS heavy gauge galvanized steel (N/A for CSU)
- Frame work for each section shall also be joined together to make the joints air tight. Suitable doors with nylon handles and all access panels should be openable with allen key/ suitable locking arrangement. Aluminium die-cast powder coated/ Nylon hinges & latches shall be provided for access to various panels for maintenance. However, AHU in the form of complete single unit shall also be acceptable with access door(s) for maintenance to various sections. The entire housing shall be mounted on galvanized steel channel frame work made out of G.I. sheet of thickness not less than 2mm. For higher capacity AHUs hot dip galvanized steel channel framework made of minimum 3 mm thick G.S. sheet shall be used.

2. DRAIN PAN

Drain pan shall be made out of minimum 1.25 mm stainless steel sheet externally insulated (If Drain pan is outside the unit), with 10mm thick closed cell Polyethylene foam/ equivalent suitable insulation with necessary dual slope to facilitate fast removal of condensate. Necessary supports will be provided to slide the coil in the drain pan. The cooling coil segment shall have a full width, multi sloped drain pan that extends Downstream of the coil to provide sufficient amount of space to contain moisture Carry-over. The unit design shall not require a drain pan in any downstream section to Contain the coil condensate. Drain pan must be accessible for inspection and cleaning.

3. COOLING/ HEATING COIL

- The coil shall be made from seamless solid drawn copper tubes. The minimum thickness of tube shall be 0.5 mm for cooling coils.
- The depth of the coil shall be such as to suit the requirements, viz. re-circulated air applications, or 100 % fresh air applications and the bypass factor required shall be specified in the tender specifications. The coil shall be 4 or 6 rows deep for normal re-circulated air application and 8rows deep for all outdoor air application, unless otherwise specified in the tender specifications. In case of 8 rows deep coils, it shall be made of 2x4 rows deep coils with a spacing of 200mm between the two coils, access door and independent drain pan.
- U bends shall be of copper, jointed to the tubes by brazing, soft soldering shall not be used.
- Each section of the coil shall be fitted with flow and return headers to feed all the passes of the coil properly. The headers shall be of copper and shall be complete with water in/out connections, vent plug on top and drain at the bottom. The coil shall be designed to provide water velocity between 0.6 to 1.8m/s in the tubes.
- The fins shall be of aluminum. The minimum thickness of the fins shall be 0.15 mm nominal. The no. of fins shall not be less than 4-5 per cm length of coil. Fins may be of either spiral or plate type. The tubes shall be mechanically expanded to ensure proper thermal contact between fins and tubes. The fins shall be evenly spaced and upright. The fins bent during installation shall be carefully realigned. For coastal areas fins shall be phenolic coated and for 100% FA application fins shall be hydrophilic type.
- The coil shall be suitable for use with the refrigerant specified or with water as the case may be. Refrigerating coils shall be designed for the maximum working pressure under the operating conditions. Water coils shall be designed for a maximum working pressure of 10 kg./sq.cm.
- Shut off and regulating valves at the inlet and outlet of water shall be provided. In the case of DX coils, solenoid valve and expansion valves shall be provided at the inlet of coil. Computerized cooling coil selection output shall be submitted. Coils shall be AHRI 410 certified.

4. SUPPLY AIR FAN AND DRIVE

- The supply air fan shall be AMCA certified SISW backward curved aerofoil plug fan with High Efficiency external rotor EC(Electronically Commutated) motor, energy optimized for operation for high efficiency and favorable acoustic behavior..
- The high efficiency Backward curved impeller made of welded aluminium sheet or high performing composite material with external rotor motor balanced together statically and dynamically according to relevant standards. The EC fan should be capable of being fitted in horizontal position in the AHU. Fan impeller shall be mounted on solid shaft supported to housing using heavy duty ball bearings. Fan housing and motor shall be mounted on a common extruded aluminum base mounted inside the fan section on anti-vibration spring mounts or cushy-foot mount. The fan outlet shall be connected to casing with the help of fire retardant fabric.
- The fan impeller assembly shall be statically and dynamically balanced.
- Motor: The minimum efficiency class of the motor shall be equivalent to IE4. The motor shall be permanent magnet external rotor motor with integrated electronics and suitable for continuous operation. The speed of the motor shall be varied with an external 0-10V/ PWM control signal. The fan in totality shall be of most efficient type so that the power consumption and noise level is minimal. The motor shall be minimum IP54 protection class. The motor shall be suitable for operation on 415 ± 10%V, 3phase, 50 Hz, A.C. supply.
- Integrated Electronics: The device electronics shall be protected from overload by the "Active Temperature Management" so that if the ambient operating temperature exceeds the design limit then the fan is not switched off immediately. In such a condition the fan should be operational at lower speeds till the operating ambient temperature drops down.

5. AIR FILTERS

The air used in an air-conditioning system must be filtered to maintain a clean atmosphere in the conditioned space. The concentration of contaminants in the air and the degree of cleanliness required in the conditioned space will determine the type of filter or filters that must be used.

a. Pre Filters

Each unit shall be provided with a factory assembled filter section containing 50mm thick washable synthetic type air filters having anodized aluminium frame with minimum 1.6 mm thickness. The filter shall have minimum 90% efficiency down to 10 microns. The media shall be supported with HDPE mesh on one side and aluminium mesh on other side. Filter banks shall be easily accessible and designed for easy withdrawal and renewal of filter cells. Filter framework shall be fully sealed and constructed from aluminium alloy. Face velocity across these filters shall not exceed 155 MPM. Each filter shall carry test certificate from manufacturer. The filter area shall be made up of panels of size convenient for handling. The filter testing method shall be as per ASHRAE 52.1 latest edition.

Design Parameters of Filters

Parameter	Filter
Parameter	Filter
Type	Flange type
Grade	MERV-8
Efficiency	90% down to 10 micron
Initial P (mm WG) - clean condition	5 mm
Final P (mm WG) - clogged condition	12 mm
Casing	Aluminium Anodized
Sealing of medium	Epoxy or equivalent
Medium	Synthetic medium supported by HDPE mesh and aluminium mesh

Sample testing at Mfr's works	No
Packing	Yes
Test Method	As per ASHRAE 52.1
Washable	Yes

b. Fine Filters (Wherever is specified in BOQ)

Each unit shall be provided with a factory assembled filter section containing 300mm thick synthetic media type air filters having anodized aluminium frame with minimum 1.6 mm thickness. The filter shall have minimum 95% efficiency down to 3 microns. The media shall be supported with HDPE mesh on one side and aluminium mesh on other side. Filter banks shall be easily accessible and designed for easy withdrawal and renewal of filter cells. Filter framework shall be fully sealed and constructed from aluminium alloy. Face velocity across these filters shall not exceed 155 MPM. Each filter shall carry test certificate from manufacturer. The filter area shall be made up of panels of size convenient for handling. The filter testing method shall be as per ASHRAE 52.1 latest edition.

Design Parameters of Filters

Parameter	Filter
Type	Flange type
Grade	MERV-13
Efficiency	95% down to 3 micron
Initial P (mm WG) - clean condition	12 mm
Final P (mm WG) - clogged condition	25 mm
Casing	Aluminium Anodized
Sealing of medium	Epoxy or equivalent
Medium	Synthetic medium supported by HDPE mesh and aluminium mesh
Sample testing at Mfr's works	No
Packing	Yes
Test Method	As per ASHRAE 52.1
Washable	No

c. GENERAL CONSTRUCTION OF FILTERS

- Each AHU shall be provided with a factory assembled filter section containing pre-filters made of cleanable metal viscous filters made of corrugated aluminum wire mesh, or dry cleanable synthetic filters. These shall be minimum 50 mm thick with a frame work of aluminum/GI.
- The filter area shall be made up of panels of size convenient for handling. The filter panels shall be held snugly within suitable aluminum framework made out of minimum 1.6 mm GI/ aluminum sheet with sponge neoprene gaskets by sliding the panels between the sliding channels so as to avoid air leakage.
- In order to indicate the condition of these filters while in operation, a manometer shall be provided to indicate the pressure drop across the fine filters and absolute filters.
- Special filters, if any specified in the tender specifications shall be provided in addition to the above filters. In that event, the latter shall function as pre-filters.
- Each filter shall carry test certificate from manufacturer.

i. HUMIDIFICATION SECTION
Wherever specified in the BOQ, humidification section shall be provided in the AHU to connect the humidification system to the AHU.

d. INSTALLATION

The air handling unit shall be so installed as to transmit minimum amount of vibration to the building structure. Adequate vibration isolation shall be provided by use of rubber/ neoprene pads and/or vibration isolation spring mountings.

6. Safety Features

The fan access door shall be equipped with micro-switch inter locked with fan motor to enable switching off the fan motor automatically in the event of door opening (N/A for CSU). The access door shall be further having wire mesh screen as an added safety feature bolted on to the unit frame (N/A for CSU).

Fan and motor base shall be properly earthed from the factory.

All screws used for panel fixing, projecting inside the unit shall be covered with PVC caps to avoid human injury.

Units needs to be CE certified.

7. Accessories

Each unit shall be provided with manual air vent at high point in the cooling coil and drain plug at the bottom of the coil. (only for water type)

8. Performance Data

The Unit shall be selected for the optimum operating point with respect to noise level & efficiency of the equipment. Fan performance rating and power consumption data with operation points clearly indicated shall be submitted and verified at the time of testing commissioning of the installation.

9. Submittals

After supply/ assembly of the units at site the manufacturers shall submit three complete sets of unit's drawings, test certificates of coil, test certificate of fan, test certificate of the unit and operation-maintenance manual.

2.0 HIGH WALL MOUNTED UNITS

The units shall be wall-mounted type. The units include pre-filter, fan section and DX coil section. The housing of units shall be light weight powder coated galvanized steel. Units shall have an attractive external casing for supply and return air.

a. INSTALLATION:

The units shall be mounted on ribbed rubber pads for vibration isolation. The contractor shall supply the required charge of refrigerant, lubricant and other consumables, for commissioning and testing of the equipment.

All the equipment shall be thoroughly tested and checked for leaks. All safety controls shall be suitably set and a record of all setting shall be furnished to the project supervisor.

Providing and fixing M.S. structural support for condensing unit with vibration isolator pad in-between support and structure and vibration isolation suspender and pads for evaporating units.

b. DIMENSIONS:

Dimensions given in figures shall be taken in preference to scaled dimensions in all cases. Before commencing any work the contractor shall get clarifications wherever necessary.

c. PAINTING:

Shop coats of paint that have become marred during transportation or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop- painted surfaces.

d. CONDENSATE DRAIN PIPING:

All pipes to be used for condensate drain shall be Insulated medium class GI pipe & all joints should be Gluing or solvent cementing as per manufacturer recommendation. The piping shall be insulated with 9mm thick XLPE insulation with Glass Fabric.

e. REFRIGERANT PIPING:

- All refrigerant pipes and fittings shall be type 'L' hard drawn copper tubes and wrought copper fitting suitable for connection with silver solder.
- All joints in copper piping shall be swaged joints using low temperature brazing and/or silver solder. Before jointing any copper pipe or fittings, its interior shall be thoroughly cleaned be passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while construction of the joints. Subsequently, it shall be thoroughly blown out using nitrogen.
- Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg per Sq.cm.
- After the refrigerant piping installation has been completed the refrigerant piping system shall be pressure tested using, Freon mixed with nitrogen at a pressure of 20 Kg per Sq. cm. (High side) and 10 Kg per Sq. cm (Low side) pressure shall be maintained on the system for a minimum of 12 hours. The system shall then be evacuated to a minimum vacuum of 70 cm. of mercury and held for 24 hours, during which time change in vacuum shall not exceed 12 cm of mercury. Vacuum shall be checked with vacuum gauge.
- All refrigerant piping shall be installed strictly as per the instructions and recommendations of air conditioning equipment manufacturers.
- The copper thickness of wall shall be 20G/22G(0.7 to 1 mm)

f. POWER SUPPLY:
Power supply near the indoor unit will be provided by the owner with suitable MCBs.
From MCB to indoor unit and outdoor unit to Indoor unit by the contractor along with earthing.

3.0 VARIABLE REFRIGERANT VOLUME (VRV) AIR CONDITIONERS

a. General:

The contractor shall supply and install VRV system air conditioners wherever indicated. The system shall be complete in all respects and comply with the specifications as given.

3.1 Condensing Units:

a. Each condensing unit shall be complete unit with hermetic compressor/s, air cooled condenser, condenser fans with motors, internal piping, switches and internal wiring and shall be enclosed in a corrosion resistant, epoxy coated weather proof outdoor type housing.
b. The compressor shall be VRV with Twin/ Triple compressor control. The compressors shall be suitable for R-410a. The optimum capacity control shall be of multiple compressors in accordance with load.
c. The condenser coil shall be air cooled type with aluminium fins and copper tubes and necessary refrigerant connections. The copper tubes shall not be less than 1/2" O.D.
d. The condenser air fans shall be propeller type direct driven, each complete with motor. The air quantity and area of the condenser shall be adequate for working in the specified outdoor conditions.
e. The casing shall be fabricated from galvanized steel zinc phosphate and finished with epoxy coating. The casing shall make the whole unit fully weather proof, suitable for outdoor installation on the sea side.
f. The unit shall include a remote control assembly with thermostat and starting and speed switches.
g. The necessary charge of refrigerant gas and lubricated oil shall be provided to run the system.

3.2 Indoor Unit:

a. The cooling unit shall be matched to condensing units and shall consist of cooling coil, blower, filters, outer casing, drain pan, accessories etc.
b. The cooling coil shall have copper tubes of not less than 3/8" O.D. and continuous aluminium plate fins with integral collars. The tubes shall be staggered in the direction of air flow.
c. The fan section shall comprise of 1 no. Aluminium /industrial plastic centrifugal blower, statically and dynamically balanced motor, drive package, mounting arrangement etc.
d. The unit shall include a cordless remote control assembly with thermostat and starter and 3 speed switches.

3.3 Refrigerant Piping:

a. The condensing unit and evaporator units shall be interconnected by type 'l' seamless copper

refrigerant liquid and suction lines using flared or brazed fittings. Necessary accessories shall be incorporated in the circuit. 1 condensing unit shall be connected to 4-14 evaporator units (wherever applicable). The maximum number of connectable indoor units shall be 20-32 Nos. and the capacity ratio shall be 50 ~ 130%.

b. The insulation of suction line shall be as per manufacturer standard.

3.4 Miscellaneous:

a. The unit shall have control panel, housing, the starters, contactor, relays etc.
b. Isolation pads shall be provided under the units.
c. Drain line shall be provided from the right / left hand side of the indoor unit to a drain trap as per drawing.
d. Suitable galvanized steel angle iron supporting frame shall be provided for the condensing unit and supporting arrangement for the indoor units, primed and painted with epoxy paint of a suitable color as per Architect's approval.
e. Interconnecting power cabling shall be provided.
f. All units shall have microprocessor based thermostats with a cordless remote control.
g. All the connections to the condensing unit shall necessarily be corrosion resistant.
One set of spare filters for each unit.

E. SHEET METAL DUCT

1A) FACTORY FABRICATED (As per SMACNA):

1. This section deals with supply, erection, testing & balancing of GI sheet metal duct work and air registers conforming to specifications as given below:

2. MATERIAL FOR DUCTING

All the ducts shall of LFQ (Lock Forming Quality) grade prime G.I. raw material furnished with accompanying Mill Test Certificates. Galvanizing shall be 120gms/sq.m. (total coating on both sides).

In addition, if deemed necessary, sample of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.

The G.I. raw material should be used in coil-form (instead of sheets) so as to limit the longitudinal joints at the edges only, irrespective of cross-section dimensions.

Governing Standards

Unless otherwise specified here, the construction, erections, testing and performance of the ducting system shall conform to the SMACNA standards and Addendum of SMACNA

Duct connectors and Accessories

All the transverse duct connectors (Flanges\Cleats) and accessories related hardware such as support system shall be zinc coated (galvanized).

Fabrication standards
All the ductwork including straight sections, tapers, elbows, branches, shoe pieces, collars, terminal boxes and other transformation pieces shall be factory-fabricated. Equivalency will require fabrication by utilizing the following machines and process to provide the requisite quality of ducts and speed of supply.

Coil lines to ensure location of longitudinal seams at corners\folded edges only to obtain the required duct rigidity and low leakage characteristics. No longitudinal seams permitted along any side of the ducts.

All ducts, transformation pieces and fittings shall be made on CNC profile cutters for required accuracy of dimensions, location and dimensions of notches at the folding lines.

All edges shall be machines treated using lock-formers and rollers for furning up edges.

Selection of G.I. and Transverse Connectors

Duct construction shall be in compliance with 1" (250 Pa) w.g. static norms as per SMACNA.

All transverse connectors shall be 4-bolt system.

To avoid any leakage additional sealant shall be used.

The specified class of transverse connectors and duct gauge for a given duct dimensions shall be 1" (250 Pa) pressure class.

Non-toxic, AC-application grade P.E. or PVC gasketing shall be provided between all mating

flanged joints. Gasket sizes shall conform to flange manufacturer's specification.

Duct construction

The fabricated duct dimensions shall be as per approved drawings and all connecting sections shall be dimensionally matched to avoid any gaps.

Dimensional Tolerances: All fabricated dimensions shall be within + 1.0mm of specified dimension. To obtain required perpendicularity, permissible diagonal tolerance shall be +1.0mm per meters.

Each duct pieces shall be identified by coded sticker, which shall indicate specific part number, job name, drawing number, duct sizes and gauge.

Ducts shall be straight and smooth on the inside. Longitudinal seams shall be airtight and at corners, which shall be either Pittsburgh or snap button punch as per SMACNA practice, to ensure air tightness.

Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7) turning vanes or air splitters shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

Plenum shall be factory fabricated panel type and assembled at site.

Factory fabricated ducts shall have the thickness of the sheet as follows and length of the piece not more than 1200mm and should have beading at every 300mm.

Recommended SMACNA standard at 4 feet Transverse Joint Reinforcement

Duct Static Pressure In Inches	**1"**	**2"**	**3"**	**4"**	**6"**
Duct Size (mm)					
150-250	B-26	B-26	B-26	B-26	C-26
251-300	B-26	B-26	B-26	C26	C-24
301-350	B-26	C26	C26	C26	C-24
351-400	B-26	C26	C26	D-26	D-24
401-450	C26	C26	C26	D-26	E-24
451-500	C26	C26	D-24	D-24	E-24
501-550	C26	C26	D-24	E-24	F-22
551-600	C26	D-26	E-24	E-24	F-22
601-650	C26	D-26	E-24	E-24	F-22
651-700	C26	D-26	E-24	F-22	G-22 R
701-750	C26	E-24	E-24	F-22	G-20
751-900	D-26	E-24	F22	G-22 R	H-20 R
901-1000	E-24	F-22	G-22R	H-20 R	I-18
1001-1200	E-24	G-22	H-20R	I-18	I-18
1201-1300	F-22	H20	I-18	I-18	J-18 R
1301-1500	F-22	H-20 R	I-18	I-18 R	-
1501-1800	H-22	I-18	J-18 R	-	-
1801-2100	I-20	J-18 R	-	-	-
2101-2400	I-18	J-18 R	-	-	-
2401-2700	I-18	-	-	-	-

Note: SMACNA- sheet Metal & Air Conditioning Contractor National Association Inc. "HVAC Duct construction standard metal & flexible"- Third Edition 2005 USA.
In 1" static pressure i.e. comfort cooling application optional "C&S and C&SS cleats joints can be used

Upto 450mm duct size use C&SS cleats.

Over 750 mm duct size use TDF/TDC flanges with respective gauges as mentioned above.

Alphabets B,C,D,E,F,G,H,I and j per SMACNA 2005, transverse joint reinforcement table 1-12m (T-25b flanged) and TDC addendum.

R means reinforcement with Zeebar Stiffener / Joint Tie Rod /Mid Tie Rod.

The gauges, joints and bracing for sheet metal ductwork shall further conform to the provisions as shown on the drawings.

Ducts larger than 600 mm shall be cross broken, duct sections up to 1200 mm length may be used with bracing angles omitted

Changes in section of duct work shall be affected by tapering the ducts with as long a taper as possible. All the branches shall be taken off at not more than 45 DEG. Angle from the axis of the main duct unless otherwise approved by the Engineer-in-charge.

* Ducts 2250 mm and larger require special field study for hanging and supporting methods.

In addition to above the following points should be also taken into account while fabrication of ducts.

a) All ducts of size larger than 450mm shall be cross broken.

b) All ducts shall be supported from the ceiling / slab by means of MS rods of dia 9mm with MS angle of size 40 x 40 x 5 mm at the bottom with neoprene pad in between the duct & MS angle. The ducts shall be suspended from the ceiling with the help of dash fasteners. Provision for necessary ancillary materials required for hanging the ducts shall be arranged by the contractor.

c) The vanes shall be provided wherever required and shall be securely fastened to prevent noise & vibration.

d) The rubber gasket shall be installed between duct flanges in all connections and joints.

e) All flanges and supports should be primer coated.

f) The flexible joints shall be fitted to the delivery side of AHU fans with Fire Retardant Double canvass. The length of flexible joints should not be less than 150 mm and not more than 300 mm between faces.

g) The ducting work can be modified if deemed necessary in consultation with the Engineer in Charge to suit actual site conditions in the building.

h) Box Type Dampers & Splitters

These dampers shall be provided in the ducting work for proper control and balancing of air distribution. All dampers shall be louver type robust construction. These dampers shall be fitted with easily accessable operating mechanism, complete with links, levers, quadrant for proper control and setting in a desired position. The position of the handle of the damper operating mechanism shall be clearly visible and shall indicate the position of the damper in the duct. All dampers, splitters shall be fabricated out of G.S. sheet of two gauges higher than the duct piece having these fittings. Dampers shall be installed in duct at all required

locations. **No extra payment shall be made separately since these form part of Air Circulation System.**

NOTE: In case angle iron supports are not feasible to be installed for supporting the ducts due to height constraint then the contractor shall support the ducts with M.S flats of at least double the thickness of the angle iron supports.

1B) SHEET METAL DUCT (SITE FABRICATED):

i) GENERAL:

Supply, fabrication, installation and testing of all sheet metal ducts & supply, installation, testing and balancing of all grilles, registers and diffusers, in accordance with these specifications and the general arrangement shown on the drawings.

Duct work shall mean all ducts, casings, dampers, access doors, joints, vanes, stiffeners, hangers and supports etc.

All ducts shall be fabricated according to ASTM 525A from galvanized steel sheets of zinc grade G27 or Z90 of the following thickness as indicated in schedule of quantities & as described in the relevant latest IS code.

ii) RECTANGULAR DUCT:

Dimensions of Ducts	GI sheet		Type of Joints	Type of Bracing
	Thickness (mm)	Gauge		
Upto 750	0.63	24	G.I. Flange at 2.5 Centre	Cross Bracing
751 to 1500	0.80	22	25x25x3mm angle iron frame with 8mm dia nuts and bolts.	25x25x3mm M.S. angle bracing at 1500mm from joints.
1501 to 2250	1.0	20	40x40x5mm angle iron be cross braced diagonally with 10mm dia nuts & bolts at 125 centre.	40x40x3mm M.S. angle bracing at 1200mm from joints or 40x40x3 mm M.S. angle diagonal bracing.
2251 and above	1.25	18	50x50x6mm angle iron frame with 10mm dia nuts & bolts at 125 centre.	50x50x3mm M.S. angle bracing at 1200mm from joints or 50x50x3 mm M.S. angle diagonal bracing.

iii) THICKNESS OF SHEET FOR ROUND DUCTS (FROM ISS: 655):

Diameter of Duct (mm)	Thickness of sheet (mm)	
	G.I. Sheets	Aluminium sheets
150 to 500	0.63	0.80
501 to 750	0.80	0.80
751 to 1000	0.80	1.00
1001 to 1250	1.00	1.50
1251 and above	1.25	1.80

Sheet metal ducts shall be fabricated out of galvanized steel sheets conforming to BIS 655, BIS 277, BIS 737. Sheets used shall be produced by Hot dip process and galvanizing shall be Class VIII.

iv) HANGERS FOR DUCT:

Duct Size (mm)	Spacing (M)	Size of MS angle (mm x mm)	Size of rod dia (mm)
Upto 750	2.4	25 x 3	8
751 to 1500	2.4	40 x 5	10
1501 to 2250	2.4	50 x 5	12
2251 to above	2.4	50 x 5	12

v) FABRICATION:

All ducts irrespective of size shall be fabricated and installed in workman like manner, generally conforming to relevant latest IS code.

a) Ducts so identified on the drawings shall be acoustically lined with thermal insulation as described in the section `Insulation' and as indicated in schedule of quantities. Duct dimensions shown on drawings are overall sheet metal dimensions inclusive of the acoustic lining, where required and indicated in schedule of quantities.

b) Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made air tight.

c) Changes in dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise indicated, shall have a centre line radius equal to one and a half times the width of the duct. Air turns shall be installed in all vanes, arranged to permit the air to make the turn without appreciable turbulence. Suitable vanes shall be provided in duct collar to have uniform/ proper air distribution.

d) Ducts shall be fabricated as per details shown on drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles of sample size to keep the ducts true to shape and to prevent bulking, vibration, breathing or oil canning.

e) All sheet metal connections, partitions and plenums required to confine the flow of air to and through 18g GI/16 gauge aluminium, thoroughly stiffened with 25mm x 25mm x 3mm angle iron braces and fitted with all necessary doors as required to give access to all parts of the apparatus. Access Doors shall be not less than 45cm x 45cm in size.

vi) INSTALLATION:

All ducts shall be installed generally as per the drawings and in strict accordance with approved shop drawings to be prepared by the Contractor.

i. The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent, of these specifications and drawings. The work shall meet with the approval of Owner's site representative in all its parts and details.

ii. All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/ or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as per the site requirements.

iii. If a duct cannot be run as shown on the drawings, the contractor shall install the duct between the required points by any path available, in accordance with other services and as per approval of Owners site representatives.

iv. All duct work shall be independently supported from building structure. Duct shall be supported to the ceiling with the help of anchor fasteners by drilling holes in concrete slab and inserting anchor fasteners and bolts. All horizontal ducts shall be rigidly and securely supported, in approved manner with trapeze hangers formed of MS rods and angle iron under ducts at not greater than 2.4 meter centres. All vertical duct work shall be supported by structural members at each floor.

If duct is passing through in such areas where space between ceiling slab to false ceiling is more than 1500 mm than duct should be supported by wall mounted brackets of 40 x 40 x 3 mm angle.

Ducting over furred ceiling shall be supported from the slab above, or from beams, after obtaining approval of Owner's site representative. In no case shall any duct by supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractors on the building.

v. Where metal ducts or sleeves terminate in wood work, tight joints shall be made by means of closely fitted heavy flanged collars. Where ducts pass through brick or masonry opening and wooden frame work shall be provided within the opening and crossing ducts provided with heavy flanged collars on each side of wooden frame work, so that duct crossing is made leak-proof.

vi. All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blower coil units that may cause vibrations in the ducts, ducts shall be provided of closely woven, rubber impregnated double layer canvas or neoprene coated fibre glass fire resistant flexible connection. The flexible connections located close to the unit, in mutually perpendicular directions. The flexible sleeve at least 10cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting duct work rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation and shall be class 'O' smoke rated.

vii. Air conditioning unit and exhaust fans shall be connected to duct work by inserting at air inlet and air outlet a double canvass sleeve. Each sleeve shall minimum 150mm securely bolted to duct and the connecting duct work rigidly held in line with unit inlet or outlet and shall be class 'O' smoke rated.

viii. All ducts above 450 mm are to be cross broken to provide rigidity to the ducts.

3.0 ACCESS PANEL:

3.1 A hinged and gasketed access panel shall be provided on duct work at each control device that may be located inside the duct work.

4.0 MISCELLANEOUS:

4.1 All ducts above 450 mm are to be cross broken to provide rigidity to the ducts.

4.2 All duct work joints are to be true right angle or approaching with all sharp edges removed.

4.3 Smoke rated sponge rubber gaskets also to be provided behind the flange of all grilles.

4.4 Each branch from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the branch.

4.5 Inspection doors measuring at least 450 mm x 450 mm are to be provided in each system at an appropriate location, as directed by Project Manager/Engineer-in-charge.

4.6 Diverting vanes must be provided at the bends exceeding 600 mm and at branches connected into the main duct without a neck.

4.7 Proper hangers and supports should be provided to hold the duct rigidly, To keep them straight and to avoid vibrations. Additional supports are to be provided where required for rigidity or as directed by Project Manager/Engineer-in-charge.

4.8 The ducts should be routed directly with a minimum of directional change.

4.9 The duct work shall be provided with additional supports /hangers, wherever required or as directed by the directed by Project Manager/Engineer-in-charge, at no extra cost.

4.10 All duct supports, flanges, hangers and damper boxes etc. shall be either zinc coated or given 2 coats of anti corrosion red oxide paint before installation and one coat of aluminium paint after the erection, at no extra cost.

4.11 All angle iron flanges to be welded electrically and holes to be drilled.

4.12 All the angle iron flanges to be connected to the GSS ducts by rivets at 100 mm centres.

4.13 All the flanged joints, to have a 3 mm neoprene rubber gasket to the flanges with Adhesive.

4.14 The G.S.S. Ducts should be lapped 6 mm across the flanges.

4.15 The ducts should be supported by approved type supports at a distance not exceeding 2.4 metres and at every vertical floor penetration.

4.16 Sheet metal connection pieces, partitions and plenums required, shall be constructed of 1.25 (18 gauge) sheet thoroughly stiffened with 25 mm x 25 mm angle iron braces and fitted with access doors.

4.17 Readymade (factory fabricated) flanges shall be used for all ducting.

4.18 All duct joints shall be filled up by silicon.

4.19 All duct penetrations in fire rated walls and slabs shall be filled up by fire resistant materials of fire rating not less than fire rating of wall / slab.

5.0 GRILLES:

5.1 The supply and return air grilles shall be fabricated from aluminium extruded sections. The supply and return air grille shall have single horizontal extruded section fixed louvers. The grilles may or may not be with an outer frame. The grille flange shall be fabricated out of 20x20x1.5 mm aluminium angle. Grilles longer than 450 mm shall have intermediate supports for the horizontal louvers.

5.2 The grilles shall have opposed blade dampers of M.S. Black sheets, which shall be key operated from the grille face wherever required as approved.

5.3 The damper blades shall be of 0.63 mm (24 gauge) M.S. Black sheets and shaped to form air tight joints. The frame work for dampers shall be fabricated from 0.63 mm (24 gauge) M.S. Black sheet.

6.0 FIRE DAMPERS:

All supply and return air ducts at AHU room crossings and at all floor crossings shall be provided with fire dampers of at least 90 minute fire rating tested by CBRI as per UL 555 standard. These shall be multi leaf dampers.

Fire dampers blades and outer frames shall be of 16SWG GSS construction. The damper blades shall be provided on both ends using chrome plated spindles in self lubricated bronze bushes. Stop shall be provided on top and bottom of damper housing made of 16SWG GSS. For preventing smoke leakage, side metallic compression seals shall be provided.

Fire damper shall be provided with factory fitted sleeves. Access doors shall be provided within the duct in accordance with the manufacturer's recommendation.

All stainless steel fire dampers blades and outer frame shall be fabricated from 16 SWG SS 304 sheet or better grade in the same manner as specified above for GSS.

Fire isolating dampers complete with outer frame, damper blades, motorized or fusible link actuator, linkages and sleeves, shall be installed in all locations as may be required by the relevant Authorities. In particulars, fire dampers shall be installed in ducts where they pass through compartmentation walls, fire walls and concrete floors except in the case where the duct itself is in a fire isolated shaft.

Fusible link type fire dampers shall be provided at all locations. Fusible link fire dampers shall be of the spring or dead weight type and shall be complete with fusible link 72 Deg. C rating so that they close automatically and remain closed under fire condition. The damper shall have a rating of not less that the rating of the fire separation walls or floors and shall be tested by a approved testing authority.

Inspection door shall be provided for fire dampers. All fire dampers shall be complete with factory fabricated and fitted duct sleeve. The joints at the sleeve end shall be slip on type.

Fire Rated Ductwork

All Fire Rated Ductwork shall have a minimum of 2 hours fire rating and to the approval of the local authorities.

Fire dampers shall be CBRI tested & certified for 90 minutes rating against collapse & flame penetration as per procedure of UL 555.

The fire damper shall be installed in the duct in such a manner that vibration and rattling does not occur due to the passage of air.

Fire dampers shall be motorized smoke & fire dampers type. Fire damper shall also close on receipt of fire alarm signal to cut off air supply instantaneously. An electric limit switch shall also be

operated by the closing of fire damper, which in turn shall switch off power supply to AHU blower motor as well as strip heaters.

Fire dampers shall be compatible with the fire detection system of building & shall be capable of operating automatically through an electric motor on receiving signal from fire alarm panel.

7.0 DIFFUSERS:

7.1 The ceiling type round or square diffusers shall be of 1.25 mm (18 gauge) aluminium sheets with flush or step down face, as specified with fixed pattern and round neck.

7.2 The diffusers shall be die formed for proper air diffusion.

7.3 All supply diffusers shall be provided with M.S. Sheet dampers, with knurled knobs for adjustment from the bottom.

8.0 PAINTING:

8.1 All grilles, and diffusers shall be anodised or powder coated, as required, before installation.

8.2 All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish.

9.0 TESTING:

9.1 After completion of sections all duct systems shall be tested for air leakage.

9.2 The entire air distribution system shall be balanced to supply the air quantity for each area and the final balance of air quantity for each area shall be submitted to the Project Manager/Engineer-in-charge, for approval. All the instrument required for testing and balancing i.e. rotating vane anemometer, thermometer, ducthood, inclined manometer etc. shall be provided by the Contractor.

10.0 VARIABLE AIR VOLUME (VAV) BOXES

These shall of the low velocity variable air volume boxes without re-heat coils, and shall be of open protocol as marketed by a firm specializing in this field. The contractor shall supply and install units to the quantity and locations as specified.

The unit shall be complete with damper, airflow ring, and solid-state electronic controls to provide accurate room temperature control. The damper shall be aero foil type construction with bearings.

Boxes shall be supplied with all internal attenuation treatment and acoustical damped casing necessary to achieve the required noise criteria. Casing shall be of 22SWG GSS minimum fitted with a completely sealed, easily removable means of access to all internal parts. Access to all boxes must be from the underside only.

The actuator shall be of 24V AC Bi-directional, direct coupled to the damper shaft. The required transformer to step down of the voltage range from 230V to 24V shall be part of the unit. The UPS power point with an isolator near the VAV will be provided by other agencies.

The unit shall be complete with transformer, access panel and other accessories as per the standard.

Maximum allowable static pressure to the boxes for its satisfactory operation shall not exceed 0.10WG, otherwise fan and motor selections may be affected.

Boxes shall be able to reset any air flow between 10% and the maximum air quantity that the boxes can handle without changing orifices or other parts. Air quantity limiters will not be accepted.

A suitable device shall be provided for the field adjustment of minimum airflow. All boxes shall be initially factory set at minimum air quantity of 10% and maximum quantity of 110%of the design requirements.
Under shut-off conditions, all boxes shall not have air leakage more than 2% of the maximum air quantity at 75mm static pressure.
The VAVs shall be used in standalone mode complete with its own temperature sensor and controller and shall perform the function of maintaining the temperature and airflow. However, the VAVs shall be BMS compatible to enable to network the VAVs to a Network Control Unit and onto BMS. In this mode all VAV data shall be available at the BMS workstation and it shall be possible to change set points and flow settings from the BMS workstation.
All boxes shall be electrically controlled. Controllers and operators shall be supplied by the contractor. The boxes shall be pressure independent. All controllers used for the control of VAV boxes shall be compliant with BACnet/ MODBUS protocol and be freely communicable to third party BACnet MSTP controllers.
VAV Box shall have provision to support from floor/ wall/ ceiling and in vertical/ horizontal condition.

11.0 PP + FRP Exhaust Ducting & Accessories for Fume hoods

Exhaust ducting for fume hoods shall be done in 3 mm PP + 2mm FRP material. PPGL sheets shall be Polypropylene sheets laminated with glass woven fabric on one side. This inline bonding due to lamination process gives the sheet optimum bond strength. The glass fabric shall provide the base for subsequent application of fibre glass or glass matting impregnated with polyester resin coats.
Technical specifications about ducting:-

1. Details about PP:-

- PPGL means:- One side smooth and glassy finish and other side is matt finish. Thickness of the material shall be minimum 3mm thick.
- The smooth surface shall be inner surface of the duct.
- On matt side FRP lining shall be done.
- Stitch welding is done in the inner surface and continuous welding on the outer surface.

2. Details about FRP (Fibre Reinforced Plastic):-

- FRP lining shall be done on the outer surface of the PPGL ie., matt finish side.
- One layer FRP is one mm. Minimum 2mm FRP coating shall be done on 3mm PP.
- The final layer shall be with fine mat to have smooth finish.
- While making the lining, there shall not be any air pockets or there shall not be any sort of uneven finish.
- There should be time gap between each layer of FRP lining, allowing each layer to be properly dried.

3. Isophthalic polyester resins shall be used for better chemical resistance.
4. The flanges shall be provided in appropriate thickness matching to the thickness of the exhaust pipe thickness.
5. All flanges shall be matched with M8 GI fasteners and flat washers on both sides.
6. All flanges shall have fasteners at four sides minimum.
7. All fasteners shall be properly ground and dressed.
8. Duct support distance shall not be more than 2500mm length.
9. 5mm thick neoprene gasket shall be used between gaskets.
10. The fabricated duct dimensions shall be as per approved drawings and all connecting sections shall be dimensionally matched to avoid any gaps.
11. A complete support system consisting of fully threaded rods, Double L Brackets, nuts, washers, clamps for circular ducts and anchor bolts etc., shall be supplied.
12. Providing the flange for the damper, louver, grille etc. shall be part of duct work and shall not be charge extra.

12.0 FLAT OVAL/ROUND SPRIAL DUCTS

- All Flat Oval/ Round Spiral Duct and Fittings shall be manufactured from 180 gsm galvanized steel of lock forming quality.
- All Flat Oval/ Round Spiral Ducts should have in Continuous external reinforcement with 4-ply Spiral lock seam at regular intervals of 125 mm of maximum length of 3 m each. The fabrication of flat Oval spiral ducts & duct fittings should be as per SMACNA High pressure duct standards, 1985.
- All Flat Oval/ Round Spiral Ducts and Duct fittings shall be joined with slip joint connects of 50mm insertion length and fastened with rivets.

Minimum duct wall thickness shall be as indicated in Table below:-

Flat Oval Duct Gauge

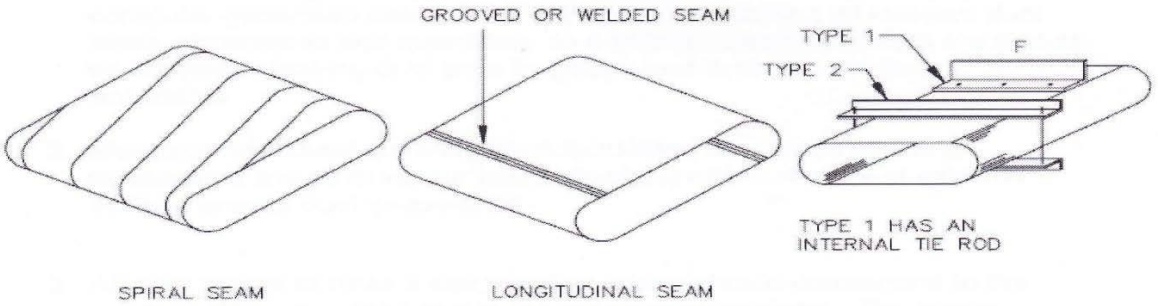
Major Dimension Duct Width (MM)	**Longitudinal Seam (GAUGE)**	**Spiral Seam (GAUGE)**	**Fitting (GAUGE)**
UPTO 600	20	24	20
601 TO 750	20	22	20
751 TO 900	20	22	20
901 TO 1050	18	22	18
1051 TO 1200	18	22	18
1201 TO 1350	18	20	18
1351 TO 1500	18	20	18
1501 TO 1750	16	20	16
1751 & ABOVE	16	18	16

ROUND Duct Gauge

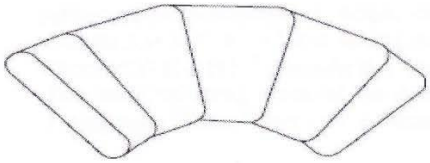
Major Dimension Duct Width (MM)	**Seam (GAUGE)**	**Fitting (GAUGE)**
UPTO 600	24	24
601 TO 900	22	22
901 TO 1250	20	20
1251 & ABOVE	18	18

- Reinforcement for oval/ Round duct shall be of the same and spacing interval as specified for rectangular duct or shall be provided to limit wall deflection to ¾ in. (19mm) and reinforcement deflection to ¼ in (6.4mm).
- Unless otherwise specified, joints and seams shall be similar to those indicated for round duct.
- Fittings shall conform to the thickness schedules in Table, shall conform to the seam, joint, and connection arrangements permitted for round duct, and shall be reinforced to conform to Point no. 1.
- The duct construction shall be capable of withstanding a pressure 50 percent greater than that of the assigned pressure class without structural failure or permanent deformation.
- Duct wall deflection at atmospheric pressure, with reinforcement and connections in place, shall not exceed ¼ in. (6.4 mm) on widths of 36 in. (914mm) or less of ½ in (13 mm) on greater widths. Refer Criteria in Chapter 11 of SMACNA Standards – 2005 Third Edition.
- Supports shall conform to those permitted for rectangular duct, with the overall dimensions taken as references.

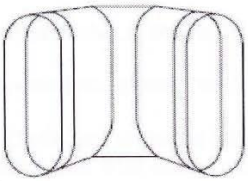
FLAT OVAL DUCTS
(Refer. Fig.3-7- SMACNA STANDARDS- 2005- THIRD EDITION)



JOINTS AND CONNECTIONS ARE SIMILAR TO ROUND DUCT SIZE REINFORCEMENTS AS FOR RECTANGULAR DUCT OF F DIMENSION ATTACH REINFORCEMENT TO DUCT AT ENDS AND 12" (305 MM) MAX. SPACING

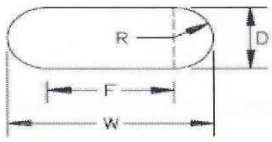


HARD BEND

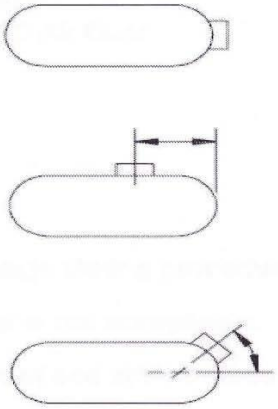


EASY BEND

F = W–D = FLAT WIDTH
W = MAJOR DIMENSION
SEE TABLE 3–4



FABRICATE FITTINGS AND CONNECTIONS AS FOR ROUND DUCT



BRANCH TAKE OFF

CONICAL TAKE OFF

F. INSULATION

This section deals with supply and fixing of **Thermal/Acoustic** insulation of ducts, pipes etc. as per the specification given in this section.

1.0 MATERIAL OF INSULATION

The insulation material of the following kind shall be used for cold insulation.

a) Closed Cell Elastomeric Nitrile Rubber

Insulation material shall be Closed Cell Elastomeric Nitrile Rubber. Thermal conductivity of elastomeric nitrile rubber shall not exceed 0.036 W/m°K at an average temperature of 0° C. The insulation shall have fire performance such that it passes CLASS 0 as per BS476 Part 7 for surface spread of flame. Water vapour permeability shall not exceed 0.04 Perm inch (2x 10-10 Kgs/m.hr.Pa). The Nitrile Rubber Insulation should have approval from CBRI, Roorkee.

Thickness of the insulation shall be as specified for the individual application

2.0 INSULATION ON SHEET METAL DUCTING

2.1 The air handling ducts shall be insulated with **Closed Cell Elastomeric Nitrile Rubber**.

2.2 Duct insulation thickness shall be 19 mm thick.

2.3 Installation

a) Clean the surface with a wire brush and make it free from rust and oil.
b) Apply one coat of heat resistant, polychloroprene base low VOC adhesive grade R242/SR998 on both surfaces with open time 10-25 minutes.
c) Fix the insulation on duct surface of the thickness mentioned in BOQ with 50 mm wide and 3 mm thick self adhesive insulating material (Nitrile rubber).

Additional treatment on Exposed duct insulation

- Apply tack coat of insulation protective coating evenly by brush (Min. 0.5 mm thick).
- After applying tack coat embed the glass fiber or canvas cloth immediately and make it wrinkle free.
- Apply finish coat of protective coating (Min. 0.5 mm thick).

3.0 ACOUSTIC LINING:

3.1 The acoustic lining shall consist of open cell nitrile rubber density 140-160 kg/m^3 (min) then it shall be covered by 0.46 mm perforated aluminium sheets having 3 mm perforation at 6 mm centres.

3.2 Installation:

- a) Clean the surface with a wire brush and make it free from rust and oil.
- Apply one coat of heat resistant, polychloroprene base low VOC adhesive both surfaces with open time 10-25 minutes.

- Fix the insulation on duct surface of the thickness mentioned in BOQ with 50 mm wide and 3 mm thick self adhesive insulating material (Nitrile rubber).

4.0 INSULATION OF PIPES

4.1 The refrigerant pipes shall be insulated with Nitrile rubber insulation in the form of tube. Drain pipes shall be insulated with Nitrile rubber in the form of preformed pipe sections. The thickness of the insulation shall be as per BOQ.

4.2 Installation:
Refrigerant and Drain Piping:

- The pipe shall be thoroughly cleaned with a wire brush and rendered free from all rust and grease.
- Apply one coat of heat resistant, polychloroprene base low VOC adhesive grade R242/SR998 on both surfaces with open time 10-25 minutes.
- The insulation shall be fixed tightly to the surface taking care to seal all joints with 50mm wide and 3 mm thick self adhesive insulating material (Nitrile rubber) (transverse and circumferential).
- Apply tack coat of insulation protective coating evenly by brush (Min. 0.5 mm thick).
- After applying tack coat embed the glass fiber or canvas cloth immediately and make it wrinkle free.
- Apply finish coat of protective coating (Min. 0.5 mm thick).

No broken insulation anywhere shall be permitted under any circumstances what so ever.

If anywhere the quality of installation is found to be inadequate as per Specifications or as per the performance requirement, the installation shall have to be redone without any extra cost to the Client.

4.3 INSULATION OF VALVES AND FITTINGS IN REFRIGERANT LINE
All valves, fittings, flanges, strainers etc. in the refrigerant line shall be insulated in the same manner as described above for refrigerant pipes. Care should be taken to ensure that no damage would be caused to the insulation when valves or strainers are operated.

4.4 APPLICATION OF ZINC CHROMATE COATING ON EXPOSED DUCT
External Surface of duct on which the rubberized paint coating is to be provided shall be thoroughly cleaned with wire brush and rendered free from all dust and grease.
Apply three coat of coating evenly by brush @ 2 m^2/liter.

G. VENTILATION FANS

1.0 SCOPE:

Scope of this section comprises of supplying, erection, testing and commissioning of following type of fans.

* Propeller Fans
* Centrifugal fans SISW /DIDW
* Axial Fans
* Cabinet fans
* Scrubber
* Inline fans

The above fans shall be as indicated on drawings and mentioned in schedule of quantities.

2.0 PROPELLER FANS:

2.1 The exhaust fans shall be propeller type with steel hub and blades, mounted directly on the shaft of a totally enclosed motor.

2.2 The fan blades shall be of pressed steel of aerofoil design for high efficiency and static pressure.

2.3 The mounting frame shall be of cast /sheet steel brackets to connect the frame, with the fan/motor assembly. Rubber mounts shall be provided between the mounting frame and the mounting brackets.

2.4 The fan motor shall be totally enclosed squirrel cage type.

2.5 All wall mounted exhaust fans shall be provided with gravity back draft louvers.

3.0 CENTRIFUGAL FANS:

3.1 Scroll:

"Pittsburg lock" form housing manufactured in galvanised sheet steel construction. The wheel having forward/backward curved blade is made of galvanised sheet steel.

The minimum thickness of casing shall be 16 gauge. The fan scroll shall be attached to the side plate by means of continuous lock seam.

18 gauge galvanized wire mesh inlet screens of 50 mm sieves shall be provided on both inlets. Housing shall be provided with standard clean out and door with quick locking tension handles and neoprene gasket. Rotation arrow shall be clearly marked on the housing.

3.2 Impeller:

The impeller shall have die-formed, forward/backward curved blades, locked to the rim and back plates to have a non-over loading characteristic of the fan. Rim shall be spun to have a smooth contour if required, intermediate stiffening rings shall be provided. Shaft sleeves shall be furnished wherever required. The impeller, pulley and housing shall be statically and dynamically balanced. Fan outlet velocity shall not exceed 2000 FPM.

3.3 Shaft:

Shaft shall be constructed of SAE 1040 steel turned, ground and polished. Shaft sizes shall be carefully calculated and designed such that the maximum operating speed (RPM) shall not exceed 75% of the first critical speed.

3.4 Bearings:

The bearing shall be self-aligning, heavy duty ball, roller or sleeve bearings. Bearing shall be selected for quiet operation and shall be grease pack, pillow block type. Bearings shall be maintenance free with permanently lubricated sealed ball bearing type.

3.5 Inlet Guard:

Inlet guard shall be spun to have a smooth contour. Inlet screen if provided shall be of galvanized wire mesh of 25 mm square.

3.6 Base Plate:

Base plate shall be provided for each fan. Base for both fans and motor shall be built as an integral part and shall be mounted on a concrete foundation through cushy foot mountings for vibration isolation. The concrete foundation shall be at least 150 mm above the finished floor level and shall be further isolated from structural floor through 50 mm thick layers of sand all around, topped with bitumen.

3.7 Motor:

Fan motor shall be of squirrel cage type totally enclosed fan cooled motor, suitable for 415 ± 10% volts, 50 Hz, 3 phase. Horse power indicated on the name plate of motor shall be more than brake horse power by at least 10% and shall have sufficient torque available for starting and continuous operation. Motor R.P.M. Shall not exceed 1450 R.P.M. The fan motor combination selected for the particular requirement shall be of the most efficient type (i.e smallest horse power) so that power consumption and noise level may be minimized. The motor shall have 'F' class insulation and four pole with IP 55 protection.

3.8 Drive:

These fans shall be provided with V-belts. All belts shall be selected for 150% rated HP. All V-belt shall be supplied with removable belt guards that do not impede the air flow to the fan inlet. There shall be a minimum of two belts per drive.

3.9 Vibration Isolation:

Fan with motor shall be mounted on a concrete foundation through Cushy foot vibration isolators for vibration isolation.

4.0 VANE AXIAL FLOW FANS:

Axial flow fan shall be of vane axial type and shall be suitable for mounting in duct or floor/slab as required/indicated on the tender drawings.

4.1 Impellers:

Single piece cast aluminium or steel impeller shall be with blades of aerofoil design to give maximum efficiency and shall vary in twist and width from hub to top to effect equal air distribution along the blade length. Single piece fan and hub shall be statically and dynamically balanced. Maximum clearance between blade tip and the fan housing at the specified speed shall be 5 mm. Impellers blades shall be whirl tested to a speed 25% above the design operating speed. Extended grease leads for external lubrication shall be provided. The fan blade shall be adjustable type so that actual air flow can be achieved at site as per indicated in Drawings & BOQ.

4.2 Casing:

Casing shall be constructed of 14 gauge sheet steel, properly reinforced for rigidity. Fan casing, motor mount and straightening vanes shall be of welded steel construction motor mounting plate shall be minimum 12.5 mm thick and machined to receive motor flanges. Casing shall be provided with two nos. wide, hinged doors which open easily. Inspection doors with handle and neoprene gasket shall be provided. Casing shall have flanged connection on both ends for ducted applications. Support brackets for ceiling suspensions shall be welded to casing for connection to hanger bolts. Straightening vanes shall be aerodynamically designed for maximum efficiency by converting velocity pressure to static

pressure potential and minimizing turbulence. Casing shall be bondorized, primed and finish coated with enamel paint.

4.3 Motor:

Motor shall be squirrel cage, totally enclosed, fan cooled, constant speed, suitable for 415 ± 10% volts, 50 Hz, 3 phase power supply, motor nameplate horsepower shall be more than brake horse power by a minimum of 10%. Motor speed shall not exceed 1450 R.P.M (4 pole). The fan and motor combination selected for particular requirement shall be of the most efficient type so that sound level and energy consumption is minimum. Motor conduit box shall be mounted on exterior of the casing. Wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit. The motor shall have 'F' class insulation with IP 55 protection.

4.4 Drive:

* **For Duct/Wall Mounted Fan:**

For duct/wall mounted fans the impeller shall be mounted directly on the motor. Drive unit and impeller shall be totally enclosed inside the duct.

* **For Floor/Ceiling Mounted Fan:**

The fan shall be provided with belt drive and adjustable motor sheave, standard sheet steel belt guard with vented front for heat dissipation. Belt shall be of the oil resistant type.

* **Vibration Isolation:**

Base shall be provided for each fan. Base for both fan and motor shall be built as an integral part and shall be mounted on a concrete foundation through cushy foot vibration isolators. The concrete foundations shall be at least 15 cm above the finished floor level and shall be further isolated from the structural floor through 5 cm. Thick layers of sand all around, topped with bitumen. In case ceiling hung fan within the ceiling shall be provided Vibration Isolation Suspension (VIS) shall be provided in each of string.

5.0 TUBE AXIAL FLOW FANS:

Axial flow fan shall be of tube axial type and shall be suitable for mounting in duct or floor/slab as required/indicated on the tender drawings.

5.1 Impellers:

Single piece cast aluminium or steel impeller shall be with blades of design to give maximum efficiency and shall vary in twist and width from hub to top to effect equal air distribution along the blade length. Single piece fan and hub shall be statically and dynamically balanced. Maximum clearance between blade tip and the fan housing at the specified speed shall be 5 mm. Impellers blades shall be whirl tested to a speed 25% above the design operating speed. Extended grease leads for external lubrication shall be provided. The fan blade shall be adjustable type so that actual air flow can be achieved at site as per indicated in Drawings & BOQ.

5.2 Casing:

Casing shall be constructed of 14 gauge sheet steel, properly reinforced for rigidity. Fan casing, motor mount and straightening vanes shall be of welded steel construction motor mounting plate shall be minimum 12.5 mm thick and machined to receive motor flanges. Casing shall be provided with two nos. wide, hinged doors which open easily. Inspection doors with handle and neoprene gasket shall be provided. Casing shall have flanged connection on both ends for ducted applications. Support brackets for ceiling suspensions shall be welded to casing for connection to hanger bolts. Straightening vanes shall be aerodynamically designed for maximum efficiency by converting velocity pressure to static pressure potential and minimizing turbulence. Casing shall be bondorized, primed and finish coated with enamel paint.

5.3 Motor:

Motor shall be squirrel cage, totally enclosed, fan cooled, constant speed, suitable for 415 ± 10% volts, 50 Hz, 3 phase power supply, motor nameplate horsepower shall be more than brake horse power by a minimum of 10%. Motor speed shall not exceed 1450 R.P.M (4 pole). The fan and motor combination selected for particular requirement shall be of the most efficient type so that sound level and energy consumption is minimum. Motor conduit box shall be mounted on exterior of the casing. Wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit. The motor shall have 'F' class insulation with IP 55 protection.

5.4 Drive:

* **For Duct/Wall Mounted Fan:**
  For duct/wall mounted fans the impeller shall be mounted directly on the motor. Drive unit and impeller shall be totally enclosed inside the duct.

* **For Floor/Ceiling Mounted Fan:**
  The fan shall be provided with belt drive and adjustable motor sheave, standard sheet steel belt guard with vented front for heat dissipation. Belt shall be of the oil resistant type.

* **Vibration Isolation:**
  Base shall be provided for each fan. Base for both fan and motor shall be built as an integral part and shall be mounted on a concrete foundation through cushy foot vibration isolators. The concrete foundations shall be at least 15 cm above the finished floor level and shall be further isolated from the structural floor through 5 cm. Thick layers of sand all around, topped with bitumen. In case ceiling hung fan within the ceiling shall be provided Vibration Isolation Suspension (VIS) shall be provided in each of string.

6.0 PACKAGE TYPE SCRUBBER

The packaged type scrubber shall be complete in all respect and shall generally comply with the following specifications given below:
The packaged scrubber shall be of GI sheet metal sectionalized construction and shall include fan section, cooling pad section, filter section, motor drive etc. The Scrubber with its part should have resistant against chemicals, toxic gases and fumes.
Housing of scrubber shall be of double skin construction. The frame work shall be of extruded aluminium hollow section. All the frames shall be assembled using pressure dye cast aluminium joints of various sections, strong and self-supporting frame work of various sections. The double skin panels shall be 40mm thick and shall be made of 0.8mm pre-plasticized and pre-painted with PVC guard on outside and inside with 40mm thick PUF insulation injected in between by injection moulding machine. These panels shall be screwed on to the frame work with soft rubber gasket in between to make the joints air-tight. Suitable air-tight access doors with hinges and locks shall be provided for access to various sections for maintenance. The entire housing shall be mounted on extruded aluminium channel frame work having pressure dye cast aluminium joints.

i. Fan: The fan shall be FRP coated plug fan backward curved type. The wheel and housing shall be fabricated from heavy SWG galvanised steel. The fan impeller shall be mounted on a solid shaft supported to housing with angle iron frame work and pillow block heavy duty ball bearing. The impeller and fan shall be statically and dynamically balanced. The fan shall be selected for a speed not exceeding 1000 RPM. Frame housing with motor shall be mounted on a common extruded aluminium base mounted inside the housing on anti-vibration mounds. Fan outlet shall be connected to casing with the help of fire retardant fabric acting as flexible connection for anti-vibration. The manual dampers shall be installed at the outlet of the unit. The damper should be air-tight and should be in a position to prevent back flow. Velocity at blower outlet shall not exceed 10 m/sec (2000 FPM).

ii. Scrubber Section: The wet section will have 16 SWG GSS tank with 5mm thick FRP coating and body with folded construction with the bolted openable sides. The wet section will contain water spray system in two banks spraying water on suction air through WIDE ANGLE NOZZLES to wet, scrub and clean the air. These nozzles will be provided on a pipe grid such that the total face of the air intake is kept fully wet and also gets pressure cleaning. PVC drain/overflow and bleed off outlet are to be provided on all wet sections.

iii. The tank shall have necessary arrangement for inlet water with float valve over flow and drain arrangement.

iv. Pumps: The unit will have a horizontal three phase 415 Volts + 6% 50 power supply mono block self priming pump assembly to provide recirculated tank water and a pressurized flow via a piping system for proper pad and media water distribution. The pump capacity will be such that it can take care of the bank of nozzles provided for cleaning the first bank and also feed water to wet the second bank. The pump shall be located outside the unit with rain protection canopy.

v. Motor & Drive: The fan motor shall be suitable for 415 ± 10% volts 50 cycle 3 phase squirrel case totally enclosed fan cooled with IP 55 protection. The motor speed shall not exceed 1450 rpm. The drive to the fan shall be provided through belt arrangement. The Fan motor shall be energy efficient with efficiency level of IE-3.

vi. Accessories:
Necessary accessories shall be provided wherever necessarily required for proper operation and shall also include:

- Necessary GI piping for water circulation
- Vibration isolations pads for the blowers and pumps
- Canvass connections at the outlet of each fan
- Nuts, bolts, shims etc. as required for the grouting of the equipment
- Float valves in the air washer tank, along with quick fill connection

7.0 Cabinet Fan:

7.1 Fan Enclosure/Housing:

The Fan housing shall be made of single skin design with main structure made of structural channel frame work in different sections. All sections shall be bolted to each other with neoprene rubber gasket in between them for perfect airtight joints.

7.2 Fan Section

The fan shall be forward/ backward curved, double inlet double width type. The wheel & housing shall be fabricated from heavy gauge galvanized steel. The fan impeller shall be mounted on a solid shaft supported to housing with angle iron frame & pillow block/ heavy duty ball bearings. The fan shall be selected for a speed not exceeding 1000 RPM. Shaft sizes shall be carefully calculated and designed such that the maximum operating speed (RPM) shall not exceed 75% of the first critical speed. The impeller & fan shaft shall be statically and dynamically balanced. The fan outlet velocity shall not be more than 1800 FPM. Fan housing with motor shall be mounted on a common steel base mounted inside the TFA housing on anti-vibration springs mounts. The fan outlet shall be connected to casing with the help of fire retardant canvass. The fan shall be complete with multi 'V' belt drive, and adjustable motor mounting base.

7.3 Fan Motor & Starter:

The totally enclosed fan cooled squirrel cage fan motor shall have a minimum rating as given under "Schedule of Equipment". The starter rating shall match the motor rating and will conform to specifications under "Motor and Switch Gears. Drive to fan shall be provided through belt-drive arrangement. Belts shall be oil resistant type.

8.0 IN-LINE CENTRIFUGAL FAN:

8.1 Fan shall be centrifugal direct driven type.

8.2 Casing shall be of Galvanized steel with Oven-baked epoxy coating. Impeller material shall be either Galvanized Steel or Glass Reinforced Polypropylene.

8.3 Small capacity Circular Inline duct fans shall be with External Rotor type motor 220-240V/50Hz/single Phase type.

8.4 Rectangular type Inline fans should be with Removable Access door for easy accessibility to motor and fan.

H. ELECTRICAL WORK

1.0 SCOPE:

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of electric control panels, wiring and earthing of all air-conditioning equipment components and accessories, including supply, installation and wiring of remote control with indicating lamps.

The following exclusions from this contract may be provided by Owner, through other agencies, as per special conditions of contract.

i. Wiring and earthing of incoming breakers in the air-conditioning plant room control panel.
ii. Supply, installation, wiring and earthing of 15 amps three pin socket in vicinity of each fan coil unit if any and each single phase ventilation fan.

2.0 GENERAL:

Work shall be carried out in accordance with the specifications of local rules, Indian Electricity Act 1910 as amended upto date, and rules issued there under, regulations of the Fire Insurance Company and Indian Standard Code of practice No. IS: 732-1963 (latest upto date). Wiring for items of work not covered by any of the above regulations. Wiring rules in the 13th edition of the Institution of Electrical Engineers (London) shall apply. Definition of terms shall be as per the rules of the Institution of Electrical Engineers (London).

3.0 WIRING SYSTEM:

All power wiring shall be carried out with 1100 volt grade XLPE/PVC insulated, armoured, overall, PVC sheathed aluminum conductor cables. Cables shall be sized for starting current and by applying proper derating factor. All control wiring shall be carried out by using 1100 volts PVC insulated copper conductor wires in wire ways or in conduit. Minimum size of control wiring shall be 1.5 sq.mm.

4.0 CONSTRUCTION FEATURES:

The control panel shall be metal enclosed sheet steel cubical indoor type, dead front, floor mounting/wall mounting type. The control panel shall be totally enclosed, completely dust and vermin proof, Gaskets between all adjacent units and beneath, all covers shall be provided to render the joints dust proof. Control panels shall be arranged in multitier formations. All doors and covers shall be lockable. All mild steel sheets used in the construction of control panels shall be 2mm. thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all slag grounded off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of control panels. Base channel of 75mm x 75mm x 5mm thick shall be provided at the bottom. Minimum clear space of 200mm between the floor of control panel and bottom most unit shall be provided.

The control panels shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear. Knockput holes of appropriate size and number shall be provided in the control panels in conformity with the location of incoming and outgoing conduits/cables. All equipment such as meters and indicating lamps, etc shall be located adjacent to the unit with which it is associated and care shall be taken to achieve a neat and symmetrical arrangement. Facility shall be provided for termination of cables from both above and below the control panel. Where cables enter below, cables boxes shall be fitted at the rear and arranged in tiers to facilitate making

connections to the upper and lower units. Clamps shall be provided to support the weight of the cables. All incoming and outgoing feeders shall be brought out to a terminal block of adequate size at suitable location inside the control panel. All wiring inside the control panel shall be colour coded and labeled with approved plastic beads for identification. Circuit diagrams showing the arrangement of circuits shall be pasted on the inside of the panel door and covered with transparent plastic sheet and all labeling shall be provided on the front face of the panel board.

5.0 CIRCUIT COMPARTMENTS:

Each circuit breaker, contactor and relay shall be housed in a separate compartment and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the breaker in the `ON' position. Safety interlocks shall be provided to prevent the breaker or Contactor from being drawn out when the breaker is in the draw out portion of the panel. Instruments and indicating lamps shall not be mounted on the panel compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section.

6.0 BUS BARS AND BUS BAR CONNECTION:

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate busbar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral busbars shall be provided). The interval between the two insulators will be designed after considering the following:

a) Strength and safe load rating of the insulator,
b) The vibrating force generated during a fault,
c) A Factor of safety of 1.25
d) A set of insulators at both ends of the bus.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanised high tensile steel nuts, bolts, plain or spring washers of suitable size will be used in connecting the various sections of the bus bars.

7.0 TERMINALS:

The outgoing terminals and neutral links shall be brought out to a terminal block suitably located in the control panels. The current transformer for instruments, metering and for protection shall be mounted on the terminal blocks. Separate cable compartment shall be provided for incoming and outgoing cables.

8.0 WIRE WAYS:

A horizontal wire way screwed covers shall be provided at the tip to take in the connecting control wiring in different vertical sections.

9.0 CABLE COMPARTMENTS:

Cable compartments of adequate size shall be provided in the control panels for easy termination of all incoming and outgoing cables entering from bottom or top. adequate and proper supports shall be provided in cable compartments to support cables. All incoming and outgoing terminals shall be brought out to terminal blocks in the cable compartment.

10.0 MATERIALS:

All materials shall be of the best quality complying with the appropriate Indian Institutions and British Standard specifications, Materials used shall be subject to the approval of the Architect/Consultant and sample of the same shall be furnished where required.

a. Air Circuit Breaker:

The air circuit breakers shall be sheet metal enclosed flush front, draw out type, and shall be provided with a trip free manual operating mechanical "ON" - "OFF" indications. The circuit breaker shall be suitable for continuous rating and of capacity as called for. It shall be possible to switch. "ON & "OFF" the circuit breaker without opening the circuit breaker compartment door. The operating handle and the mechanical trip push button shall be at the front of the breaker and integral with the breaker.

Cradle:

The cradle shall be so designed and constructed as to permit smooth withdrawal and insertion of the breaker into it. The movement shall be free from jerks, easily operable and shall be on steel balls/rollers and not on flat surfaces.

There shall be four distinct and separate position of the circuit breaker on the cradle.

Service	Both main and secondary isolating contacts closed.
Test	Main isolating contacts separated and secondary isolating contacts closed.
Isolated	Both main and secondary isolating contacts isolated.
Maintenance	Circuit breaker full outside the panel ready for maintenance. There shall be provision for locking the breaker in any or all of the first three positions.
Maintenance	Circuit breaker full outside the panel ready for maintenance. There shall be provision for locking the breaker in any or all of the first three positions.

Protective Devices:

C.T. operated IDMT Relays for over voltage and short circuit earth fault protection shall be provided for all air circuit breakers. Suitable over and under voltage tripping mechanism for voltage greater or less than +/- 10% of full rated voltage shall be provided. The release of circuit breakers, shall be magnetic/thermal type. The thermal type shall be triple pole fully enclosed and of the ambient temperature compensated type. The breakers and releases shall be designed to clear the faults with minimum delay to limit the effects of the thermal stress on the system.

The magnetic trips shall be of attracted armature type. The time delay in magnetic trips shall be obtained by mechanical means which are rugged and nonageing. Direct action releases shall be fitted with test strips for periodical checking of trip operations.

There shall be not less than 6 N/O 6N/C auxiliary contacts rated 5 amps on the breaker. The auxiliary contact blocks shall be so located as to be accessible from the front. The auxiliary contacts in the trip circuit shall close before the main contacts have opened. All other contacts shall close simultaneously with the main contacts.

b. Selector Switch:
When called for, selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode.

c. Starters:
Each motor shall be provided with a starter of suitable rating. Starter shall be in accordance with latest IS amendment upto date. Direct on line starters shall be provided for motors upto 7.5 HP. Star Delta Type starters shall be provided for motors 10 HP to 50 HP capacity.

Starters contactors shall have 3 main and 3 auxiliary contacts and shall be air break type suitable for making and breaking contact a minimum power factor of 0.35. For design consideration of contactors, the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of star delta/reduced Voltage starters.

Main and auxiliary contacts shall be silver or silver alloy. The insulation for contactor coils shall be of class "E". Operating coils of contactors shall be suit able for 220/415 +/- 10% volts AC, 50 cycles supply sys tem. The contactor shall drip out when voltage drops to 90% of the rated voltage. The housing of the contactors shall be heat resistant and having high impact strength. Each starter shall have thermal overload protection on all three phases.

d. Over Load Relays:
Contactors shall be provided with a three element, positive acting ambient temperature compensated time lagged hand-reset type thermal over load relay with adjustable setting. Hard reset button shall be flush with the front door for resetting with starter compartment door closed, Relays shall be directly connected for motors below 35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacity.

e. Current Transformers:
Current Transformer shall be of accuracy class - I and suitable VA burden for operation for the connected meters and relays.

f. Single Phase Preventers:
Single phase preventers shall be provided as per Bill of Quantities and shall be in conformity with relevant ISI standards. Single phase preventers shall act when the supply voltage drops down to 90% of the rated voltage or on failure of one or more phases.

g. Time Delay Relays:
Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one at auxiliary contacts for indicating lamp connection.

h. Indicating Lamp and Metering:
All meters and indicating lamps shall be in accordance with latest BS. Each main panel shall be provided with operated ammeter of suitable range with three Nos. CTs of suitable ratio with three way and off selector switch, phase indicating lamps, and other indicating lamps as called for. Each phase indicating lamp shall be backed up with 2 amps MCB. Other indicating lamps shall be backed up with MCB as called for.

i. Cables:
M.V. cables shall be XLPE insulated aluminum conductor and armoured cables conforming to latest IS. MV cables shall be armoured and suitable for laying in trenches, duct, and on cable trays as required. MV cables shall be termite resistant. Control cables, and indicating panel cables shall be termite resistant. PVC insulated copper conductor and armoured cables.

j. Wires:
1100 volts grade PVC insulated aluminum conductor wires in conduit shall be used.

11.0 CABLE LAYING:

Cable shall be laid generally in accordance with Indian Standard Code of practice. Cable shall be laid on 14 gauge perforated M.S. sheet cable trays as approved by the Supervisor. Easy access to all cables shall be provided to allow cable withdrawal/replacement in the future. Where more than one cable is running, proper spacing shall be provided to minimize the loss in current carrying capacity.

Cable shall be suitably supported with wooden cleats when run on wall/floor ducts. When buried, they shall be covered with a layer of soft shifted sand and protected with cement concrete tiles bricks. Special care shall be taken to ensure that the cables are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of the cable.

12.0 EARTHING:

Shall be in galvanised Iron Strips/wires, or copper strips/wires as mentioned in Bill of Quantities.

a. G.I. Earthing:

The main panel shall be connected to the main earthing system of the building by means of 2 Nos. 25mm x 6mm GI strips. All single phase metal clad switches and control panels shall be earthed with minimum 3mm diameter GI conductor wire. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

i.	Motors upto and including 10HP	2 Nos. 4mm dia GI wires.
ii.	Motors 12.5 HP to 40 HP	2 Nos. 6mm dia GI wires.
iii.	Motors 50 to 75 HP capacity	2 Nos. 25 x 3mm GI strips.
iv.	Motor above 75 HP	2 Nos. 25mm x 6mm GI strips

All the switches shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

i. 3 phase switches and control panels upto 60 Amps rating. 2 Nos. 4mm dia GI wires
ii. 3 phase switches and control panel 63 Amps to 100 Amps rating.2 Nos. 8mm dia GI wires.
iii. 3 phase switches and control panels 125 Amps to 200 Amps rating.2 Nos. 25 x 3mm GI tapes.
iv. 3 phase switches and control panels, bus ducts above 200 Amps rating. 2 Nos. 25mm x 6mm GI tapes.

b. Copper Earthing:

The main panel shall be connected to the main earthing system of the building by means of 2 Nos. 25mm x 3mm copper tapes. All single phase metal clad switches and control panels be earthed with minimum 2mm diameter copper conductor wired. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent copper wires/tapes as follows:

i.	Motors upto and including 10 HP rating.	2 Nos. 3mm dia copper wire
ii.	Motors 12.5 HP to 40 HP capacity	2 Nos. 4mm dia copper wire
iii.	Motors 50 to 75 HP capacity	2 Nos. 6mm copper wires.
iv.	Motor above 75 HP	2 Nos. 25mm x 3mm copper wires.

All the switches shall be earthed with two numbers distinct and independent copper wires/tapes as follows:

i.	3 phase switches and control panels upto 60 Amps rating.	2 Nos. 3mm dia copper Wires.
ii.	3 phase switches and control panel 125 amps to 200 Amps rating	2 x 6mm dia copper wire.
iii.	3 phase switches and control panels 63 Amps to 100 Amps rating	2 Nos. 4mm dia copper wires.
iv.	3 phase switches and control panels, bus ducts above tapes 200 Amps rating.	2 Nos. 3mm x 6mm copper.

13.0 RATING:

All components, accessories, cables etc specified, shall be operational for rated capacities at 55oC operating temperature.

14.0 DRAWINGS:

Shop drawings for control panels and wiring of equipment showing the route of conduit/cable shall be submitted by the contractor for approval of Architect/Consultant before starting the fabrication of panel and starting the work. On completion, four sets of completion "As-installed" drawings incorporating all details like, conduit routes, number of wires in conduit, location of panels, switches, junction/pull and cable route etc. shall be furnished by the Contractor.

15.0 PAINTING:

All sheet steel work shall undergo a process of degreasing, through cleaning, and painting with a high corrosion resistant primer. All panels shall then be baked in an oven. The finishing treatment shall be by application of synthetic enamel paint of Siemens Gray, Pheroze or any other shade approved by Owner/Architect/Consultant.

16.0 TESTING:

Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with latest Code of practice and test report furnished by a qualified and authorised person. The entire electrical installation shall be got approved by Electrical Inspector and a certificate from Electrical Inspector shall be submitted. All tests shall be carried out in the presence of supervisor.

17.0 PVC CONDUIT:

Wiring shall be carried out in recessed/ surface PVC conduits. The PVC conduits conform to latest and shall be ISI embossed. The conduits shall be heavy gauge (minimum 2 mm wall thickness) and the interiors of the conduits shall be free from all obstructions. All joints in conduits shall be sealed/ cemented with approved solvent cement. Damage conduits/ fittings shall not be used. Cut ends of conduits shall not have sharp edges.

18.0 CONTROL CABLES:

18.1 SCOPE

18.1.1 This specification covers the design, manufacturing, testing and supply of Fire Retardant Low Smoke Control Cable of High conductivity, annealed copper, acid, alkali, weather, oil and moisture resistant Multi-core laid up heavy duty PVC insulated and graded upto 1100 Volts sheathed cables for electric supply and control purposes.

18.1.2 The Control cables are required for power supply, control & connections of various equipment including protective device etc.

18.2 FEATURES

18.2.1 Cable under this specification shall be suitable for use on A.C. or D.C. System for rated voltages upto 1100 Volts to earth R.M.S.

18.3 TYPE OF CABLES

88.3.1 The cable shall be multi core HR PVC insulated type C category conforming to IS-1554(Part-1).

18.4 CONDUCTOR

18.4.1 The cable conductor shall be made from standard copper to form compact conductor having a resistance within the limits specified in ISS. The minimum number of strands for 1.5mm2, 2.5mm2, 6mm2 and 10mm2 conductor shall be 7 (seven).

18.4.2 The normal current rating of all PVC insulated cables shall be as per IS:3961.

18.5 INSULATION (PVC Type C Category)

18.5.1 The insulation of the cable shall be designed and manufactured for the specified system voltage. The manufacturing process shall ensure that insulation is free from voids. The insulation shall withstand mechanical and thermal stresses under steady stage and transient short circuit operating conditions. Test requirement for PVC insulation sheath shall be as per Table 2 of IS: 5831-1984

I. SUBMITTALS

1.0 Submittals shall be submitted for the following equipments:

i) VRV Units
ii) Piping
iii) Ducting
iv) Insulation
v) Electrical Panels
vi) Controls
vii) Centrifugal/ Inline/ Propeller fans
viii) Dry Scrubber

2 Submittals must be specific to this project. Generic submittals will not be accepted. Any other submittal if required shall be submitted by contractor.

J. TEST AT SITE

1.0 GENERAL:

The Contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the Architect, in accordance with the provisions of the applicable AHSRAE Standards or approved equal and furnish necessary test certificates from manufacturers.

2.0 ASSOCIATED WORKS AT SITE:

2.1 All electrical items will be subjected to inspection at any stage during manufacturing activity. Routine electrical test as per relevant codes. Inspection of Manufacturer's Test Certificates.

2.2 Inspection of raw materials to be used for fabrication and assembly and inspection of Manufacturer's Certificates.

2.3 Inspection of welding including welders qualification as desired by inspection Engineers. Inspection of fabricated items.

2.4 Pressure testing of pipe fittings used for the refrigerant and water services.

2.5 Vacuum missing and gas/oil charging for refrigeration system.

2.6 Checking of electrical circuits (power & controls) and checking functioning of controls of refrigerant systems and other circuits of air conditioning plant.

2.7 Checking of calibration of controls and instrumentation

2.8 Checking of assemblies for electrical control panel, instruments panels, local panels (dimensional and functional) annunciator panels etc.

2.9 Inspection of complete electrical installation at site.

2.10 Installation of main equipment like VRV units, ventilation fans etc.

2.11 Performance testing of complete A.C. system as per Specifications.

2.12 The above inspection procedure is given for general guidance and information of vendors and inspection of Purchaser/Consultant is strictly not limited to these and Inspection Engineer of Purchaser/Consultant will have full right to have detailed inspection at any stage right from placement of order to completion of project as desired by Inspection Engineer, Co-ordination of Inspection Agency of Purchaser/Consultant with his Factory/Sub-vendor's Factory/Erection Site will be the sole responsibility of successful vendor after placement of order for complete Air-conditioning Plant covered under these Technical Specifications.

3.0 PIPING SYSTEM:

3.1 In general pressure tests shall be applied to piping only before connection of equipment and appliances. In no case shall piping, equipment or appliances be subjected to pressure exceeding their test ratings.

3.2 Tests shall be completed and approved before any insulation is applied.

3.3 Water Piping

All water piping shall be tested and proven tight under hydrostatic pressure of 1 ½ times the design pressure unless stated otherwise in the specifications. Prescribed pressure shall be maintained for four hours.

4.0 DUCT WORK:

4.1 All branches and outlets shall be tested for air quantity, and the total of the air quantities shall be within plus five percent (5%) of fan capacity.

4.2 Fire Dampers, Volume Dampers and Splitter Dampers shall be tested for proper operation.

4.3 All ducting shall be smoke tested for any leakages.

5.0 BALANCING AND ADJUSTMENT:

All air conditioning & ventilation equipment, duct work and outlets shall be adjusted and balanced to deliver the specified air quantities indicated, at each inlet and outlet, on the drawings. If these air quantities cannot be delivered without exceeding the speed range of the sheaves or the available horse power, the architect shall be notified before proceeding with the balancing of air distribution system.

6.0 ELECTRICAL EQUIPMENT:

6.1 All electrical equipment shall be cleaned and adjusted on site before application of power.

6.2 The following tests shall be carried out:
Wire and cable continuity tests.

6.3 Insulation resistance tests, phase to phase and phase to earth, on all circuits and equipment, using a 500 volt meggar. The meggar reading shall be not less than one megaohm.

6.4 Earth resistance between conduit system and earth must not exceed half (1/2) chm.

6.5 Phasing out and phase rotation tests.

6.6 Operating tests on all protective relays to prove their correct operation before energising the main equipment.

6.7 Operating tests on all starters, circuit breakers, etc.

7.0 PERFORMANCE TESTS:

7.1 The installation as a whole shall be balanced and tested upon completion, and all relevant information, including the following shall be submitted to the Architects.

7.1.1 Air volume passing through each unit, duct, grilles, and apertures.

7.1.2 Electrical current readings, in amperes of full and average load running, and starting, together with name plate current of each electrical motor.

7.1.3 Continuous recording over a specified period, of ambient wet and dry bulb temperatures under varying degrees of Internal Heat Loads and use and occupation, in each zone of each part of the building.

7.2 Any other readings shall be taken which may subsequently be specified by the Architect.

7.3 Drawings marked with all grill outlets with CFM.

8.0 MISCELLANEOUS:

8.1 The above tests are mentioned herein for general guidance and information only but not by way of limitation to the provisions of conditions of Contract and Specification.

8.2 The date of commencement of all tests listed above shall be subject to the approval of the Architect, and in accordance with the requirements of this specification.

8.3 The contractor shall supply the Commissioning Engineer and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system if the architect requests such a test for determining specified or guaranteed data as given in the Specification or on the Drawings.

8.4 Any damage resulting from the tests shall be repaired and/or damaged material replaced to the satisfaction of the architect.

8.5 In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommended after the adjustment or repairs have been completed.

8.6 The Contractor must inform the architect when such tests are to be made, giving sufficient notice, in order that the architect or his nominated representative may be present.

8.7 Complete records of all tests must be kept and 3 copies of these and location drawings must be furnished to the Architect.

8.8 The Contractor may be required to repeat the test as required, should the ambient conditions at the time not given, in the opinion of the Architect, sufficient and suitable indication of the effect and performance of the installation as a whole or of any part, as required.

9.0 ERECTION AND COMMISSIONING:

The contractor shall carry out the complete erection and commissioning. All work shall commence on previously prepared foundation. All the materials shall be moved from their place of storage to the respective locaion by the Contractor. The contractor shall make his own arrangement to OFF load equipment/material received at respective Rail/Road Transport Terminal Points, dispatched to site and to store all material received at site. The purchaser shall provide clear storage and erection space only. All erection tools and tackles as and when required to suit the erection program shall be provided by the Contractor.

All consumables required for erections such as cotton waste, kerosene, oil, emery paper, coil string, bamboo's and planks for scaffolding etc as well as necessary welding rods, gases etc shall be provided by the contractor. Protective and finish painting shall be carried out by the contractor. Carbon steel surface shall be thoroughly cleaned before painting. The contractor shall indicate the water and electricity requirements during erection. The contractor shall remove all the waste material or rubbish from and about the work site and leave the job thoroughly cleaned up and ready for use.

K. BALANCING AND COMMISSIONING

1.0 General:

Perform following testing and commissioning to approval:
Air balancing of each system (each supply air system, fans, ductable units).
Excessive noise & vibration testing.

2.0 Criteria:

Systems shall be balanced and adjusted to give design/operating conditions under following criteria:

- Tolerance of air flow quantities : 3% S.A. Ducts, 5% other ducts
- Tolerance of water flow quantities : 5%
- Maximum noise level reading : NC-35 in occupied spaces.
- Maximum current load on motors : 100% of nameplate capacity

3.0 Reports:

3.1 On completion, supply at least six copies of balancing and test report, suitably bound, 8 ½" x 11" sizes for checking and review. Submit completed reports within three weeks of testing and balancing.

3.2 Reports shall include all design data together with recorded data of all tests for comparison and schematic of each system and components.

3.3 report all temperatures in Degree Celsius. For convenience, reports may also show temperature in Fahrenheit but only as secondary data.

3.4 Reports should show schematic of each system. Location of each traverse should be mark and each outlet should have corresponding number.

3.5 Keep a record of all tests and have these signed by General Contractor's superintendent and where applicable, equipment Manufacturer's Representative. Show in an approved schedule form, record of systems or parts of systems tested or intended to test, date of test, circumstances such as pressure, temperature, duration of test and any special remarks pertaining to events during test.

3.6 Final Report Shall Include:

- Specified and achieved total air quantities per system.
- Specified and achieved individual air quantities for each VAV box complete with sp.
- Specified and achieved individual air quantities per outlet with supporting schematic diagrams.
- Specified and actual fan total SP with breakdown showing inlet and discharge pressure.
- Sheaves and belt sizes and quantities per unit.

4.0 Testing:

4.1 Carry out all tests specified. Test equipment to requirement of and where necessary, in presence of equipment manufacturer.

4.2 Tests for balancing shall proceed only after system installation has been completed and system has been put into continuous operation.

5.0 Sanitary Exhaust & Miscellaneous Exhaust Systems:

5.1 test each system as herein described. Pre-set system as follows:

* Set exhaust (backdraft) dampers to fully open position.
* Close doors for those rooms being exhausted.
* Start related supply air system.

5.2 Check fan speed, motor amperage and voltage. Compare to shop drawing data. Adjust fan speeds (except for direct drive fans) to within 5% of shop drawings figure.

5.3 Make pitot tube traverse, velocity and static pressure readings in ducts wherever needed as specified for test.

5.4 When airflow capacity is within 5% of design, test and balance individual inlets starting with those closets to fan.

5.5 Adjust system to normal operating audition and record all data.

6.0 Miscellaneous Air Flow and Pressure Testing:

After all systems are balanced, set supply air systems to maximum outdoor air and maximum relief position and test building pressures in main lobby relative to atmosphere. Adjust air flows to direction of engineer when unsuitable building pressure occurs.

8.0 Temperature Testing:

8.1 Record temperatures of air and liquid flow for all refrigeration machines and DX coils on air sides as applicable.

8.2 Record for each room DB^{0}C and WB^{0}C temperatures and R.H. and re-adjust readings for local conditions at time of test.

9.0 Excessive Noise & Vibration Testing:

9.1 Test and explore all sources of excessive noise generation or vibration caused by mechanical system. Perform octave band sound measurements at locations requested by Architect/ Client. Tests shall be done after systems have been balanced.

L. TECHNICAL DATA

Contractor should furnish technical data as mentioned below, of the equipment and accessories offered by him as per scheme given in schedule of equipment and Bill of Quantities.

S. No.	Description	Unit	Condition of Services

1.0 VRV type Air-conditioning Units:

1.1 General:
Manufacturer
Overall Dimensions (mm)
Weight (Kg)

1.2 Compressor:
Refrigerant
No. of Cylinders
Bore of Stroke
Swept Volume (mm)
Speed (R.P.M.)
Capacity K. Cal/Hr at
7°C Sat. Suction Temp. and 43.3°C Cond. Temp.

1.3 Cooling Coil:
Refrig. Temp. (^{O}C)
Type of Tube
Tube Material
Tube Dia (mm)

1.4 Condenser:
Cond. Temp. (^{O}C)
Type of Tube
Tube Material

Tube Dia (mm)

1.5 TFA:

Unit No.

Manufacturer

Type-Horizontal/Vertical/ Ceiling Suspended

Air Quantity	m^3/Hr
Fan Outlet Velocity	M/S
No. of Fans	Nos.
Dia. of Fans	mm
Fan Speed	RPM

S.No.	Description	Unit	Condition of Services
	Total Static Pressure	MM WG/	
	Balancing-Static and/or Dynamic		
	Operating Weight	Kg.	
	Overall Dimension	m	
	Dimension of Coil	m	
	Finned Area	m^2	
	No. of Rows	No.	
	Fins per cm	No.	
	Type of Fins		
	No. of Circuits	Nos.	
	Water Velocity in Tubes	M/S	
	Tube Material		
	Tube Dia	mm	
	Thickness of Tubes	mm	
	Fin Material		
	Water Pressure Drop	m	
	Motor Output	HP/KW	
	Type of Motor		
	Type of Air Filters		
	Velocity Across Filters	M/	
2.0	**Ventilation Fans:**		
2.1	S. No.		
2.2	Type		
2.3	Manufacturer		
2.4	CFM		
2.5	Static Pressure MM WG		
2.6	Motor H.P.		

S.No.	Description	Unit	Condition of Services
2.7	Insulation Class		
2.8	Outlet Vel. FPM		
2.9	R.P.M		
2.10	Type of Drive		
2.11	Noise Level DB		
3.0	**Grilles/Diffusers/Dampers:**	**Make, Materials and Gauge**	
3.1	Fire Dampers - UL Listed		
3.2	Grilles		
3.3	Louvers		
3.4	Diffusers		
3.5	Duct Dampers		
4.0	**Insulations:**		
4.1	Manufacturer		
4.2	Duct Acoustic Lining Materials		
4.3	Duct Insulation Material		
4.4	Thermal Conductivity		
4.5	Duct Insulation		
5.0	**SCRUBBERS:**		
5.1	Make		
5.2	Size of Equipment		
5.3	Air Quantity (CFM)		
5.4	Fan Size		
5.5	Static Pressure (mm WG)		
5.6	Motor (KW)		
5.7	Pump (Nos x KW)		
5.8	Make-up water quantity LPH		

S.No.	Description	Unit	Condition of Services
5.9	Size of Air Cooling Pad		
5.10	Depth of Pad		
5.11	manufacturer cutsheets with performance data		
5.12	Operating Weight (kg)		
5.13	manufacturer cutsheets with performance data		

M. MODE OF MEASUREMENTS

1.0 UNIT PRICES IN THE SCHEDULE OF QUANTITIES:

1.1 The item description in the Schedule of Quantities is in the form of a condensed resume. The unit price shall be held to include every thing necessary to complete the work covered by this item in accordance with the specifications and drawings. The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.

1.2 The Unit Price of the Various Items shall include the following:

1.2.1 All equipment, machinery, apparatus and materials required as well as the cost of any tests which the Design Consultant may request in addition to the tests generally required to prove quality and performance of equipment.

1.2.2 All the labour required to supply and install the complete installation in accordance with the specifications.

1.2.3 Use of any tools, equipment, machinery, lifting tackle, scaffolding, ladders etc. required by the contractor to carry out his work.

1.2.4 All the necessary measures to prevent the transmission of vibration.

1.2.5 The necessary material to isolate equipment foundations from the building structure, wherever necessary.

1.2.6 Storage and insurance of all equipment apparatus and materials.

1.3 The Contractor's unit price shall include all equipment, apparatus, material and labour indicated in the drawings and/or specifications in conjunction with the item in question, as well as all additional equipment, apparatus, material and labour usual and necessary to make in question on its own (and within the system as a whole) complete even though not specifically shown, described or otherwise referred to.

2.0 MEASUREMENTS OF SHEET METAL DUCTS, GRILLES/DIFFUSERS ETC.

2.1 Sheet Metal Ducts:

a) All duct measurements shall be taken as per actual outer duct surface area including bends, tees, reducers, collars, vanes & other fittings. Gaskets, nuts, bolts, vibration isolation pads are included in the basic duct items of the BOQ.

b) The unit of measurements shall be the finished sheet metal surface area in meters squares. No extra shall be allowed for lapse and wastage.

c) All the guide vanes, deflectors in duct elbows, branches, grille collars quadrant dampers etc. shall be measured for actual sheet metal surface and paid for at the same rate as duct of same thickness.

d) The unit duct price shall include all the duct hangers and supports and making, exposing of concrete reinforcement for supports and good of the same as well as any materials and labour required to complete the duct frame.

2.2 Grilles/Diffusers

All grilles/diffusers are as per tender requirements shall be tested as a lump sum item. Where extra grilles diffusers are ordered upto award of work, they should be measured as follows:

a) All measurements of grilles/diffusers shall be the actual outlet size excluding the outer flanges.

b) The square or rectangular grilles/diffusers shall be measured in plain m^2.

c) All round diffusers shall be measured by their diameters in cm.

e) All linear diffusers shall be measured as per actual length in metres.

3.0 MEASUREMENTS OF PIPING, FITTINGS, VALVES, FABRICATED ITEMS:

3.1 Pipes:

Including water piping, steam piping and all other piping required to be executed at site for completion of the work:

a) All pipes shall be measured in linear metre (to the nearest cm) along the axis of the pipes and rates shall be inclusive of all fittings and branches e.g. tees, bends, reducers, elbows etc. deduction shall be made for valves in the line.

b) Exposing reinforcement in wall and ceiling and floors of possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and Schedule of Quantities.

c) Rates quoted shall be inclusive of providing and fixing vibration pads and wooden pieces, wherever specified or required by Project Coordinator.

d) Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.

e) The length of the pipe for the purpose of payment will be taken through the centerline of the pipe and all fittings (e.g. tees, bends, reducers, elbows, etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges.

3.2 Structural Supports

Structural supports including supports fabricated from pipe lengths for pipes shall be measured as part of pipe line and hence no separate payment will be made. Rates shall be inclusive of hoisting, cutting, jointing, welding, cutting of holes and chases in walls, slabs or floors, painting supports and other items as described in specifications, drawings and schedule of quantities or as required at site by Project Coordinator.

4.0 INSULATION

4.1 The measurement for piping and ducts shall be made over the bare un-insulated surface area of the metal.

4.2 Duct:

Measurements for insulation of ducts shall be made in actual net square metres of bare un-insulated duct surface through all dampers, flanges and fittings. In case of bends the area shall be worked out by taking an average of inner and outer lengths of the bends. Measurements for the dampers, flanges, fittings shall be for the surface dimension for the connecting duct, nothing extra over the above shall be payable for insulation over dampers, flanges and fittings in duct routing.

4.3 Accessories Insulation

4.3.1 In case of curved or irregular surfaces, measurements shall be taken along the curves.

4.3.3 The unit insulation price shall include all necessary adhesives, vapour proofing and finishing materials as well as additional labour and material required for fixing the insulation.

4.4 Acoustic Duct Lining

4.4.1 In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square metres shall be final for billing purposes.

4.4.2 The insulation/acoustic panels shall include cost of battens, supports, adhesives, vapour proofing, finished tiles/boards/sheets as well as additional labour and materials required for completing the work.

Sl No.	Item	Approved Make
	HVAC WORK	
1	Air handling Units /treated fresh air units/ Cabinet Fans / Scrubber	Zeco/ Edgetech/ Systemair/ Citizen/Nutech
2	Al. Sheets	Hindalco/ Balco/ Nalco
3	Adhesive	Pidilite
4	Anchor/Fastener	Hilti/Fisher/ Rawl Plug
5	Bus bar	Jindal/ Indalco/ Century
6	Centrifugal Fans for ventilation/ AHUs/ Air washer/ Scrubber	Kruger/ Nicotra/ Comefri/ Green heck
7	Closed Cell Nitrile rubber insulation	Armacell / K- Flex/ A-Flex
8	Contactors	ABB/ Schneider/ Siemens
9	Duct Support	Hilti/ Kanwal
10	Air Filters	Spectrum/ AAF/ Camfil/ Thermadyne
11	G.I. Pipes	Sail/ Tata/ Jindal
12	G.I. Sheets	Sail/ Tata/ Jindal
13	Grills/ Diffusers/ Dampers/ Louvers	Systemair/ Ruskin Titus/ Brightflow/ Caryaire/ Tristar
14	GSS Factory Fabricated Ducts/ Duct Flanges	Rolastar/ Zeco/ Ductofab
15	Inline Fans	Kruger/ Green heck/ Maico/ Caryaire/ Systemair
16	M.S. Sheets	Sail/ Tata/ Jindal
17	Motors	ABB/ Siemens/ CGL/ BBL
18	MPCB/ MCB/ MCCB	ABB/ Schneider/ Siemens
19	Propeller Fans	Kruger/ Green heck/ Maico/ Caryaire

20	Puff pipe support	Malanpur/ lloyd/ Beardsell
21	PVC Eliminators	Munterz/ BKB extrusions
22	PVC Pipes	Finolex/ Prince/ Supreme/ KML Classic
23	Refrigerant Piping	Tot Line/Mehta Tube/Mandev/Rajco
24	Spiral Round/ Oval ducts	GP Spira/ Dustech/ Ductofab
25	Split AC	Carrier/ Daikin/ Hitachi/ Mitsubishi/ Voltas
26	Weathercoat Protective Coating	Pidilite
27	Starters	L&T/ ABB/ Siemens/ Allen Bradley
28	Axial flow Fans	Kruger/ Green heck/ Maico/ Nicotra
29	Variable frequency drive	ABB/ ALLEN BRADLEY/ DANFOSS/ Siemens
30	VAV Boxes	Systemair/ Ruskin Titus/ Honeywell
31	PPGL sheets for Ducts	JSW/ Shreya Polymers/ Malur Tube/ HV metal Arc
32	PPGL Ducts Manufacturer	Corrosion Control equipment/ Sagar Plastic/ Ppi projects/ Citizen
33	Plug Fans	Ziehlabegg/ Feudenberg/ EVM
34	FRP Material	Reichhold/ Equivalent
35	VRV AC System	Daikin/ Toshiba/ Mitsubishi/ Samsung

Note:-All other electrical items for which makes are not given in this list of makes, consider from electrical list of makes

V) PLUMBING WORKS

TECHNICAL SPECIFICATIONS

SECTION - I SANITARY FIXTURES

1. SCOPE OF WORK

1.1 The work in general shall be carried out as per CPWD Specifications- 2009 Volume-I to II with up to date correction slips.

1.2 The rules and regulations of_Local Authority Having Jurisdiction, and as per the statutory regulations applicable.

1.3 The codes of the Uniform Plumbing Code of India and relevant British Standards shall be used as a general guide for good engineering practice, design and workmanship norms.

1.4 Work under this section shall consist of furnishing all Material and labour as necessary and required to completely install all Sanitary Fixtures, brass and chromium plated fittings and accessories as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.5 Without restricting to the generally of the foregoing the Sanitary Fixtures shall include all Sanitary Fixtures, C.P. fittings and Accessories etc. necessary and required for the Building.

1.6 Whether specifically mentioned or not all Fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

2. GENERAL REQUIREMENTS

2.1 All Fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, Specifications and Drawings.

2.2 All Fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per Architectural/ Interior designer's requirements. Wherever necessary the fittings shall be centered to dimensions and pattern desired.

2.3 Fixing screws shall be half round head Chromium Plated brass with C.P. washers wherever required as per directions of Engineer-in-Charge / Owner.

2.4 All Fittings and Fixtures shall be fixed in a neat workmanlike manner true to Levels and Heights shown on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all Inlet and Outlet Pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, tiling or terrace shall be made good at Contractors cost.

2.5 When directed, Contractor shall install Fixtures and accessories in a mock-up room for the approval of the Engineer-in-Charge/Owner. Sample room Fixtures may be reused on the works if undamaged, but no additional payment for fixing or dismantling shall be admissible.

3. EUROPEAN W.C.

3.1 European W.C. shall be wash down, single or double siphonic type, wall mounted set, flushed by means of exposed or concealed type flushing cistern, as specified in Schedule of Quantities. Flush pipe/bend shall be connected to the W.C. by means of suitable rubber adapter. Wall hung W.C. shall be supported by C.I. floor mounted chair/bolts as per approval.

3.2 Each W.C. seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C.

4. URINALS

4.1 Urinals shall be white glazed Vitreous China flat back half stall or lip type as specified in Schedule of Quantities.

4.2 Half stall Urinals shall be provided with 15 mm dia C.P. spreader, 32 mm dia C.P. domical waste and C.P. cast brass bottle trap with pipe and wall flange, and shall be fixed to wall by one C.I. bracket and two C.I. wall clips as recommended by manufacturers complete and as directed by Engineer-in-Charge/Owner.

4.3 Half stall urinals shall be fixed with C.P. Brass screws and shall be provided with 32 mm dia Domical Waste leading to Urinal trap.

4.4 Urinals shall be flushed by means of automatically sensor operated flushing system as specified in Schedule of Quantities.

5. SINKS

5.1 Sinks shall be of precast Terrazzo marble or White Glazed fire clay or vitreous china or stainless steel or any other material as specified in the Schedule of Quantities.

5.2 Each sink shall be provided with R.S. or C.I. brackets and clips and securely fixed. Counter top sinks shall be fixed with suitable angle iron clips or brackets as recommended by the manufacturer. Fixing shall be done as directed by Engineer-in-Charge / Owner.

6.0 WASH BASIN

6.1 Wash Basins shall be white glazed vitreous chinaware of size, shape and type as specified in the Schedule of Quantities.

6.2 Each Basin shall be provided with R.S. or C.I. brackets duly painted. The clips and the basin securely fixed to wall and have accessories as mentioned in the Schedule of Quantities.

7. ACCESSORIES

7.1 Contractor shall install all Chromium Plated and porcelain accessories as shown on the drawings or directed by Engineer-in-Charge / Owner, and given in the Schedule of Quantities.

7.2 All C.P. Accessories shall be fixed with C.P. brass half round head screws and cup washers in wall with raw plugs or nylon sleeves and shall include cutting and making good as required or directed by Engineer-in-Charge/Owner.

7.3 Porcelain accessories shall be fixed in walls and set in cement mortar 1:2 (1 cement: 2 coarse sand) and fixed in relation to the tiling work.

8. URINAL PARTITIONS

8.1 Urinal partitions shall be white glazed vitreous china or 25mm thick marble of size specified in the Schedule of Quantities.

8.2 Porcelain partitions shall be fixed at proper heights with C.P. brass bolts, anchor fasteners and M.S. clips as recommended by the manufacturer and directed by Engineer-in-Charge / Owner.

9. EWC PAN CONNECTOR

The EWC pan connector shall be Flexible, soft and shall be made of single body construction with integral fins. The pan connector must be supplied with factory fitted spring loaded seal guard.

While fixing of the pan connector with the Soil pipe, the pipe must be reasonably clean and smooth on the inner surface; in case the soil piping is in C.I. then supplier supplied bush / adaptor shall be used. The connector socket is pushed fully home onto the pan spigot, thereafter the WC is placed in position gently pushing the fitment to ensure that the connector end fits into the Spigot of the pipe. The pan connector must be pushed in such a easy as to ensure that the seals and fins turn inward to ensure proper sealing.

10. MEASUREMENT

10.1 Rates for fixing of Sanitary Fixtures Accessories, urinal partitions shall include all items and operations stated in the respective specifications and Schedule of Quantities and nothing extra is payable.

10.2 Rates for all items under specifications above shall be inclusive of cutting holes and chases and making good the same, C.P. screws, nuts, bolts and any fixing arrangements required and recommended by Manufacturers, Testing and Commissioning.

10.3 Payment shall be made as per approved BOQ quantity and Rates.

END OF SECTION - I

SECTION - II SOIL, WASTE & VENT PIPES

1. **SCOPE OF WORK**

1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install all soil, waste, vent and rainwater pipes as required by the drawings, specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generally of the foregoing, the soil, waste, vent and rainwater pipes system shall include the followings:

a) Vertical and horizontal Soil, Waste and Vent Pipes, Rainwater Pipes and Fittings, Joints Clamps and connections to Fixtures.

b) Connection of pipes to Gully Traps & Manholes etc.

2. **GENERAL REQUIREMENTS**

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of Engineer-in-Charge / Owner.

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

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

2.4 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.5 Access doors for fittings and cleanouts shall be so located that they are easily accessible for repair and maintenance.

2.6 All works shall be executed as directed by Engineer-in-Charge / Owner.

3. **CAST IRON PIPES & FITTINGS (IS: 3989)**

3.1 **Pipes & Fittings**

All pipes & fittings shall be straight and smooth and inside free from irregular bore, blowholes, cracks and other manufacturing defects & shall conform to the specifications as per IS:3989 for Centrifugally Cast Spun Spigot & Socket soil, waste & ventilating pipes fittings & accessories, complete in all respects & as specified in the relevant item of the bill of quantities.

3.2 Other Fittings

a) Other casted CI Fittings used for drainage pipes shall conform to the required specifications & as per site conditions & wherever possible to the relevant IS code.

3.3 **Fixing**

- All vertical pipes shall be fixed by M.S. clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a Cowl (terminal guard).

- Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of special design shown on the drawings or as directed. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

- Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the building Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surface.

3.4 **Jointing**

CI pipes shall be jointed with synthetic sealing compounds (drip seal compound) of approved make.

The sealant shall be manufactured in two separate compounds of different colors "Black" and "White", and used for jointing of C.I. in place of lead joints, as per approval of the engineer-in-Charge / Owner. The sealant compound shall be of approved make and manufacturer.

The compound shall have high bonding strength and shall be non-toxic. The specified density shall be 1.95 grams / c.c. or as per approved manufacturer specifications.

The two separate compounds shall be mixed homogeneously from the supplied packets. In cold conditions both unmixed packets are to be heated in Sun or heated to room temperature (25^0 C) to make them more workable for mixing. The pipe joint is cleaned to make it free from dust, grease, oil, cement splashes and all other foreign matters and contaminants. The joint shall be made dry. Hemp yarn shall be provided in pipe joint as back filler. The mixed compound is to be forced into the lap of pipe joint with Caulking tool, MS Flat piece or by Hand.

Proper pressing of compound is necessary to avoid air entrapment. The joint is not to be disturbed till the compound is hardened.

The mixed compound shall not be kept without use for more than 30 to 40 minutes. The expiry date of the material shall also be checked before use and in case of expiry of material, the lot shall be rejected.

The compound shall be allowed to cure at room temperature with a setting time of 4 to 6 hours.

Consumption of mixed compound shall be as per the following table:

Diameter of pipe (mm)	Consumption per joint (grams)
50	130 to 150
80	150 to 170
100	200 to 250
150	250 to 300

To ensure proper quantity of compound used in to the joint, three samples shall be made and the quantum of compound per joint shall be approved by the Engineer-in-Charge / Owner. The actual consumption should be within ± 5% of the approved samples.

4. HDPE PIPES FOR LAB WASTE

4.1 Materials

4.1.1 All pipes and fittings to be HDPE System manufactured to DIN 19535, DIN 19537, DIN 8047, DIN 8045 fittings to carry a BBA certificate No. 92/2796.

4.1.2 All materials should be manufactured under a BS 5750 / ISO 9000 approved scheme & as per general description given by the approved manufacturer.

4.2 Installation

4.2.1 All pipes and fittings to be fusion welded by either electro sleeve coupling or butt weld, complete as given in relevant bill of quantities & as per manufacturer's instructions. A sample / mock-up shall be made for approval before execution of complete work.

4.2.2 Fixed points must be provided at a maximum of 5 meter intervals and / or changes in direction. Intermediate sliding supports must be provided in accordance with the application technique manual

4.2.3 All components of the system to be installed in accordance with BS EN 12056 Part 2: Gravity drainage systems inside buildings.

4.2.4 All operatives to be trained in welding and jointing techniques by the manufacturer's representative.

4.3 Inspection & Testing

4.3.1 The work shall be inspected and tested during installation at agreed stages. All work which is concealed shall be tested before it is finally enclosed.

4.3.2 Work to be inspected regularly by the manufacturer who is to verify compliance with manufacturer's installation guidelines.

4.3.3 A final test shall be made upon completion for soundness and performance in accordance with BS EN 12056 Code of Practice for Sanitary Pipework.

5. UPVC PIPES (I.S. 4985) FOR RAIN WATER

5.1 4/6/10 kg/cm2 Class selection shall be as per Bill of Quantities.

All fittings for uPVC pipes up to 200 mm O.D. size shall be injections moulded as per manufacturer, confirming to IS: 4985 and as specified in bill of quantities.

5.2 For Fittings of sizes which are not injection moulded but fabricated (Locally/ Imported) sample of the same shall be submitted for approval.

6. CLAMPS / STRUCTURAL SUPPORTS

6.1 G.I. clamps shall be of standard design and fabricated from M.S. flat 40x3mm thick with required Galvanization.

6.2 Where G.I. clamps are to be fixed on RCC columns or slotted angles, walls or beam they shall be fixed with 40x3mm flat iron "U" type clamps with anchor fasteners of approved design or 6mm nuts and bolts.

6.3 Structural clamps shall be fabricated from G.I. (Galvanized) Structural members e.g. rods, angles, channels flats as per detailed drawing or as directed. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of black Enamel paint. Wooden saddles, where required shall be provided free of cost.

6.4 Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in Schedule of Quantities, angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.

6.5 Wherever G.I. clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20mm nominal size) as directed by the Engineer-in-Charge / Owner.

7. TRAPS

7.1 Floor traps shall be of CI, deep seal with an effective seal of 50 mm as given in bill of quantities. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30x30 cm of the required depth. Where traps are suspended below ceilings, they shall be provided with proper structural supporting arrangements. For Lab area HDPE Multi trap 110 mm inlet and 75 mm outlet shall be used.

7.2 **Urinal Traps**

Urinal traps shall be of uPVC deep seal traps or as given in bill of quantities with or without Vent and set in cement concrete block specified in Para above without extra charge.

7.3 **Floor Trap Inlet**

Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, Contractor shall provide a special type uPVC inlet hopper without or with one, two or three inlet sockets to receive the waste pipe. Hopper shall be connected to trap with at least 50 mm seal (Hopper and traps shall be paid for separately).

7.4 **C.P./Stainless Steel Gratings**

Floor and Urinal Traps shall be provided with 100-150 mm square or round C.P/Stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4-5 mm or as specified in the Schedule of Quantities.

8. **CLEANOUT PLUGS**

Contractor shall provide brass cleanout plugs as required. Cleanout plugs shall be threaded and provided with key holes for opening. Cleanout plugs shall be fixed to the pipe by a male threaded adaptor.

9. **WASTE PIPE FROM APPLIANCES**

9.1 Waste pipe from appliances e.g. wash basins, sinks, urinals, water coolers shall be of uPVC as given in the Schedule of Quantities or as shown on the drawings.

9.2 All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps at approved spacing.

10. **CEMENT CONCRETE**

Soil and Waste pipes under floors in sunken slabs and in wall chases (When cut specially for the pipe) shall be encased in cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm size) 75 mm in bed and alround. When pipes are running well above the structural slab, the encased pipes shall be supported with suitable cement concrete pillars of required height and size at intervals as directed by Engineer-in-Charge/Owner.

11. **CUTTING AND MAKING GOOD**

Pipes shall be fixed and tested as buildings proceeds. Contractor shall provide all necessary holes cutouts and chases in structural members as building work proceeds. Wherever holes are cut or left originally, they shall be made good with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) or cement mortar 1:2 (1 cement: 2 coarse sand) and the surface restored as in original condition.

12. INSPECTION & TESTING

12.1 Inspection

Work should be inspected during installation and tests applied on completion, care being taken that, all work which is to be encased for concealed is tested before it is finally enclosed.

Inspection should be carried out to ensure the following:

(a) Work accords with the drawing and specifications.

(b) All pipe brackets, clips etc. are securely fixed.

(c) Fixtures are correctly spaced.

(d) Pipe is protected where necessary by Thermal Insulation.

(e) Embedded pipe work is properly protected before sealing-in

(f) All access covers, caps or plugs.

- Are accessible
- Are so made that the internal faces truly complete in internal bore.
- Cause no obstruction in the pipe bore
- Are well joined.

12.2 Testing

The soil, waste piping system and rain water should be tested after installation as follows:

(a) **Water Test**

The pipes shall be tested after installation & before the appliances are connected, preferably in sections so as to limit the static head of 4.5m. The pipe shall be filled with water for at least 10 minutes. After filling, pipes shall be struck with a hammer and inspected for blow holes and cracks. Then it will be necessary to seal all openings and leaks at joints immediately as observed during the test and all defective pipes shall be rejected and removed from the site. Pipes with minor sweating shall be accepted at the discretion of the Engineer-in-Charge/Owner.

(b) **Smoke Test**

Alternatively, the Contractor may test all Soil, Waste and Rainwater stacks by smoke testing machine. The smoke test shall be carried out as under:

Smoke shall be pumped into the stack after plugging all inlets and connections at the lowest points from a smoke testing machine which consists of a bellow & burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detected by sight as well as by smell, if there is leak at any points of the pipe. The top end shall however be left open. The stack shall then be observed for leakiness and all defective pipes and fittings removed or repaired as directed by the Engineer-in-Charge / Owner.

12.3 A test register shall be maintained and all entries shall be signed and dated by Contractors and Engineer-in-Charge/Owner.

13. MEASUREMENTS

13.1 General

(a) Rates for all items quoted shall be inclusive of all work and items given in the above mentioned specifications and Schedule of Quantities and applicable for the work under floor, in shafts or at ceiling level at all heights and depths.

(b) All rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same.

(c) All rates are inclusive of pre testing and on site testing of the installations, materials and commissioning.

13.2 **Pipes** (Unit of measurement)

HDPE, uPVC & all pipes shall be measured per running meter correct to a centimeter for the finished work, which shall include fittings e.g. Bends, Tees, Elbows, Reducers, Crosses, Sockets, Nipples and Nuts but exclude brass or Gunmetal Taps (Cocks), Valves lead connection pipes and shower rose. The length shall be taken along center line of the pipes and fittings. All pipes and fittings shall be classified according to their diameter, method of jointing and fixing substance, quality and finish. The diameter shall be nominal diameter of internal bore. The pipes shall be described as including all cutting and waste. In case of fittings of unequal bore, the largest bore shall be measured.

13.3 Cement concrete around pipes shall be measured along the center of the pipe line measured per linear meter and include any Masonry Supports, Shuttering and Centering Cutting complete as described in the relevant specifications.

13.4 Slotted angles/channels shall be measured per linear metre of finished length and shall include support bolts and nuts embedded in masonry walls with cement concrete blocks and nothing extra will be paid for making good the same.

13.5 **Structural Clamps/Supports:** Individual MS holder bat clamps & fixing arrangements will not be paid extra & will be a part of fixing the pipes.

In case of main supporting structure for vertical & horizontal pipes, where number of pipes are clamped, as per approved shop drawings, then the structural supports shall be paid extra.

Structural supports consisting of structural steel members / fabricated and U clamps shall be paid extra for by weight per kg. Rates shall be inclusive of all nuts, bolts, dash fasteners, drilling, cutting, welding. Weight of clamps shall be calculated from the actual length used in structural members multiplied by its theoretical weight given in manufacturers catalogues. Weight of nuts, bolts, shall not be taken into account.

13.6 **Excavation for soil pipes**: No extra payment shall be admissible with respect to excavation, refilling and disposal of surplus earth for Soil and Waste Pipes.

13.7 Payment shall be made as per approved BOQ quantity and Rates.

END OF SECTION – II

SECTION – III WATER SUPPLY SYSTEM

1. SCOPE OF WORK

1.1 Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following:-

a) All water lines to different parts of building and making connection from source etc.
b) Pipe protection and painting.
c) Providing Hot water supply lines and insulation of hot water pipe lines.
d) Control valves, masonry chambers and other appurtenances.
e) Connections to all toilets, kitchen equipments, storage tanks and appliances.
f) Excavation and refilling of pipe trenches, wherever required.
g) Trenches for taking pipe lines for these services.

2. GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Engineer-in-Charge / Owner.

2.2 Pipes and Fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Short or Long bends shall be used on all main pipe lines as far as possible. Use of Elbows shall be restricted for short connections. As far as possible all Bends shall be formed by means of a hydraulic pipe bending machine for pipes up to 65mm dia.

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

2.5 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.6 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

3. G.I. PIPES & FITTINGS

3.1 All pipes inside the buildings and where specified, outside the building shall be galvanized steel tubes conforming to I.S. 1239-1979 of class specified.

3.2 Fittings shall be malleable iron galvanized fittings, of approved make. All fittings shall have manufacturer's trade mark stamped on it. Fittings for G.I. pipes shall include Couplings, Bends, Tees, Reducers, Nipples, Unions, Bushes, Fittings shall be of I.S:1879 - (part I to X) 1975.

3.3 Pipes and fittings shall be jointed with screwed fittings. Care shall be taken to remove burr from the end of the pipe after cutting by a round file. Genuine red lead with grummet and a few strands of fine hemp shall be applied. All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pockets. G.I. pipes inside toilets shall be fixed in wall chases well above the floor. No pipes shall be run inside a sunken floor as far as possible. Pipes may be run under the ceiling or floors and other as shown on drawings.

4. CPVC PIPES AND FITTINGS

4.1 Description

CPVC piping shall be Fire Proof, Corrosion resistance with smooth, friction free interior surfaces and with anti - bacterial growth properties.

4.2 JOINING TUBING & FITTINGS

(a) **Cutting**
CPVC tubing shall be cut with a wheel-type plastic tubing cutter, a hack saw or other fine toothed hand or power saws. Use of ratchet cutters shall be permitted, provided blades are sharpened regularly. A milter box should be used to ensure a square cut when using a saw.

(b) **Deburring/Beveling**
Burrs and fillings can prevent proper contact between tube and fitting during assembly, and should be removed from the outside and inside of the tubing. A chamfering tool shall be used for this purpose. A slight bevel on the end of the tubing shall be provided to enable entry of the tubing into the fitting socket and minimize the chances of pushing solvent cement to the bottom of the joint.

(c) **Fitting Preparation**
The surfaces shall be wiped clean of dirt and moisture from the fitting sockets and tubing end. Check the dry fit of the tubing and fitting. The tubing should make contact with the socket wall 1/3 to 2/3 of the way into the fitting socket.

(d) **Solvent Cement Application**
Only approved type Solvent Cement shall used for jointing the CPVC pipes, which shall be procured as per the manufacturer recommendations. Apply an even coat of Cement Solvent on the Pipe end after cleaning of whole pipe and also inside the fittings socket. Old or deteriorated or thickened or Lumpy Solvent Cement shall not be used.

(e) **Assembly**
Immediately insert the pipe into fitting socket, rotate the pipe ¼ to ½ turn while inserting. This motion ensures an even distribution of cement within the joint. Properly align the fitting. Hold the assembly for approximately 10 seconds, allowing the joint to set-up. An even bead of cement should be evident around the socket edge, it may indicate that sufficient cement was applied. In this case, remake the joint to avoid potential leaks. Wipe excess cement from the tubing and fitting surfaces for an attractive, professional appearance.

(f) **Rating & Dimensional Details of CPVC Pipes SDR 11**

Nominal Pipe Size		Average Outside Diameter		Wall Thickness		Pressure Rating	
inch	mm	inch	mm	inch	mm	73.4° F psi	23° C kg/cm²
½	12.70	0.625	(15.9)	0.068	(1.73)	400	28
¾	19.05	0.875	(22.2)	0.080	(2.03)	400	28
1	25.40	1.125	(28.6)	0.102	(2.59)	400	28
1 ¼	31.75	1.375	(34.9)	0.125	(3.18)	400	28
1 ½	38.10	1.625	(41.3)	0.148	(3.76)	400	28
2	50.80	2.215	(54.0)	0.193	(4.90)	400	28

5. **STAINLESS STEEL PIPES for Drinking water system**

The SS pipe for drinking water purposes shall be of grade SS-316 & conforming to EN 10312 standard compete with Press type fittings with SC-Contur in accordance with international regulation (DVGW - W534) & as per approved makes & specifications, complete as per the instructions of Engineer-in-charge & as specified in the bill of quantities.

6. **UPVC PIPES FOR GARDEN HYDRANT SYSTEM**

6.1 **Definition**

UPVC pipe means unplasticized Polyvinyl Chloride pipe, confirming to IS: 4985.
It has density of Approx. 1.43 g / Cm3 as such it is less than 1/6th the weight of C.I. and steel pipes, therefore easier to handle during installation and transportation.

6.2 The uPVC Pipes to be used for horticultural purpose, water to be odorless and hygienic, and should have inside surface mirror smooth.

6.3 The Pipes should have high corrosion resistance and should be immune to chemical electrolytic and galvanic action.

6.4 These Pipes should be longer lasting because of corrosion resistance property.

6.2 **Handling Guidelines**

Pipes should be kept on an even surface while storing. They should be properly supported and should not be stacked for heights more then 1.5 meters for longer duration.

6.3 **Jointing Instructions**

The uPVC Pipes are of two types i.e. Selfit and Ringfit. The following procedure may be adopted while jointing the Pipes: -

(a) **Selfit Pipes**

- Cut the Pipes as square as possible and ensure fitment of Pipes with socket of fitting is correct. Total length of insertion of sockets to be marked from the Pipe.

- The Pipe and the socket should be clean and dry. Dust, Oil, water, grease etc. should be wiped out with dry cloth or cleaner from the surfaces to be coated with Solvent Cement.

- Roughen the outside of Pipe and inside of Socket using sand Paper up to the entry mark. Stir adhesive i.e. Solvent Cement thoroughly.

- Apply thick coat of Solvent Cement using a flat clean brush evenly on the inside of the socket mouth for full length of insertion and then outside of the Pipe end up to the marked line.

- After application of Solvent Cement, insert the Pipe within one minute in to the Socket. Hold the Joint for few seconds and ensure that the Pipe does not come out of the fittings. Wipe off extra cement and allow it to dry for at least 24 Hours. The PVC Pipe with joint is ready for use.

Consumption of Solvent Cement

Diameter of Pipe (mm)	20	25	32	40	50	63	75	90	110	160	200	250	315	400
Approx. No: of joints which can be made per liter of Solvent cement	324	270	225	180	130	125	103	79	54	27	15	9	5	2

(b) **Ring-fit Pipes**

- Clean the inside of Socket. Remove all traces of mud, dirt, grease, gravel and also clean sealing ring.

- Form the EPDM ring into heart shape by pinching a portion of ring inside. Insert it into the socket and release to seat in to the groove.

- Mark the insertion depth on spigot portion of the pipe. Clean and apply lubricant to insertion depth before pushing in to the Socket. Ensure that no sand or dirt adheres to the lubricated surface of the Pipe.

- Push the Spigot into the Socket until it reaches the depth of entry mark, taking care not to over insert. This can be done manually. Make sure that the insertion of Spigot end inside the socket should be at correct angle. The Pipe and Joint are ready for use.
- In case of large diameter Pipes if crow bar does not give sufficient leverage, use of jointing jack may be helpful.

Precautions

1. uPVC Pipes and Fittings should not be cleaned by Solvent Cement.
2. For large diameter and Higher class Pipes (6 kgf/cm^2 & above), use heavy duty Solvent cement.
3. uPVC pipes and fittings to be used of same Brand and Manufacturer.

7. **CLAMPS**

G.I. pipes in shafts and other locations shall be supported by M.S. clamps of design approved by Engineer-in-Charge / Owner. Pipe in wall chases shall be anchored by iron hooks. Pipes at ceiling level shall be supported on structural clamps fabricated from M.S. structural as described in the sub section. Pipes in typical shafts shall be supported on Slotted Angles/Channels as specified elsewhere.

8. **UNIONS**

Contractor shall provide adequate number of unions on all pipes to enable dismantling later. Unions shall be provided near each Valve, Stop Cocks, or Check Valves and on straight runs as necessary at appropriate locations as required and/or directed by Engineer-in-Charge / Owner.

9. **FLANGES**

Flanged connections shall be provided on pipes where shown on the drawings, all equipment connections as necessary and required or as directed by Engineer-in-Charge / Owner. Connections shall be made by the correct number and size of the bolts and made with 3 mm thick insertion rubber washer. Where hot water or steam connections are made insertion gasket shall be of suitable high temperature grade and quality approved by Engineer-in-Charge / Owner. Bolt hole dia for flanges shall conform to match the specification for C.I. Sluice Valve to I.S. 780.

10. **TRENCHES**

The external water supply pipes belowground shall be laid in trenches. The width and depth of the trenches for the different diameters of the pipes shall be as follows:

Dia of Pipe	Width of Trench	Depth of Trench
15mm to 50mm	30 cms	60 cms
65mm to 100mm	45 cms	75 cms

At joints the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications for earthwork in trenches.

When excavation is done in rock, it shall be cut deep enough to permit the pipes to be laid on a cushion of sand minimum 7.5 cm deep.

11. **PAINTING**

11.1 All surfaces shall be thoroughly cleaned before painting.

11.2 All pipes above ground shall be painted with one coat of Red Lead and two coats of Synthetic Enamel paint of approved shade and quality. Pipes shall be painted to standard color code specified by Engineer-in-Charge/Owner.

11.3 All pipes in chases and below floor shall be provided Anti-corrosive treatment.

12. **PIPE PROTECTION**

Where specified in the Schedule of Quantities all pipes below ground shall be protected against corrosion by wrapping 100mm wide and 4mm thick layer of material of approved make over the pipe.

13 **BALL VALVES**

The Ball Valve shall be made from forged brass and tested to 20 Kg/cm² pressure. The valve shall be internally threaded to receive pipe connections. The Ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body bonnet gasket and gland packing shall be of Teflon. The handle shall be of chrome plated steel with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the Teflon packing shall be sealed to prevent water seeping upto 14 Kg / cm² pressure. The handle shall also be provided with a lug to keep the movement of the ball valve within 90 degree.

14. **BUTTERFLY VALVES**

- The Butterfly Valve shall be suitable for waterworks. The Valves conforming to IS : 13095 shall be provided. All valves shall be suitable to withstand the pressure in the system and rating shall be PN 1.6. All valves shall be right handed (i.e. handle or key shall be rotated clock wise to close the valve).

- The direction of opening and closing shall be marked and an open / shut indicator fitted.

- The material of valves shall be as under:-

  Body - Cast iron
  Disc - Ductile Iron
  Seat - EPDM/Nitrile rubber
  Shaft - Stainless Steel

- The Valve shall be fitted between two flanges on either side of pipe flanges. The Valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

- Joints for butterfly valves shall be made with suitable tail /socket pieces on the pipe line and flanged joints made with 3mm thick insertion rubber gasket with appropriate number of bolts, nuts and washers.

- Butterfly valves shall be provided on all branches as shown in the drawings or as specified.

15 **Non-Return Valve**

Non-return valves shall be of Cast Iron body and Stainless Steel seat. They shall conform to API-594 and have companion flanges. They shall be Dual Plate Type suitable for both horizontal and vertical installation. An arrow mark in the direction of flow shall be marked on the body of the valve.

16. **AIR RELEASE VALVES**

(a) Air release valves shall be single acting type air valves with cast iron body and bronze/gunmetal internal parts and plastic float.

(b) Each air release valve shall be provided with a cast iron isolating sluice valve of specification given above.

17 **Fittings and Inspection Chambers**

Fittings and chambers shall be provided as required.

17.1 **Anchor Block**

Suitable anchor blocks shall be provided at all bends and tees to encounter the excessive thrust developed due to water hammer.

17.2 **Rubber Joints**

Joints between two pipes shall be made by pre-moulded rubber joints with suitable tackles in a manner recommended & approved by the manufacturer. No joints shall be covered until the lines are hydraulically tested.

18. **VALVE CHAMBERS**

18.1 Contractor shall construct chambers for all full way valves, butterfly valves and other type of valves as specified in the Bill of Quantities. These shall be made, in brick masonry in cement mortar 1:4 (1 cement: 4 coarse sand) on cement concrete foundations 150mm thick 1:5:10 mix (1 cement: 5 coarse sand: 10 graded stone aggregate 40mm nominal size) 12 mm thick cement plaster 1:3(1 cement : 3 coarse sand) inside finished with a floating coat of neat cement with 8mm thick M.S surface box with hinged cover and locking arrangement, 150 mm thick reinforcement cement concrete top slab of 1:2:4 (1 cement : 2 coarse sand: 4 graded stone aggregate 20mm nominal size), as specified and shown in drawings, including excavation, back filling rammed complete or as specified in Bill of Quantities.

18.2 Valve chambers shall be constructed as specified in BOQ but generally shall be of following sizes:

	Length (mm)	Width (mm)	Depth (mm)
For pipes dia. Up to 80 mm	600	600	1000
For pipes dia. 80 mm and above	750	750	1000

19. **TESTING**

19.1 All pipes, fittings and valves shall be tested by hydrostatic pressure of min. 1.5 times, the working pressure and subject to minimum of 7 kg/cm^2 in any case and with the consent of Engineer-in-Charge / Owner.

Pressure shall be maintained for a period of at least two hours without appreciable drop in the pressure after fixing at site. (±10 %). A test register shall be maintained and all entries shall be signed and dated by Contractor(s) and Engineer.

19.2 In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakages, and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and Fixtures shall be made good during the defects liability period without any extra cost.

19.3 After completion of the water supply system, Contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

20. MEASUREMENT

(a) Pipes shall be measured per linear meter (to the nearest cm) and shall be inclusive of all fittings e.g. couplings, tees, bends, elbows, unions, deduction for valves shall be made, cutting holes chases and making good the same and all items mentioned in the specifications and Schedule of Quantities.

(b) Cast iron (C.I.) & brass valves shall be measured by numbers.

(c) Single flanges shall be measured by numbers (per single flange) and shall include bolts, nuts, washers and 3mm thick rubber gasket complete.

(d) Pair of flanges shall be measured by number of pairs and shall include bolts, nuts, washers, and 3 mm thick rubber gaskets complete.

(e) Painting for Pipes and over insulation shall be measured per linear metre over finished surface and shall include all valves and fittings for which no deduction shall be made.

21. DISINFECTION

21.1 After completion of the work Contractor shall flush clean the entire system with the city's filtered water after connection has been made.

21.2 After the first flushing, commercial bleaching powder is to be added to achieve a dosage of 2 to 3 mg/l of water in the system added and flushed. This operation should be performed twice to ensure that the system is fully disinfected and usable.

22. PRE COMMISSIONING

22.1 Ensure that all pipes are free from debris and obstructions.

22.2 Check all valves and fire hydrant for effective opening and closing action. Defects should be rectified or valves replaced.

22.3 Ensure that all Connections to Branches has been made.

22.4 Ensure that mains have been connected to the respective pumps, underground and overhead tanks.

22.5 Water supply should be available at main Underground tank.

22.6 All main line Valves should be closed.

23. COMMISSIONING

23.1 Fill Underground tank with water. Add 1kg fresh bleaching powder after making a solution to be added near inlet.

23.2 Start Water Supply Pump and allow water to fill main Underground tank. Water will first fill the fire tank and then overflow to the Raw Water tanks.

23.3 After filling Overhead Reservoir drain the same to its one forth capacity through tank scour valve. (This is to ensure removal of all mud, debris etc. from the tank).

23.4 Fill Overhead tank to full.

23.5 Release water in the main lines by opening Valves in each circuit. Drain out water in the system through scour valves or fire hydrant in lower regions. Ensure clean water is now coming out of the system.

23.6 Open valves for individual clusters. Observe for leakages or malfunctions, check pressure & flow at end of line by opening Hydrants etc. Remove and rectify defects noticed.

23.7 Check all outlet points for proper operation by opening each valve and allowing water to flow for a few minutes. Also check for effective closure of valve.

23.8 The entire water supply system should be disinfected with bleaching powder and system flush cleaned.

23.9 Send four samples of water drawn from four extreme locations for testing for bacteriological test in sterilized bottles obtained from the concerned laboratory. (Laboratory personal may collect the samples themselves).

24. RESPONSIBILITY

Responsibility for various activities in pre-commissioning and commissioning procedures will rest with the Contractor.

END OF SECTION – III

SECTION - IV SEWERAGE / DRAINAGE SYSTEM

1. SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all Labour, Materials, Equipments and Appliances necessary and required to completely finish Sewerage/Drainage system as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the sewerage system shall include:

- Installation of all sewer lines / effluent lines
- Installation of all storm water drainage lines
- Construction of all catch basins, chambers, manholes & other related civil works

2. GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of the Engineer-in-Charge / Owner.

2.2 Drainage lines shall be laid to the required gradients and profiles.

2.3 All drainage work shall be done in accordance with the local Municipal bye laws.

2.4 Location of all manholes, catch basins etc., shall be got confirmed by the Contractor from the Engineer-in-Charge / Owner before the actual execution of work at site.

2.5 All works shall be executed as directed by Engineer-in-Charge / Owner.

3. ALIGNMENT AND GRADE

The sewer pipes shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-Charge / Owner from time to time to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the Engineer-in-Charge / Owner.

4. HIGH DENSITY POLYTHENE PIPES FOR SEWERAGE LINE

4.1 HDPE(High density polythene black) pipes conforming IS: 14333, for Sewerage effluents with material grade PE-80 with working pressure 4 Kg / Cm2 or as specified in bill of Qty.

6.2 Laying and Jointing of HDPE Pipes

Laying and jointing of the pipes shall be done as specified in IS: 14333

While laying the pipe in trenches the bed of the trench should be level and free from sharp edged stones. While lying in rocky areas suitable bed of sand or gravel should be provided. The initial back fill about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete M-100, 15 cm shall be provided, before putting in the soft sand/gravel.

Jointing of two pipes shall be done through BUTT-Welding. The method of butt-welding shall be as below:

a) The ends of the pipes to be joined are cut vertically at right angles with a fine toothed saw and trimmed with a file to make both ends smooth so that the pipes when pressed together are without leaving any gap.
b) Both the inside and outside surfaces of the ends of the pipes are scraped (up to about ½" from the end) with a sharp scraper to remove the thin oxidized layer.
c) It is necessary to see that there are no extraneous particles of dust, mud, grease, polyethylene powder etc. at the joining portion of the pipes.

An electrical HEAT MIRROR (Hot Plate) is used for heating the ends of the pipes. The pipes are pressed flush against the flat surface of the Heat Mirror, one on each side horizontally, and held in that position under slight pressure. The Heat Mirror is maintained at a steady temperature of 200 deg C. with the help of THERMOSTAT. After a while, a slight rim is formed at the ends of the pipes both inside and outside. When a rim of about 1/10" to 1/8" is formed, the pipes are pulled apart and the Heat Mirror is quickly withdrawn. Then the two ends of the pipes are brought together face to face so that the molten portions come into contact with each other. Then the pipes are drawn back very slightly (without separating the joined molten portion) and then again the pipes are pressed together with a moderate pressure of about (1 to 1.5 kg/cm sq). This ensures that any air bubbles are squeezed out. The pipes are held in that position until the pipe-joint cools off naturally in atmospheric air. When a perfect joint is made, the rims cohere in such a way that there is only a very fine slight depression between the two rims. If the top surface of the rim is too flat, it will be because the pipe is overheated. If there is too much of depression (groove) between the rims, the pipe is under-heated. The rims should not be cut off or erased from the joints. Also, correct alignment of the pipes will help in joining the pipes perfectly, as otherwise there will be reduction in the area of the joining surface rendering the joint weak and imperfect.

5. GULLY TRAPS

5.1 Gully traps shall be of the same quality as described for stoneware pipes in Clause 4.

5.2 Gully traps shall be fixed in cement concrete 1:5:10 mix (1 cement: 5 coarse sand: 10 stone aggregate 40mm nominal size) and a brick masonry chamber 45x45 cms inside in cement mortar 1:3 with 15 x 15 cms grating inside and 45x45 cms C.I. sealed cover and frame weighting not less than 14 kg to be constructed as per standard drawing. Where necessary, sealed cover shall be replaced with C.I. grating of the same size.

6. REINFORCED CEMENT CONCRETE PIPES FOR STORM WATER SYSTEM

6.1 All underground storm water drainage pipes and sewer lines where specified (other than those specified cast iron) shall be centrifugally spun RCC pipes of specified class. Pipes shall be true and straight with uniform bore. Throughout cracked, warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the Contractor shall produce, when directed a certificate to that effect from the manufacturer.

6.2 **Laying**

R.C.C. spun pipes shall be paid on cement concrete bed or cradles as specified and shown on the detailed drawings the cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12mm below the invert level of the pipe properly placed on the soil to prevent any disturbance. The pipe shall than be placed on the bed concrete or cradles and set for the line and gradient by means of sight rails and bonding rods etc. cradles or concrete bed may be omitted, if directed by the Engineer-in-Charge / Owner.

6.3 **Jointing**

After setting out the pipes the collars shall be centered over the joint and filled in with tarred gaskin, so that sufficient space is left on either side of the collar to receive the mortar. The space shall then be filled with cement mortar 1:2 (1 cement: 2 fine sand) and caulked by means of proper tools all joints shall be finished at an angle of 45 degree to the longitudinal axis of the pipe on both side of the collars neatly.

7. TESTING

All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole. All pipes shall be subjected to a test pressure of at least 1.5 meter head of water. The test pressure shall, however, not exceed 1.5 meter head at any point. The pipes shall be plugged preferably with standard design rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head. The tolerance figure of two liters per centimeter of dia per kilometer may be allowed during a period of ten minutes. Subsidence of the test water may be due to one or more of the following causes:

- Absorption by pipes and joints
- Sweating of pipe or joints
- Leakage at joints or from defective pipes

(a) Trapped Air

Allowance shall be made for (i) by adding water until absorption has ceased after which the test proper should commence. Any leakage will be visible and the defective part of the work should be cut out and made good. A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joint shall be watched for and taken as indicating a defect to be made good.

(b) Sewer and Drain Pipelines shall be tested for straightness by:

- Inserting a smooth ball 12mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball should roll down the invent of the pipe and emerge at the lower end.

- Means of a mirror at one end and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction of deviation will be apparent.

(c) The Contractor shall give a smoke test to the drains and sewer at his own expense and charges, if directed by the Engineer-in-Charge / Owner.

(d) A test register shall be maintained which shall be signed and dated by Contractor, Engineer-in-Charge / Owner and representative of Architects/ Consultants.

8. CEMENT CONCRETE AND MASONRY WORKS FOR MANHOLES AND CHAMBERS ETC.

8.1 Materials

(a) **Water**

Acidity , Alkalinity and percentage of Solids shall be in accordance with IS: 3025. The Ph value shall generally be not less than 6. In general potable water is considered satisfactory for use.

Sea water shall not be used.

Testing shall be done individually for different source points before the start of the work and there after once in every three months.

(b) **Aggregate for Concrete**

It shall be strong, durable and free from adherent coatings, sea shell, organic impurities, disintegrated pieces.

If dirty, shall be washed with water before actual use. Flaky and elongated piece shall be avoided. It shall confirm to IS: 383 and IS: 2386.

(c) **Sand**

It shall be hard, durable, chemically inert, clean and free from adherent coatings, organic matter etc. and shall not contain any appreciable amount of clay bald harmful impurities and shall confirm IS: 23l or pellets an86. It shall not contain more than 8 % of silt as per the field test.

Grading for masonry, plaster and concrete shall be as per IS: 2116, IS: 1542, IS: 383 respectively, Sea sand shall not be used.

Testing for bulkage to be done and allowance be made at the time of use.

(d) **Cement**

The cement used for all the constructional purposes shall be Portland pozzolana cement confirming to I.S. 1489 OR rapid hardening, Portland cement conforming to I.S. 269.

Different types of Cement shall not be mixed together, shall be stacked and stored separately. Cement Bags shall be stacked in a manner to facilitate their removal and use in the order in which they are received.
The site where it is stored shall be dry, leak proof and as far as possible moisture proof.

Necessary precautions to be taken to avoid dampness through floor and walls. Stacking shall not be more than 10 bags high.

(e) **Mild Steel Reinforcement**

The mild steel for the reinforcement bars shall be in the form of round/ twisted/deformed bars conforming to all requirements of I.S. 432 (Grade I).

(f) **Bricks**

Brick shall have uniform color, thoroughly burnt, smooth rectangular faces, with parallel slab, sharp and right angled edges, but not over-burnt.

When struck should give clear ringing sound.

The maximum permissible area of perceptible deposit of efflorescence shall be 50% of the surface area of the Bricks. The affected bricks should not be more than 80% of the lot. There shall be no powdering or flaking of the surface.

The average water absorption shall not exceed 22% by weight after 24 hours immersion in water.

The average minimum compressive strength for bricks of class designation 75 shall not be less than 75 kg / cm2.

(g) **Other Materials**

Other materials not fully specified in these specifications and which may be required in the work shall conform to the latest I.S. All such materials shall be approved by the Engineer-in-Charge / Owner before use.

8.2 **Cement Concrete (Plain or Reinforced)**

(a) Cement concrete pipes bedding, cradles, foundations and RCC slabs for all works shall be mixed by a Mechanical mixer where quantities of the concrete poured at one time permit. Hand mixing on properly constructed platforms may be allowed for small quantities by the Engineer-in-Charge / Owner. Rate for cement concrete shall be inclusive of all shuttering and centering at all depth and heights.

(b) Concrete work shall be of such thickness and mix as given in the Schedule of Quantities.

(c) All concrete work shall be cured for a period of at least 7 days. Such work shall be kept moist by means of gunny Bags at all times. All pipe trenches and foundations shall be kept dry during the curing period.

10.3 **Masonry Work**

Masonry work for manholes, chambers, brick masonry pipe trench and such other works as required shall be constructed from 1st class bricks as specified in the Schedule of Quantities in cement mortar 1:4 mix (1 cement: 4 coarse sand). All joints shall be properly raked to receive plaster.

8.4 **Cement Concrete for Pipe Support**

(a) Wherever specified or shown on the drawings, all pipes shall be supported in concrete bed all round or in haunches. The thickness and mix of the concrete shall be given in the Schedule of Quantities. Type of the bedding is as described as follows:

(b) Unless otherwise directed by the Engineer-in-Charge / Owner cement concrete for bed, all round or in haunches shall be laid as follows:-

Description	Upto 3 M depth
Pipes in open ground (No sub soil water)	All round (1:5:10)
Pipes (all) in sub soil water condition	All round (1:3:6)
Pipes under the building or at road crossing or under public places	All round (1:2:4)

(1=1 =1 cement, 2-3-5 coarse sand, 4-6-10) stone aggregate 20 / 40mm nominal size)

(c) R.C.C. pipes or C.I. pipes ,may be supported on brick masonry or precast R.C.C or Cast insitu cradles. Cradles shall be as shown on the drawings.

(d) Pipes in loose soil or above ground shall be supported on brick or RCC anchor blocks as shown on the drawings.

9. **MANHOLES AND CHAMBERS**

9.1 All manholes, chambers and other such works as specified shall be constructed in brick masonry in cement mortar 1:4 (1 cement: 4 coarse sand) or as specified in the Schedule of Quantities.

9.2 All Manholes, Chambers, etc., shall be supported on base of cement concrete of such thickness and mix as given in the Schedule of Quantities or shown on the drawings.

Where not specified, Manholes may be constructed as follows:-

(All dimensions internal clear in cms) (As / BMC Regulation)

Size of Manhole Type	**90x80 Rect.**	**91 dia Circular**	**122 dia Circular**	**152 dia Circular**
Maximum depth	90	167	230	Any depth beyond 230
Average thickness of R.C.C slab	15	--	--	--
Size of cover and frame (Internal dia)	61x45.5	56 dia	56 dia	56 dia
Weight of cover and frame not less than	38 Kg. or as specified	116 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ	116 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ	116 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ
Type of Cover & Frame	D.I. or SFRC as specified in BOQ.	D.I. or SFRC as specified in BOQ.	D.I. or SFRC as specified in BOQ.	D.I. or SFRC as specified in BOQ.

9.3 All manholes shall be provided with cement concrete benching in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20mm nominal size). The benching shall have a slope of 10cm towards the channel. The depth of the channel shall be full diameter of the pipe. Benching shall be finished with a floating cost of neat cement.

9.4 All manholes shall be plastered with 12/15mm thick cement mortar 1:3 (1 cement: 3 coarse sand) and finished with a floating coat of neat cement inside. Manhole shall be plastered outside as above but with rough plaster.

9.5 All manholes with depths greater than 1 M. shall be provided with plastic encapsulated 20mm square or 25mm round rods foot rungs set in cement concrete blocks 30 x 20 x 15cms in 1:3:6 mix 30 cms vertically and staggered. Foot rests shall be coated with coal tar before embedding.

9.6 All manholes shall be provided with cast iron covers and frames and embedded in reinforced cement concrete slab or SFRC precast concrete covers as per instructions of the Engineer-in-Charge / Owner. Weight of cover, frame and thickness of slab shall be as specified in the Schedule of Quantities or as given above.

9.7 All catch basins shall be having C.I. grating or SFRC precast Gully Grating as per instructions of Engineer-in-Charge / Owner. The grating along with frame shall be of approved design and quality as per instruction of Engineer-in-Charge/ Owner.

10. NEUTRALIZATION CHAMBER

These shall be provided on Treatment Room waste lines before discharging the waste into the main sewer line. It shall be built in RCC masonry and shall be similar in construction to manholes. They shall be constructed to size as shown at the location on drawings and shall be provided with drop inlet, drop outlet, galvanised wrought iron sediment pan and a baffle wall. It shall be provided with 2 Nos, double seal DI Heavy duty manhole cover and frame which shall be identified with lettering `Neutralization chamber

11. **MAKING CONNECTIONS**

Contractor shall connect the new sewer line to the existing manhole by cutting the, benching and restoring them to the original condition. A new channel shall be cut in the benching of the existing manhole for the new connection. Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

12. **MEASUREMENT**

12.1 **Pipes**

Pipes for Sewerage & Drainage shall be measured for the finished length of the pipe line per linear metre i.e. (a) lengths between Manholes shall be recorded from inside of one manhole to inside of other manhole, (b) length between socket of pipe near gully trap and inside of manhole. Rate shall include all items given in the Schedule of Quantities and specifications.

12.2 **Gully Traps**

Gully traps shall be measured by the number and rate shall include all Excavation, Foundation, Concrete Brick Masonry, Cement Plaster inside and outside, C.I. Grating and sealed cover and frame.

12.3 **Manholes**

(a) All manholes shall be measured by numbers and shall include all items specified above and necessary Excavation, Refilling & Disposal of surplus earth.

(b) Manholes with depths greater than specified under the main item shall be paid for under "extra depth" and shall include all items as given for manholes. Measurement shall be done to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of Channel.

12.4 **Making Connections**

Item for making connection to municipal sewer shall be paid for by number and shall include all items given in the Schedule of Quantities and Specifications.

12.5 **Masonry Drains**

Payment for masonry drains shall be made under individual items of Masonry, Cement concrete and plaster by volume or area as given in the Schedule of Quantities.

12.6 Brick Masonry and Cement Concrete shall be measured per cubic metre and shall include all items as given in the Schedule of Quantities.

12.7 For Cement Plaster, Length and breadth shall be measured correct to a Centimeter and it's area shall be calculated in Sq. M. correct to two places of decimal.

13. **COMMISSIONING**

13.1 After successful testing of the different sewerage and drainage pipes in parts, the Contractor shall provide all facilities including necessary pipings, labours, tools and equipments etc. for carrying out testing and commissioning of the entire external sewerage and drainage system complete as per requirement in the presence of Client representative/Consultant, whenever and as may be required. Generally, the following test/inspection has to be carried out:-

(a) For any Leakages/seepages in the external sewerage and drainage pipes.

(b) For checking the functioning of the entire external sewerage and drainage system including rainwater harvesting system and to ensure that the waste water is continuously flowing towards outfall without any intermediate stagnation.

(c) For the functioning of the valves and accessories etc. by putting ON/OFF the controlling valves of the various diversions in the sewerage and drainage and rain water harvesting system.

END OF SECTION – IV

PLUMBING SYSTEM

LIST OF APPROVED MAKES OF MATERIALS

S.No	Materials	Brand & Manufacturer
1	Sanitary Fixtures and Fittings	As per Architect
2.	Flexible Connectors for Water Supply to Wash Basins/Sinks/Geysers	VILINO BRAIDEN/ASR
3.	CP Copper connecting pipe for water supply to Wash basin / Sink / Geysors	JAQUAR/VIJAY METAL WORKS
4.	Stainless Steel Sink	NIRALI/ JAYNA/ NEELKANTH
6.	CP / SS Grating for Floor Trap & Floor Drain	ACO/NEER/VIJAY
7.	Emergency shower/ Eye wash fountain	VIJAY METAL WORKS
8.	G.I. pipes	TATA/JINDAL HISSAR/SURYA ROSHNI
9.	G.I. Fittings for Water Supply (Malleable)	UNIK/ZOLOTO/KS
10.	SS Pipes	JINDAL STAINLESS/ RAMPART/VIEGA
11.	SCI 3989	NECO/HEPCO/RIF
12	UPVC pipe Pressure Fittings	CEPEX/ASTRAL
13	HDPE pipes for Labs	SO SOON/ GEBERITT
14	HDPE IS 14333	SUPREME/JAIN IRRIGATION
15	Insulation For Hot water Pipes	CAREFLEX/ARMAFLEX/THERMAFLEX
16	Insulation For External / Exposed Hot water Pipes	CAREFLEX/ARMAFLEX/TWIGA
17	Pipe protection For External Water Supply Pipes	PYPKOTE/MAKPOLYKOTE/ARMAFLEX

S.No	Materials	Brand & Manufacturer
18	Pre-Fabricated Structural supports and clamps	CHILLY/EASYFLEX/CAMRY
19	Paints	ASIAN PAINTS/BERGER
20	C.I Manholes cover	NECO/KARTAR/RIF
21	SFRC Manhole Cover & Gratings	KK/ABC-ACCURATE BUILDCON/SURABH
22	Plastic Encapsulated Foot Rest	KGM
23	Ball valves	TIMME/ARCO/LEADER/CIM/ZOLOTO/SANT
24	Butterfly valve	KSB/SKS/AIP/LEADER/ZOLOTO/SANT
25	Air Release Valve	RBM/TIMME/SKS/ZOLOTO/SANT
26	Motorized valve	AIP/CASTLE/LEHRY/ZOLOTO/SANT
27	Butterfly Valve with Electric Actuator / Motorized for Water tank	DANFOSS/AIP/CASTLE/ZOLOTO/SANT/LEHRY
29	PVC Valves	CEPEX
30	PVC Water storage tank	SINTEX/SHEETAL
31	Flow metre	FORBES MARSHALL/KENT/IOTA
32	Heat Pump	INTER SOLAR/AO SMITH/VENUS
33	Pumps	GRUNDFOS/DP HOLLAND/KSB
34	RO WATER SYSTEM	SIMA LAB/RENAISSANCE AQUA
35	Electrical Panel	ADVANCE/DIAMOND

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SANITARY FIXTURE

			HINDWARE			JAQUAR			
	FIXTURE	DETAILS	MAKE / MODEL NO.	COST (RS)	REFERENCE IMAGE	MAKE / MODEL NO.	DETAILS	COST (RS)	REFERENCE IMAGE
1	TOILET WC	WALL HUNG WC	**HINDWARE TWILIGHT 92092**	13000		**ARS-WHT-39951**	WALL HUNG WC	12990	
2	TOILET CISTERN	CONCEALED CISTERN				**JCS-WHT-2400S**	SINGLE PIECE SLIM CONCEALED DUAL FLUSH WITH A PROVISION OF 3/6LTR FLUSH (CAN BE ADJUSTED TO 2/4 LTR)	6150	
3	FLUSH VALVE	CONCEALED DUAL FLUSH VALVE	**HINDWARE F850022**	3285		**FLV-1085SQ**	CONCEALED DUAL FLUSH VALVE (3-6 LITRE PER FLUSH)	3200	
4	WASH BASIN	WALL HUNG WB -PEDESTAL	**HINDWARE CEDAR 91049**	3800		**CNS-WHT-801 + CNS-WHT-301**		3080	
5	WASH BASIN	UNDER COUNTER BASIN	**HINDWARE 10080 (580*430)**	3020		**CNS-WHT-701**		1950	
6	WASTE COUPLER	FULL THREAD (32 MM) WITH BOTTLE TRAP	**HINDWARE F850002**	350		**ALD-CHR-705**	WASTE COUPLING 32MM SIZE FULL THREAD WITH 80MM HEIGHT	400	
7	BOTTLE TRAP (WASH BASIN)	BOTTLE TRAP 32MM WITH 125MM & 175MM LONG WALL CONNECTION	**HINDWARE F850015**	1210		**ALD 769L250 X 190**		1250	
8	FAUCET FOR WASH BASIN	NORMAL TAP (PRESSMATIC)	**HINDWARE F310001**	1710		**PRS-CHR-031**	PILLAR COCK AUTO CLOSING SYSTEM ((G 2.5 LPM)	1775	
9	FAUCET FOR WASH BASIN	NORMAL TAP	**HINDWARE F440001CP**	1510		**JAQUAR OPP-15001PM**	**(<= 3 LPM)**	1400	
10	FAUCET FOR WASH BASIN (HOT & COLD)	MIXING TAP (ONLY RESIDENTIAL)	**HINDWARE F360011CP**	3550		**JAQUAR OPP-15011BPM (<= 3 LPM)**		3200	
11	FAUCET (MEDICAL WARD)	ELBOW OPERATED				**JAQUAR FLR-CHR-5166**	**(G-2.5LPM)**	3600	
12	SHOWER (OVER HEAD)	ONLY SHOWER HEAD	**F160016CP**	5450		**JAQUAR OHS-1989**	**(GA-6LPM)**	1300	
13	SHOWER ARM	450 MM LONG	**HINDWARE F160024CP**	1485		**SHA-CHR-483**	**190MM LONG**	850	
14	FAUCET (BATH) (HOT & COLD)	SINGLE LEVER	**360019CP (21 x 17.8 x 13.3 cm**	5720		**JAQUAR OPP-15117PM (NRV MODEL ZLF-CHR-011)**	**(GA-6LPM)**	6000	
15	HEALTH FAUCET	CHROME PLATED	**F160068CP**	970		**JAQUAR ALD-573**	**FULL METAL BODY (GA-6 LPM)**	1500	
16	GEYSER		**FRAISO 3 LITRES**	4390		**JAQUAR INSTA (3L)**		3400	
	KITCHEN & UTILITY								
17	SINK	SINGLE BOWL WITHOUT DRAINBOARD (GLOSSY)	**HINDWARE FLAMINGO KSS0G242008**	6390					
18	SINK WITH DRAIN BOARD	SINGLE BOWL WITH DRAINBOARD (GLOSSY)	**HINDWARE PLATINO KSS1G4012008**	7590					
19	FAUCET (SINK) ON COUNTER TOP (HOT & COLD)	NORMAL TAP (SWAN NECK)	**Avior SINK COCK WITH NORMAL SWIVEL SPOUT**			**FLR-5357N**	SINK COCK WITH REGULAR SWINGING SPOUT (TABLE MOUNTED MODEL)	1500	
20	BIB COCK (UTILITY)		**F450003CP**	1800		**JAQUAR FLR-5047N**	WITH WALL FLANGE (GA 6 LPM)	800	
21	ANGLE STOP COCK	FLORA ANGULAR STOP COCK	**F280004CP**	960		**JAQUAR FLR-5053N**	WITH WALL FLANGE (GA 6 LPM)	800	

PUBLIC TOILET

21	URINAL SENSOR	ELECTRIC SENSOR	**HINDWARE ELECTRIC SENSOR (1 Ltr or Less per Flush)**	7000		**SNR-STL-51077**	AQUISENSE SENSOR CONCEALED TYPE FLUSHING VALVE FOR URINAL	12500	
20	URINAL FLUSH	SINGLE FLUSH VALVE 40MM WITH ROUND PLATE.	**F860005**	3075		**JAQUAR PRS-073**	AUTO-CLOSING MANUAL FLUSH	1975	
21	URINAL (WITHOUT IN-BUILT SENSOR)		**60010**	9350		**JAQUAR URS-WHT-132530**		7190	

ACCESSORIES

22	URINAL PARTITIONS	RECTANGULAR TYPE STILT TOILETS				**JAQUAR JSE-CHR-185C3640H19X**	CURVED/RECTANGULAR SHAPED URINAL PARTITION WITH FROSTED GLASS H: 1950 W: 3201-3600 MM	58500	
23	TOWEL RACK	STUDENT ROOM TOILETS	**F840010CP**	3480		**JAQUAR- AKP-35781P**		3000	
24	TOWEL RING	STUDENT ROOM TOILETS	**F450023CP**	760		**JAQUAR ACN1121BN**		825	
25	SOAP DISH HOLDER	STUDENT ROOM TOILETS	**HINDWARE F870006**	**1135**		**ACN-CHR-1131N**		525	
26	SOAP DISPENSER	STILT TOILETS				**JAQUAR SDR-WHT-DJ0010F**	STILT TOILETS	1400	
27	PAPER TOWEL DISPENSER	STILT TOILETS				**JAQUAR PTD-SAP-DT0160AS**	STILT TOILETS	6500	
28	HAND DRYER	STILT TOILETS				**JAQUAR HDR-SAP-M99ACS**	STILT TOILETS	17500	
29	GRAB BAR (VERTICAL SWING)	DIFFERENTLY ABLED TOILET				**JAQUAR WAC-SAP-BG0800CS**	DIFFERENTLY ABLED TOILET	16000	
30	GRAB BAR (RIGHT, 90)	DIFFERENTLY ABLED TOILET				**JAQUAR WAC-SAP-BAD090CS**	DIFFERENTLY ABLED TOILET	11700	
31	GRAB BAR (692 MM LONG)	DIFFERENTLY ABLED TOILET				**JAQUAR WAC-SAP-BR0600CS**	DIFFERENTLY ABLED TOILET	6700	

ANNEXURE - I

HAND BOOK ON HEALTH AND SAFETY AT WORK

FOR

CONTRACTORS WORKING IN THE PROJECT

SECTION - 1

INTRODUCTION:

This document defines the operations undertaken by Principal Contractors and their sub-vendors on Project premises, which can give rise to hazards to those engaged in the work and others who may be working, standing or passing in the vicinity.

Compliance with NBC norms on construction safety for ensuring safety during construction

It is the **IISER's** endeavour to secure a high standard of safety at site. Therefore, Contractors and sub-Contractors must know their duties under common law, both for establishments, and their own employees and to conduct their business and methods of work to conform to the best practices.

Before the **IISER**, allows any contracting or sub- contracting firm to carry out work on its premises, the **IISER** insists that Contractors and sub-Contractors understand their duties regarding safe practices for themselves, others and regulations covering the type of work they will be carrying out.

In furtherance to this policy, rules herein have been devised to bring to the notice of Contractors and sub-Contractors, some of the more common hazards, and appropriate preventive measures in connection with the erection, construction, cleaning, painting, alteration or demolition of plant, machinery and buildings.

The **IISER** is confident that the observance of these rules will be no hindrance to progress the work, but will assist in the avoidance of accidents.

IT IS IN A TERM OF ALL CONTRACTS BETWEEN THE **IISER** AND CONTRACTORS THAT THEY AND ANY SUB-CONTRACTORS, APPOINTED BY THEM COMPLY WITH THESE RULES AND THEIR CO-OPERATION IS THEREFORE OBLIGATORY IN CARRYING OUT THE PRECAUTIONS LAID DOWN.

Section - 2 : Details general rules which are applicable to most Contractors and sub-Contractors.

Section - 3 : Details specific rules which must be followed where applicable, where a particular type of work is to be undertaken.

All Contractors Supervisors will make sure that the Engineering Services / Safety Manager on Project site are notified as and when he and others (Sub-Contractors) are reporting for work on that site.

SECTION 2

RULES FOR GENERAL OPERATIONS:

2.1 ACCESS:

Nothing shall be done or omitted to be done by Contractors or Sub-Contractors or their employees to render unsafe or obstruct:

- Any means of access to the places at which people are required to work.
- The passage of people and / or vehicles whether on a defined gangway or not, unless permission is obtained from the designated safety officer.
- Access for emergency apparatus, such as firefighting equipment.
- Contractors and sub-Contractors shall nevertheless provide adequate fencing, lighting and warning signs to ensure safety at all times.

2.2 ACCIDENT AND INCIDENT REPORTING:

All notifiable accidents, dangerous occurrences and potential hazard situations shall be reported to the safety officer at site.

Injuries are to be treated by experienced medical staff available at site.

2.3 CONTRACTORS AND SUB-CONTRACTORS' TOOLS AND EQUIPMENTS:

All Contractors and sub-Contractors tools and equipment must comply with statutory regulations and approved codes of practices.

2.4 HAZARDOUS MATERIALS:

The Contractor must inform the safety officer, prior to commencement of work, procurement of materials connected with the contract work of a hazardous nature. The Contractor will have to secure storage for any such material.

2.5 DUST AND FUME CONTROL:

Contractors and sub-Contractors must inform the safety officer at the Project site of all processes producing dust or fumes, and under the conditions as laid down in the relevant Act of Government the safety precautions are to be fulfilled.

2.6 FIRE HAZARDS AND PRECAUTIONS:

When at site, all fire regulations, as well as regulations under relevant Sections of the relevant Act of Government of must be observed at all times.

2.7 MACHINERY SAFETY :

Contractors and sub-Contractors working at the Project site must not remove or displace any guard, fencing or other safety equipment which is designed to protect personnel or machinery or any place where safety equipment has been provided without the written permission of the safety officer or his designated representative.

On completion of any work, any guards that had to be removed must be replaced immediately and whilst work is being carried out, machinery must not be operated. The requirement of the relevant Act must be followed:

2.8. HOUSE-KEEPING:

The House-keeping standards employed by Contractors and sub- Contractors, must be as good as the **IISER**. Care must be taken by all responsible people to ensure that the standard of house-keeping for all establishments is known and understood.

2.8.1 House keeping and hygiene go hand in hand with safe working practices. Contractors and sub-Contractors must leave work areas in a clean, tidy and safe condition at the end of each working period.

2.8.2 Special attention must be paid to potential fire hazards, trip points and equipment left in a hazardous condition.

2.8.3 Contamination of any product (by drill swarf sawdust, oil, salient, paints and materials etc.) must be avoided at all costs, and the officers of the **IISER** are empowered to stop any activity which could result in contamination.

2.9. NOISE:

Contractors and sub-Contractors working at the Project site must obtain permission from the safety officer if the processes being employed to carry out that work significantly increase the ambient noise level in that area being worked.

2.10. OVERHEAD WORKING:

No work may be carried out above the heads of people or over gangways or roads, until all precautions have been taken to ensure the safety of the persons below, and until permission is given by the safety officer. Each specific site of overhead working will require consent from the safety officer. This will be given after satisfactory inspection.

Work may be carried out in the vicinity of power cables only when permission is obtained from the safety officer and/or **IISER** Project Engineer.

Work connected with overhead safety includes the movement of long metal objects, machinery, jibs, masts, arms or other elevated parts.

2.11 WORKING AT HEIGHT:

All temporary structure, erected by Contractors or sub-Contractors for the purpose of allowing their staff to work at heights of more than 2 M. above floor level, must be constructed in accordance with the Safety Regulations laid down.

Whenever possible, ladders are to be made of wood and in good condition. Metal ladders must not be used where there is any possibility of the ladder coming into contact with an electrical conductor.

Roof working must be properly supervised.

2.12 SAFETY CLOTHES AND EQUIPMENT:

This will be supplied by Contractors and sub-Contractors who are working on sites and must be adequate for the well being of their staff engaged in the type of work contracted for.

The equipment and its use must comply with the regulations and codes of practice as laid down that apply to the conditions of work being undertaken.

Contractors and sub-Contractors will be responsible for the use of any tools and equipment that is supplied by them, or their staff to the exclusion of all responsibility of the **IISER**. Tools will be maintained to the highest standard of safety. Whilst in the possession of such tools, the person so using said tools is responsible for the continued maintenance of safety standards.

It is the individual's responsibility to ensure that the tools he works with are suitable for the job and in a safe condition prior to work commencement. All necessary tools and equipment to complete a contract should be supplied by the Contractor. Due provision must be made during contract preparation.

2.13 PLANT SERVICES:

Before using plant services such as electricity, permission to do so must be obtained from the appropriate authority, **IISER** Project Engineer or Safety Officer.

2.14 SUPERVISION:

Contractors working at the Project site must ensure that their staffs are adequately supervised.

2.15 WARNING SIGNS AND NOTICES:

Suitable warning signs are to be displayed warning of potential hazards.

1.16 The ACMV Contractor shall at his own expense arrange for complying with all the occupational safety, health and welfare legislations of Government including the Electrical code and the Occupational Safety, Health and Welfare Act.

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SECTION – 3

TOOLS

3.1 ELECTRICALLY DRIVEN PORTABLE TOOLS:

Permission is to be obtained from the nominated person before any Contractor or sub-Contractor's electrical hand tools can be connected to the electricity supply.

Connection must be by 3-core and 3-pin plugs and sockets, except when tools are double insulated on a 2-wire supply. Where the supply is 3-phase, 4-core cable and 4-pin plugs and sockets with earth connections must be used.

Make-shift connections are prohibited.

The use of extension cables is discouraged, but sometimes necessary.

Portable electric lamps must be the 'Gripper' type with caged wire protection for the bulk and precautions as laid down under relevant section of the relevant Act of Government must be observed.

In all cases, with the exception of double insulated tools, the metal work of the tools must be effectively earthed; also any flexible metallic cable coverings must be earthed.

3.2 COMPRESSED AIR TOOLS

Contractors and sub-Contractors must obtain permission to use any compressed air supply at the Project site.

Contractors and sub-Contractors must also provide suitable noise suppression for pneumatic hammers, drills etc.

3.3 PERCUSSION CARTRIDGE TOOLS

Permission to use percussion tools must be obtained from the designated safety representative prior to the use of these tools.

Also when using percussion tools, it is the individual’s duty to ensure that the charges used in said tools are correct. These tools are to be handled as dangerous weapons, never leave tools unattended, never leave tools charged or store charged, never point tools at personnel, always lock up when finished both tool and charges.

3.4 HOISTING AND LIFTING:

Permission must be obtained prior to the use of Plant and equipment, from the **IISER** Project Engineer or other nominated responsible person.

Equipment must be adequate for the purpose required and anchorage approved by the site safety officer.

All equipment so used must have been examined by a competent person, and where necessary a certificate obtained in accordance with relevant sections of the relevant Act of Government.

No object is to be left unattended whilst using lifting equipment.

3.5 MOVEMENT OF PLANT AND MACHINERY

Permission must be obtained prior to the movement of construction materials, plant or equipment in and around Project site.

3.6 POWERED INDUSTRIAL TRUCKS

Permission must be obtained prior to the use of lift-trucks by Contractors or sub-Contractors at the Project site.

Trucks must only be driven by competent licensed personnel, and must comply with statutory regulations.

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SECTION – 4

CONTRACTORS AND SUB-CONTRACTORS GUIDELINES

1. Safe working practices must be observed at all times.

2. It is the responsibility of the Contractors and sub-Contractors staff to use appropriate personal protection. It is the Contractors and sub-Contractors obligation to supply necessary protective equipment and clothing.

3. Certain areas are designated hazardous (eg. noisy areas) and warning signs must be obeyed.

4. Where the Contractors and sub-Contractors work presents a potential hazard, appropriate notices must be supplied and displayed, and the area made secure as far as is reasonably possible.

5. The **IISER** will not provide tools, materials, lifting or access equipment, fixings or raw materials, unless by previous arrangement.

6. Any equipment brought to site by Contractors and sub-Contractors must not be used by untrained persons, and attention is drawn to the indemnity clause of the **IISER** orders, which states that the Contractor is liable for any consequent damage or loss to people, equipment or buildings.

7. All welding, burning and grinding operations which could potentially cause fire must be reported to security.

8. No alcohol is permitted at site, and anyone deemed to be under the influence of alcohol will be required to leave the site.

9. Vehicle parking will be in designated areas only.

10. No smoking is allowed in work areas.

11. No food is to be consumed or left in work areas.

12. Warning signs and speed restrictions must be observed.

13. Place of work to be left in a tidy and safe condition at the end of each work period.

14. Care to be taken against contamination of any product of paint, oil, etc.

15. All injuries must be reported to the authorities as per law applicable.

16. A health and safety officer shall be employed on such conditions as circumstances require.

The above has been received and read by Contractor / Sub- Contractor, we agree to comply with these Rules (See foot-note)

Contractors ……..…….

Company……..…….

Date ……..…….

NOTE :

The Contractor will ensure that sub-Contractor receive and sign a copy of these Rules.

MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS

FIRST-AID-FACILITIES

At every work place there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 labourers or part thereof ordinary employed.

The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment, :-

1.2.1 For work places in which the number of labour employed does not exceed 50, each first-aid box shall contain the following equipment:-

- 6 small sterilized dressings
- 3 medium size sterilised dressings
- 3 large size sterilised dressings
- 3 large size sterilised burn dressings
- 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
- 1 (30 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
- 1 snakebite lancet
- 1 (30 gms.) bottle of potassium permanganate crystals
- 1 pair scissors
- 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
- 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
- Ointment for burns
- A bottle of suitable surgical antiseptic solution

1.2.2 For work places in which the number of labour exceed 50.
Each first-aid box shall contain the following equipment.

- 12 small sterilised dressings
- 6 medium size sterlised dressings
- 6 large size sterilised dressings
- 6 large size sterilised burn dressings
- 6 (15 gms.) packets sterilised cotton wool
- 1 (60 ml.) bottle containing a two per cent alcoholic solution of iodine.
- 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
- 1 roll of adhesive plaster
- 1 snakebite lancet
- 1 (30 gms.) bottle of potassium permanganate crystals
- 1 pair scissors

- 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes / Government of India.
- A bottle containing 100 tablets (each of 5 gms.) of aspirin. Ointment for burns
- A bottle of suitable surgical antiseptic solution

Adequate arrangements shall be made for immediate recoupment of the equipment when necessary.

Nothing except the prescribed contents shall be kept in the First-aid box.

The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

A person in charge of the First-aid box shall be a person trained in First-aid treatment, in the work places where the number of contract labour employed is 150 or more.

In work places where the number of contract labour employed is 750 or more and hospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained Compounder. The Compounder shall be on duty and shall be available at all hours when the workers are at work.

Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

2.0 DRINKING WATER

Water quality shall conform to Indian standards. Drinking: IS 10500-1991, Irrigation: IS 11624-1986

2.1 In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of water fit for drinking.

2.2 Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

2.3 Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn form it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and waterproof.

2.4 A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

3.0 WASHING FACILITIES

3.1 In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of labour employed and supervisory staff separately therein.

3.2 Separate and adequate cleaning facilities shall be provided for the use of male and female labourers and supervisory staff.

3.3 Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

4.0 LATRINE AND URINALS

This facility shall Compliance with NBC norms based on population of workers at site on construction safety for ensuring safety during

4.1.1 Latrines shall be provided in every work place on the following scale namely:-

4.1.2 Where females are employed there shall be at least one latrine for every 25females.

4.1.3 Where males are employed, there shall be atleast one latrine for every 25 males.

Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be upto the first 100, and one for every 50 thereafter.

4.2 Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.

4.3 Construction of latrines: the inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials and shall be cement washed inside and outside. Standard sanitary fixtures & fittings shall be provided.

4.4 Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women only" as the case may be.

4.04.01 The notice shall also bear the figure of a man or of a woman, as the case may be.

4.5 There shall be atleast one urinal for male workers up to 50 and one for female workers upto fifty employed at a time, provided where the number of male or female workmen, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females upto the first 500 and one for every 100 or part thereafter.

4.6 .a The latrine and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

b Latrine and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.

4.7 Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrine and urinals.

4.8 Disposal of excreta shall be arranged either by connection to a municipal sewer with permission from the local sanitary authority, or by providing connection to a covered soak pit.

4.9 The contractor shall at his own expense, carry out all instructions issued to him by the **IISER** to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Statutory Authority for execution of such on his behalf.

PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for males and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 metres from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m per head.

Provided that the **IISER**/ Architects may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

CRECHES

At every work place, at which 20 or more women worker are ordinarily employed; there shall be provided two rooms of reasonable dimensions for the use of their children under at the age of six years. One room shall be used as a play room for the children and the other as their bedroom. The rooms shall be constructed with painted masonry walls with light weight roofing.

The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

The contractor shall supply adequate number of toys and games in the play room.

The contractor shall provide one ayah to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceeds 50.

The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

CANTEENS

In every work place where the work regarding the employment of labour is likely to continue for six months and where in contract labour numbering one hundred or more is ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such labour.

The canteen shall be maintained by the contractor in an efficient manner.

The canteen shall consist of at least a dining hall, kitchen, and pantry and washing places separately for workers and utensils.

The canteen shall be sufficiently lighted at all times when any person has access to it.

The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colour washed.

The premises of the canteen shall be maintained in a clean and sanitary condition.

Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

Suitable arrangements shall be made for the collection and disposal of garbage.

The floor area of the dining hall shall be suitably provided with furniture.

Sufficient tables, stools, chair or benches shall be available for the number of diners to be accommodated.

There shall be provided and maintained sufficient utensils crockery, furniture and any other equipment's necessary for the efficient running of the canteen.

The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.

Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

A service counter, if provided, shall have top of smooth and impervious material.

Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment.

The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

The charges for food stuffs, beverages and any other items served in the canteen shall be based on 'No Profit, No Loss' and shall be conspicuously displayed in the canteen.

In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:-

The depreciation and maintenance charges for the building and equipment provided for the canteen.

The cost of purchase, repairs and replacement of equipment including furniture, crockery, cutlery and utensils.

The water charges and other charges incurred for lighting and ventilation.

The interest and amounts spent on the provision and maintenance of equipment provided for the canteen.

8.0 Minimum Safety Requirements (To be made a part of Tender conditions and BOQ of works related package to address the inclusion of PPE, Scaffold, Electrical safety measures, House keeping as a minimum)

Prior to commencing work on Site, the Contractor must make himself aware of all the requirements for the Works and the Site relating to Environment, Health & Safety (EH&S) matters including all relevant legislation and standard codes of practice.

Contractor shall comply with all the EH&S Requirements listed below which shall be deemed a fundamental condition of this Contract.

Contractor must comply in full with all applicable Health & Safety (H&S) local and national legislation. (e.g. Labour Licence, Insurance Policy under Workmen Compensation Act, etc.)

In circumstances where there is a conflict between local or national legislation and these Minimum Safety Requirements (MSR), the higher (more protective) requirement shall prevail.

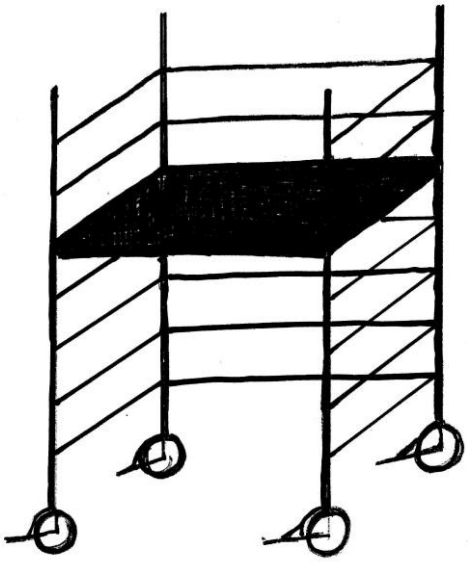
Guardrails are to be provided at all working places and other locations where persons or materials could fall more than 2.0m / 6'6". Where this can physically not be achieved, suitable and sufficient fall protection devices that do not rely on individuals should be provided and used to establish a safe place of work. (Examples include Safety Nets closely installed under height works, Stretched wire ropes installed to hook up safety harnesses while workers move from one location to another at height, Use of full body safety harnesses with double lanyards etc.)

Full body harness with double lanyard

Proper Access to workplatform

All persons working on suspended scaffolds/cradles/gondolas must wear and use appropriate fall prevention equipment so as to protect them effectively at all times when they are at risk from any failure of any part of the scaffold/cradle/gondola, including its suspension system.

Free-standing scaffold towers used externally must not be higher to the top platform level than three times the minimum base dimension, unless secured to a permanent structure. For internal use only, the height to platform may rise to 3.5 times the minimum base dimension. Wheels must be locked when towers are in use. No person is permitted to remain on a tower platform while a tower is being moved.



Mobile Scaffolds

Holes, shafts and edges from or through which persons could fall a distance of more than 2 metre /6ft 6in must be clearly marked with signage or other means **and** be adequately protected by covers or barriers so as to prevent falls of persons and materials.

Holes, Shafts, Floor Penetrations

All temporary electrical circuits must include a Residual Current Device, Earth Leakage Circuit Breaker or Ground Fault Circuit Interrupter at source.

Temporary Electrical System

Powered Lifts and hoists, aerial platforms and scissors lifts must have a competent driver, certified by a qualified third party. Additionally, the above items must be certified as safe to use by a local government approved third party.

Adequate lighting must be provided to enable safe access to and egress from every place on a site where persons are liable to work, this is in addition to task lighting.

Induction/Orientation

All workers shall receive site-specific safety induction/orientation, before they are involved in any activity at site. They must be made aware of site safety rules, provisions of first aid and welfare facilities such as drinking water, washing place, toilets, rest rooms, etc.

Task related Safety Instruction

Contractor shall ensure all workers shall receive at least one specific task-related training/skilling session per week. This may be achieved by using Toolbox talks &/or induction to Safe Work Method Statement.

Incident/Injury Reporting & Investigation

Contractor shall report and record all incidents, which have potential to cause injuries and damages and also injuries including first aid cases.

Lost Time Injury (LTI) or serious injury must be intimated immediately as soon as possible by phone. (If an injured person doesn't likely to report to work in his next following shift, it is to be recorded as Lost Time Injury)

Job Safety Analysis & Safe Work Method Statement

Contractor must produce detailed Job Safety Analysis / Safe method of work for approval and use only approved work methods only. No work shall start without approved Job Safety Analysis / Safe Work Method Statement. All workers and supervisors must be inducted to Job Safety Analysis / Safe method of work.

(iii) Oxygen / Acetylene / Fuel Gases/ Compressed or Liquefied Gases

(a) All gas cylinders shall be stored, transported and handled as per the requirements of Gas Cylinder Rules, 1981

Indian Standard Safety Codes to be followed by the CONTRACTOR during execution of work

S.No	IS No	Part No./Year	Description
1.	IS 3696	1 - 1987	Safety code for scaffold and ladders
2.	IS 3996	2 - 1991	Safety code for ladders
3.	IS 4014	2 - 1967	Code of practice for steel tubular scaffolding
4.	IS 4081	1986	Safety code for blasting and related drilling operations
5.	IS 4082	1977	Recommendation on stacking and storage materials at site (1st Revision)
6.	IS 4130	1991	Safety code for demolition of buildings 2nd revision
7.	IS 4138	1977	Safety code for working in compressed air
8.	IS 4756	1978	Safety code for funneling work
9.	IS 4912	1978	Safety requirements for floor and wall openings, railing and toe boards
10.	IS 5121	1990	Safety code for piling and other deep foundations
11.	IS 5916	1990	Safety code for constructions involving use of hot bituminous material
12.	IS 7272	1974	Recommendation for labour output constants for building work
13.	IS 7293	1987	Safety code for working with construction machinery
14.	IS 7969	1975	Safety code for handling and storage of building materials with amendment No.1
15.	IS 8989	1978	Safety code for erection of concrete framed structures

S.No	IS No	Part No./Year	Description
16.	IS 10067	1982	Material constants in building works
17.	IS 1029	1990	Safety code for dress divers in civil engineering works
18.	IS 10302	1995	Unified nomenclature of workmen for civil engineering
19.	IS 13415	1992	Protective barriers in and around buildings - code of safety
20.	IS 13416	1 - 1992	Preventive measures against hazards at work places - recommendations falling materials hazards prevention
21.	IS 13416	2 - 1992	Preventive measures against hazards at work places - recommendations fall prevention
22.	IS 13416	3 - 1994	Preventive measures against hazards at work places - recommendations disposal of debris
23.	IS 13416	4 - 1994	Preventive measures against hazards at work places - recommendations timber structures
24.	IS 13416	5 - 1994	Preventive measures against hazards at work places - recommendations fire protection
25.	IS 13430	1992	Safety during additional construction and alteration to existing buildings - Code of practice.

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) TIRUPATI

VOLUME III

FINANCIAL BID DOCUMENT

Schedule of quantity (BOQ)

"CONSTRUCTION OF UG Block with associated Services"
AT IISER TIRUPATI

NIT NUMBER : 2/IISER/TIRUPATI/2018-19

Bids to be submitted online on : URL:https://eprocure.gov.in/eprocure/app

A - Civil ,Structural & Architectural Works

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Note : - All the items of substructure include the cost of dewatering, wherever necessary during the progress of work till its completion without any extra cost to IISER. Tenderers are advised to visit site of work to acquaint themselves about the level of subsoil water, drainage facility for dewatering, accessibility to the site & quote the rates accordingly.				
1	**CARRIAGE OF MATERIAL**				
1	Carting away surplus excavated earth (beyond initial lead of 50 m) to approved designated locations outside IISER Campus at approved location as per local Goverment Authority, using mechanical transport including loading, unloading and stacking Lead upto 1 Kms.	Cum	2,668.00	98.34	2,62,371
2	**EARTH WORK** **Note : Incase of over excavation, it need to be filled with Plum concrete (1:4:8) having no extra cost.**				
2.1	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including getting out and disposal of excavated earth upto 50 m and lift upto 1.5 m, as directed by Engineer-in-Charge - All kinds of soil	Sqm	4,088.00	53.00	2,16,664
2.2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge - All kinds of soil	Cum	4,965.00	125.95	6,25,342
2.3	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :				
2.3.1	Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia	Rmt	730.00	225.45	1,64,579
2.3.1.1	Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. (Rate is over corresponding basic item for depth upto 1.5 metre). Pipes etc., exceeding 80mm dia but not exceeding 300mm dia	Rmt	75.00	286.32	21,474
2.3.2	Pipes, cables etc. exceeding 300 mm dia. but not exceeding 600 mm dia	Rmt	70.00	352.00	24,640
2.4	Extra for every additional lift of 1.5 m or part thereof in excavation/banking excavated or stacked materials. - All kinds of soil.	Cum	1,130.00	177.70	2,00,801

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
2.5	**Filling of Excavated Earth:**Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. (Quoted rate to include cost of compaction to achieve at least 95% Proctor Density of refilled excavated earth.)	Cum	4,471.00	125.75	5,62,228
2.6	**Surface Dressing** Surface dressing of the ground including removing vegetation and in-equalities not exceeding 15 cm deep and disposal of rubbish, lead upto 50 m and lift up to 1.5 m.	Sqm	7,033.00	13.95	98,110
2.7	**Anti termite Treatment**				
2.7.1	Supplying chemical emulsion in sealed containers including delivery as specified. - Chlorpyriphos emulsifiable concentrate of 20%	Lts	1,535.00	185.95	2,85,433
2.7.2	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 liters / sqm of the vertical surface of the substructure to a depth of 300 mm including excavation channel along the wall & rodding etc. complete: With Chlorpyriphos E.C. 20% with 1%concentration.	Rmt	281.00	16.80	4,721
2.8	**Filling with Approved Earth** Filling in plinth with murrum/ selected earth approved by Engineer-in-charge excavated from nearby borrow areas including all leads, lifts, loading, unloading, stacking, leveling, spreading, in layers not exceeding 150 mm thick, watering, compaction to give 95% proctor density etc. complete as per specifications, drawings & as directed by the Engineer-in-Charge. Rate is inclusive of all scenery charges, royalty, etc. Nothing extra shall be paid.	Cum	2,484.00	630.00	15,64,920
3	**STRUCTURAL WORK** **CEMENT CONCRETE (CAST -IN - SITU)** **Plain Cement Concrete using 1:3:6 Mix**				
3.1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1:3:6 (1 cement : 23 coarse sand (zone-III) : 6 graded stone aggregate 20 mm nominal size)	Cum	591.00	4,814.55	28,45,399
3.2	Providing and laying damp-proof course 50 mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size).	Sqm	394.00	320.25	1,26,179
3.3	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	Sqm	180.00	450.35	81,063

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
3.4	Providing and fixing at or near ground level precast cement concrete in kerbs, edgings etc. as per approved pattern and setting in position with cement mortar 1:3 (1 Cement : 3 coarse sand), including the cost of required centering, shuttering complete. 1:1½:3 (1 Cement: 1½ coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size).	Cum	20.00	6,170	1,23,397
4	**REINFORCEMENT CEMENT CONCRETE WORK**				
4.1	Centering and shuttering including strutting, propping etc. and removal of form for all heights :				
4.1.1	Foundations, footings, bases of columns, etc.	Sqm	2,220.00	193.95	4,30,569
4.1.2	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc	Sqm	10.00	387.50	3,875
4.1.3	Lintels, beams, plinth beams, girders, bressumers and cantilevers.	Sqm	1,815.00	342.90	6,22,364
4.1.4	Columns, Pillars, Piers, Abutments, Posts and Struts.	Sqm	1,180.00	467.85	5,52,063
4.1.5	Stairs, (excluding landings) except spiral-staircases.	Sqm	55.00	419.35	23,064
4.1.6	Vertical and horizontal fins individually or forming box louvers band, facias and eaves boards	Sqm	10.00	627.85	6,279
4.1.7	Suspended floors, roofs, landing, beams and balconies with water proof ply 12 mm thick	Sqm	9,254.00	497.45	46,03,402
4.1.8	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of de-shuttering and decentering at all levels, over a height of 3.5 m, for every additional height of 1 meter or part there of (Plan area to be measured).	sqm	350.00	171.50	60,025
4.2	Reinforcement for R.C.C.work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo-Mechanically Treated bars. (Fe 500 D)	Kg	45,785.00	56.60	25,91,431
4.3	Reinforcement for R.C.C.work including straightening, cutting, bending, placing in position and binding all complete above plinth level (for all level) Thermo-Mechanically Treated bars. (Fe 500 D)	Kg	1,91,795.00	56.60	1,08,55,597

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
4.4	**Exposed Formwork:**Providing, fabricating, erecting and fixing in position designed approved brand formwork system using 18mm thick plastic coated shuttering plywood PERI make or equivalent, shuttering giving fair finish concrete surfaces, making leak proof joints, using required couplers, tie bolts, M.S. ties, concrete spacer wheels or SS spacers, providing openings/ cut-outs/ pockets, niches, grooves etc., using required deshuttering emulsion which will not stain the concrete, etc. complete at all height, depths, lead & lift and required any height staging and supporting sturdy and braced. Also include removing & dismantling the aforesaid assembly after specified or as approved period from the day of casting of concrete. Shuttering design shall take into account stagging, supporting, grooves as required in single or double row, construction joints in shape and forms as detailed in the Architectural drawing. The Contractor shall prepare and submit to the Engineer - in - Charge shuttering drawings showing mould details, its fixing, finish, construction joints porposed, leak proofing etc. all complete to the satisfaction of the Engineer - in- Charge. The shuttering thickness, support and bracing should be as per shop drawings submitted by contractor & approved by the structural engineer. (Maximum no. of uses - 2) Walls (any thickness) including attached pilasters, parapet wall, buttresses, plinth and string courses fillets, kerbs and steps etc.	Sqm	2,545.00	876.00	22,29,420
4.5	Add for plaster drip course/ groove in plastered surface or moulding to R.C.C. projections.	Rmt	281.00	34.15	9,596
4.6	**<u>FOR EXPOSED CONCRETE PROTECTIVE TRANSPARENT</u>** Providing and applying Hydrophobic Silane - Siloxane coating of Wacker BS-290 make or approved equivalent make, to exposed concrete surfaces at all heights & leads and wherever instructed by Engineer-In-Charge. The treatment shall be in two coats wet-on-wet or as recommended by approved manufacturer including preparation of surfaces by cleaning, curing, protecting, independent double legged scaffolding etc complete. The rate includes the cost of all materials, its application by specialized applicators by spray coating with airless sprayer, cleaning the substrate of all laitance, construction dust, contaminants, double scaffolding, labour etc., all complete and at all levels, leads and heights as per particular specification & directions of EIC. Guarantee Bond in the prescribed proforma shall be executed by the contractor for the satisfactory performance of the application for 10 years.	Sqm	2,545.00	325.00	8,27,125

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
4.7	DESIGN MIX CONCRETE Providing and laying in position machine batched and machine mixed design mix M-30 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 OPC shall be used with Fly ash content of 15% and fly ash conforming to IS 3812 (Part 1) only to be used. Note:- Soft water shall be used for Concrete having pH 7 to 7.5 All work upto plinth level	Cum	770.00	6,516	50,17,282
4.8	**Self Compacting Concrete in M30 Grade** Providing and laying in position, without vibrator, machine batched and mixed design mix Smart Dynamic Concrete – Self Compacting, honeycomb-free concrete of required grade for Form Finished reinforced cement concrete work, using cement & fly ash content as required including transportation of concrete through transit mixer to site of laying for all leads, lift, all floor levels, pumping of concrete to site of laying including admixtures conforming to IS 9103 as per designed proportions to accelerate, retard setting of concrete, Single component, High-performance super plasticiser based on PCE (polycarboxylic ether) for Smart Dynamic Concrete (i.e. Low Fines Self Compacting Concrete) MASTER GLENIUM SKY 8650 (BASF or equivalent approved) improve workability without impairing strength and durability as per direction of PMC/Employer. The Mix design as per particular specifications shall be got approved by Engineer -in -Charge before execution of the item. Exposed surfaces shall be free of blamish, residues of curing compound, uniform in colour, free of construction joint except detailed or approved under methodology of construction, forming construction joint or as providing joint free/ hole free water retaining structures. All system to have in built supporting safety screens.	Cum	1,720.00	7,205	1,23,92,600
5	**BRICK WORK**				
5.1	Brick work with common burnt clay machine moulded perforated 230mm thick bricks of class designation 12.5 conforming to IS: 2222 in superstructure above plinth level up to floor five level in cement mortar 1:6 (1 cement : 6 coarse sand) With F.P.S.(non modular) bricks	Cum	50.00	5640.20	2,82,010
	HALF BRICK MASONRY				
5.2	Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level.				
5.2.1	a) Cement mortar 1:4 (1 cement :4 coarse sand)	Sqm	10.00	708.70	7,087
5.2.2	Extra for providing and placing in position 2 Nos 6mm dia. M.S. bars at every third course of half brick masonry.	Sqm	10.00	56.85	569
	Autoclaved Aerated Concrete Block Wall				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
5.3	Providing & laying Autoclaved Aerated cement block masonry with 150mm/230mm/300mm thick AAC blocks in super structure above plinth level upto V level with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortor all complete as per direction of Engineer in charge (The Payment of RCC band and reinforcement shall be made for seperately)	Cum	1,545.00	5687.10	87,86,570
6	**GRANITE WORK**				
	Contractor shall submit flooring/ cladding (for all type of stone flooring/ cladding/ wall lining) pattern drawing and get approved by Engineer in charge before execution of work.				
6.1	Providing edge moulding to 18 mm thick Granite counters, Vanities etc., including machine polishing to edge to give high gloss finish etc complete as per design approved by Engineer-in-Charge .	Rmt	85.00	246.00	20,910
6.2	Providing and fixing expansion hold fasteners on C.C. /R.C.C./Brick masonry surface backing including drilling necessary holes and the cost of bolt etc complete. Wedge expansion type				
6.2.1	Fastener with threaded dia 6 mm	Each	10.00	25.25	253
6.2.2	Fastener with threaded dia 10 mm	Each	10.00	25.55	256
6.2.3	Fastener with threaded dia 12 mm	Each	10.00	44.45	445
	Flamed Granite Slab Flooring				
6.3	Providing and laying flamed finish Granite stone in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent				
6.3.1	Flooring	Sqm	505.00	3122.00	15,76,610
6.3.2	Tread with 3 No. of Grooves and Nosing	Sqm	152.00	3585.00	5,44,920

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Polished Granite Slab Flooring				
6.4	Providing and laying Polished Granite stone flooring of 18mm thick in required size or design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.				
6.4.1	Flooring of size 850mm x 550mm	Sqm	25.00	2937.70	73,443
6.4.2	Tread of single stone with 3 No. of Grooves and Nosing	Sqm	20.00	3713.00	74,260
6.4.3	Riser of single stone	Sqm	10.00	3250.00	32,500
	Granite Skirting				
6.5	providing and laying Granite of any approved skirting for a height 100mm including necessary chipping, chamfering, finishing, grooves, pattern & details as per drawing etc.,	Rmt	1,045.00	325.00	3,39,625
	WOOD AND PVC WORK				
7	Providing and fixing M.S. grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including one coat of steel priming with two coats of approved enamel paint all complete. Fixed to Steel windows by welding	kg	2,490.00	104.65	2,60,579
8	**STEEL WORK**				
	Structural Steel				
8.1	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved Zinc chromate yellow steel primer all complete. The item shall be executed as per particular specifications. (All Structural member shall have FY -310 Mpa.) Contractor shall submit shop drawing as per intent drawing as per tender document for all structural elements. Contractor shall also submit deign calculations for peer review approval for stability of element. Contractor shall getting approval of shop drawing before execution of work.	Kg	67,017.00	67.60	45,30,349
8.2	Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. Hot finished seamless type tubes Contractor shall submit shop drawing as per intent drawing as per tender document for all structural elements. Contractor shall also submit deign calculations for peer review approval for stability of element. Contractor shall getting approval of shop drawing before execution of work.	kg	60,798.50	93.90	57,08,979

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
8.3	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	kg	500.00	58.45	29,225
8.4	Steel work welded in built up sections/ framed work including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. The item shall be executed as per particular specifications given for structural steel. Contractor shall submit shop drawing as per intent drawing as per tender document for all structural elements. Contractor shall also submit deign calculations for peer review approval for stability of element. Contractor shall getting approval of shop drawing before execution of work. In gratings, frames, guard bar, ladder, platform, railings, brackets, had rail, gate, grill door, insert plate, threaded bolt, fencing pole, cable tray support, false ceiling supporting member, hanger, supporting framing for masonary work, walk way above false ceiling, supporting frame for doors, framing work for wall panelling, and similar works.	Kg	100.00	85.95	8,595
8.5	**MS Railing to Staircase** Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works including applying one coat of steel primer with two coats of approved enamel paint all complete as per the direction of Engineer-In-charge - MS Tube .	Kg	1,785.00	92.00	1,64,220
8.6	**Metal Steel Door - Painted** Providing and fixing of Hollow metal Rail & Stile doors made of pressed galvanized steel confirming to IS 277 with the following specification. Doors shall be with vision glass and louver as a part of complete assembly. Approved manufacturers. Door frame shall be Double rebate of size 143 x 58mm made out of minimum 1.20mm (18gauge) thick galvanized steel sheet with groved profile to receive the seal. Frames shall be mitered and field assembled with self tabs. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with non-fire rated puff.				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Door leaf shall be 46mm thick fully flush double skin door, with or without vision lite. Door leaf shall be manufactured from minimum 0.8mm (22guage) thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be resin bonded honeycomb core. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. All doors and frames shall be finished to "PURE POLYSTER POWDER COATING" for minimum 50 microns (on the visible surface of the Shutter and Frame) of approved colour. The door leaf and frame shall have passed minimum 500 hours of salt spray test Rate should include supply and installation of door and hardware as a complete assembly as given in the schedule. Once frame installed should be filled with fire rated PUF as recommended by the manufacturer or the Engineer in charge				
	D4A ,SD7A,SD7C,D10A,D19A ., etc any additional door as in GFC **Ironomergies (Dorma or equivalent)** Butt Hinges D Type Pull Handle (300mm) Dead Lock 300mm Tower Bolt Allen Key Sash Lock with Lever Handle Door Closer	Sqm	175.00	12,914	22,59,950
8.7	**2hr. Fire Rated Hollow Metal Doors - Painted** Providing and fixing of Hollow metal Insulated fire rated doors as per IS 3614 part-1, for stability, integrity & insulation. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 / BS476 Part 20 & 22, CBRI / Cerifire or third party certified/NABL accredidated or equivavelent lab, for maximum rating of 120mins with 30minutes of insulation, in latched /unlatched condition (if used with deadbolts and pull handles). Labled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. manufacturer Shakti Hormann or equivalent.				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Door frame shall be Double rebate of size 143 x 58mm made out of 1.6mm (16gauge) minimum thick galvanized steel sheet with groved profile to receive the seal. Frames shall be mitered and field assembled with self tabs. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be high density insulation material. Intumescent seals 15x2mm to be provided all around the door in addition to the grooved smoke seal. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should not be exceed of size 200x300 provided as per manufacturers recommendation with a clipon arrangement. The glass should be 6/8mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished to “PURE POLYSTER POWDER COATING” for minimum 50 microns (on the visible surface of the Shutter and Frame) of approved colour. The door leaf and frame shall have passed minimum 500 hours of salt spray test Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule. Once frame installed should be filled with PUF as recomended by the manufacturer or engineer. **D8B,FD21A,FD21B etc., any additional door as in GFC** **Ironomergies (Dorma or equivalent)** Butt Hinges D Type Pull Handle (300mm) Dead Lock 300mm Tower Bolt External Trim with Lock Sash Lock with Lever Handle Panic bar with External Trim Allen Key	Sqm	37.00	16,237	6,00,769
8.8	**Steel Glass Panel Door** Providing and fixing of Hollow metal Rail & Stile doors made of pressed galvanized steel confirming to IS 277 with the following specification. Doors shall be with vision glass and louver as a part of complete assembly. Approved manufacturer approved equivalent.				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Door frame shall be Double rebate of size 143 x 58mm made out of minimum 1.20mm (18gauge) thick galvanized steel sheet with groved profile to receive the seal. Frames shall be mitered and field assembled with self tabs. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with non-fire rated puff. Door leaf should be 46mm thick fully glazed door with or without midrails. Door leaf rail and stile shall be manufactured from 0.8mm (22 guage) minimum thick galvanised steel sheet. The maximum size of the top rail should not exceed 150mm & bottom rail 200mm respectively. The stiles can be 150mm / 120mm as approved by the engineer. The internal construction of the door should be rigid with steel stiffeners/ pads and reinforcement. The infill material shall be resin bonded honeycomb core. All doors should be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite of 8mm toughen glass shall be fixed with steel beeding and screwed on to the face of rails and stile. Necessary gaskets to be used for holding the glass in position. Assembly of rail and stile shall be spot welded in the factory. All doors and frames shall be finished with etched primer coating, stove zinc phosphate primer and thermosetting polyurethane aliphatic grade paint of approved colour. The door leaf and frame shall have passed minimum 250 hours of salt sprey test. Rate should include supply and installation of door and hardware as a complete assembly as given in the schedule. Once frame installed should be filled with fire rated PUF as recommended by the manufacturer or the Engineer in charge **D6A,6B,D5A ., etc any additional door as in GFC Ironomergies (Dorma or equivalent)** Butt Hinges D Type Pull Handle (300mm) Dead Lock 300mm Tower Bolt Allen Key	Sqm	34.00	11,931	4,05,654
8.9	**Structural Glazing works** **Supply and fixing of 8mm SKN 144 Toughened glass +16mm Air Gap +6mm Clear Toughened Glass GL1A & GL1B etc.,any additional door as in GFC Ironomergies (Dorma or equivalent)** Butt Hinges D Type Pull Handle (300mm) Dead Lock 300mm Tower Bolt External Trim with Lock Sash Lock with Lever Handle Panic bar with External Trim Allen Key	Sqm	80.00	3910	3,12,800
9	**FLOORING & DADOING** Contractor shall submit flooring (for all type of flooring) pattern drawing and get approved by Engineer in charge before				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	execution of work.				
9.1	Cement concrete flooring with concrete hardener topping under layer 62 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) and top layer 12mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix : 2 graded stone aggregate, 6mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacture's specifications. This includes cost of cement slurry, but excluding thecost of nosing of steps etc. complete. 62mm thick with 20mm nominal size stone aggregate	Sqm	135.00	609.05	82,222
9.2	Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS : 15622 (thickness to be specified by the manufacturer) of approved make in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados over 12 mm thick bed of cement Mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete.	Sqm	305.00	1520.00	4,63,600
9.3	Providing and laying Ceramic glazed anti skid floor tiles 300 mm x 300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick Cement Mortar 1:4 (1 Cement : 4 Coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including pointing	Sqm	84.00	1687.00	1,41,708
9.4	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades,laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand),jointing with grey cement slurry @ 3.3kg/sqm including grouting the joints with white cement and matching pigments etc., complete. Size of Tile 600x600 mm	Sqm	2,370.00	2130.00	50,48,100
	~~**Self Levelling work**~~				
9.5	Providing & laying 2-3 mm thick Eurocol 975 self-levelling compound using Eurocol 078 Europrimer Multi. The product should be manufactured in GERMANY and must have EMIDOCE EC 1 R Plus, GISCODE ZP 1. CE marking according to DIN EN 13813: CT- C30-F6. The product should Base : Special cements, mineral aggregates, polyvinyl, acetate, condenser and additives **Colour : Grey** Consistency : Powder Cleaning Agent : Water Mixing ratio: 6.0 Ltr water with 25 kg of powder Consumption approx.: 1. 5 kg /m²/mm Processing time: 20 - 30 minutes; we recommend a waiting time of 2-3 minutes Ready for foot traffic approx.: 2 – 4 hrs. Drying time approx. : 24 hrs with 3 mm layer thickness, for each additional 2 mm should another day of drying time be added	Sqm	345.00	556	1,91,820

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
9.6	**2mm thick Vinyl Flooring** Providing & laying Eternal 2.0 mm thick approved Vinyl Flooring (Wood, Stone & Abstract Shade) as per EN-ISO 10582, made up of PUR Pearl lacquering protection technique as per manufacturers specifications. The product Should have 0.7mm transparent compact wear layer to provide better performance. A non woven, fully impregnated, glass fleece layer functions as the backbone of the flooring. The Vinyl flooring mustl conform to all standards including the new VOC emission classes. The welding / seaming shall be done using hot air welding gun Thickness as per EN-ISO 24346 : 2.0 mm Roll width as per ENISO 24341 : 2 m Wear Layer as per EN-ISO 24340 : 0.7mm Roll Length as per EN - ISO 2431 :< 25mm Abrasion Resistance EN-660-2 : Group-T Commercial use as per EN-ISO 10874 : CLASS 34 very heavy Light Industrial use as per EN-ISO 10874 : Class 43 heavy Resistance to chemicals as per EN-ISO 26787: very good Reaction to fire as per EN13501-1: B-s1 Slip Resistance as per DIN51130 R10 Residual Indentation as per EN-ISO 24343-1 : <0.05mm, typical value 0.03mm Method of Installation: Vinyl Flooring to be installed over Eurocol 975 self leveling compound using Eurocol 078 Primer	Sqm	345.00	1540.00	5,31,300
10	**ROOFING & CEILING** Contractor shall submit false ceiling pattern drawing and get approved by Engineer in charge before execution of work.				
10.1	Making khurras 450mm x 450mm with average minimum thickness of 50mm cement concrete 1:2:4 finished with 12mm cement plaster 1:3 (1 cement : 3 coarse sand) and a coat of neat cement rounding the edges & finishing the outlet complete including providing suitable M.S.Iron grating.	Nos	8.00	187.60	1,501

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
10.2	Providing and Fixing 15 mm thick densified tegular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x 600 mm panel to from grid of size 600x600 mm, resting on periphery walls /partitions on a Perimeter wall angle pre-coated steel of size(24x24X3000 mm made of 0.40 mm thick (minimum) sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calicum silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening"for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main 'T', bottom exposed with	Sqm	340.00	1497.90	5,09,286
	Heat Resistant Terrace Tiles				
10.3	Providing and fixing Heat Resistant Terrace Tiles (300 mm x 300 mm x 20 mm) with SRI (solar refractive index) > 78, solar reflection > 0.70 and initial emittance > 0.75 on waterproof and sloped surface of terrace, laid on 20 mm thick cement sand mortar in the ratio of 1:4 (1 cement : 4 coarse sand) and grouting the joints with mix of white cement & marble powder in ratio of 1:1, including rubbing and polishing of the surface upto 3 cuts complete, including providing skirting upto 150 mm height along the parapet walls in the same manner.	Sqm	2,165.00	1150.00	24,89,750
11	**FINISHING WORKS**				
	Internal Walls				
11.1	12 mm cement plaster finished with a floating coat of neat cement of mix : 1:4 (1 cement: 4 fine sand)	Sqm	105.00	214.20	22,491
	External Walls				
11.2	18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement: 5 coarse sand) and a top layer 6mm thick cement plaster 1:3 (1 cement: 3 coarse sand)	Sqm	1,950.00	272.05	5,30,498
	Ceiling Plastering				
11.3	**6 mm cement plaster of mix :** 1:3 (1 cement : 3 fine sand)	Sqm	530.00	143.80	76,214
11.4	Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers	Kg	50.00	50.35	2,518
11.5	Distempering with oil bound washable distemper of approved brand and manufacture to give an even shade :	Sqm	525.00	93.70	49,193
11.6	New work (two or more coats) over and including water tinnable priming coat with cement primer	Sqm	105.00	150.65	15,818

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
11.7	Finishing walls with textured exterior paint of required shade : New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/ 10 sqm	Sqm	10.00	150.65	1,507
11.8	Finishing walls with Acrylic Smooth exterior paint with exterior primer having VOC (Volatile Organic Compound) content less than 50 grams/ liter of required shade : New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm)	Sqm	2,575.00	96.05	2,47,329
11.9	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	Sqm	230.00	122.50	28,175
	Gypsum Plastering				
11.10	Providing and applying 12 mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part - 1 & II) 1976, applied on hacked / uneven background such as bare brick/ block/ RCC work on walls & ceiling at all floors and locations, finished in smooth line and level etc. complete.	Sqm	4,605.00	217.35	10,00,897
11.11	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/ liter of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour. Two coats of premium acrylic emulsion paint of interior grade	Sqm	5,415.00	71.00	3,84,465
11.12	Painting with synthetic enamel paint over MS works, having VOC (Volatile Organic Compound) content less than 150 grams/ liter, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour. Two coats.	Sqm	75.00	75.00	5,625
	Toilet Cubical				
11.13	Providing and fixing toilet cubical systems of approved equivalent make and manufactured in standard dimensions of 600mm ± 10mm width door size with 12mm thick solid Compact Laminate panels made of KRAFT paper impregnated with Phenolic resins under high pressure and temperature, including doors, pilasters & intermediate panels, which should be resistant to heat, bacteria, water, chemical, scratch and impact. Finished product should be as per approved texture, shade & drawing, detailing and developed according to IS-2046 and BS-476/97 standards. The toilet cubicle setup shall include necessary hardware fittings, made out of stainless steel (Grade-304), as per manufacturer's specifications and approved by Engineer-in-Charge				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Hardware fittings should consist of (1) Stainless steel Adjustable foot/ pedestal of SS 316 grade to give 150mm clearance from bottom and of weight not less than 600grams (2) Stainless steel U-channels of 20 gauge and 12 x 20mm size (3) Stainless steel Top rail pipe (OD:24mm of 18 gauge) with corner connectors (4) Stainless Steel Head Rail Tubular Holder (5) Stainless steel Gravity hinges (3 nos.) not less than 75mm length and weight not less than 210 grams of weight not less than 200 grams. (6) Stainless steel Coat hook with nylon door stopper (7) Stainless steel Door knob (8) Stainless steel Thumb-turn lockset with occupancy indicators (9) Wall bracket SS 304 (10) Corner Connector (11) Rubber noise deafening tape (12) Stainless steel 304 Screws and PVC wall plugs. The top fitting arrangement shall comprise of stainless steel (round) top rail, fixed to pilasters and stainless steel tubular holder. Stainless steel wall fixing roses shall be used on the wall to hold the top rail. In absence of brick walls, stainless steel corner bends (connected to the top rail) will be used on the corners of the cubicle. All screws should be of stainless steel (Grade-304). All pilasters will be supported by stainless steel adjustable foot. The base of the stainless steel bottom cladding will be anchored to the floor with a clearance height of 150mm.The intermediate panel shall be of one continuous panel without any joint. All visible edges will be chamfered.				-
11.13.1	a) L-Shape Toilet cubicle with standard dimensions of 2000 ± 25mm (Height) x 1000mm (Width) x 1550mm (Depth) consisting of 600 ± 10 mm width of door. The rate includes cost of 12mm Solid compact laminate board along with all necessary fixtures mentioned above	Sqm	54.00	31,942	17,24,868
11.13.2	b) I-shape (front partition) toilet cubicle with standard dimensions of 2000 mm (Height) x 1765 mm (Width) consisiting of 600 mm Width of door .The rate includes cost of 12mm Solid compact laminate board along with all necessary fixtures mentioned above	Sqm	12.00	24,973	2,99,676
12	**DRAINAGE** Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : 150mm dia RCC Pipe	Rmt	110.00	356.70	39,237
13	**ROAD WORKS**				
	Granual Sub - Base				
13.1	Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30	Cum	250.00	2,090	5,22,425

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
13.2	**Wet Mix Macadam** Providing, laying, spreading and compacting graded stone aggregate (size range 53 mm to 0.075 mm) to wet mix macadam (WMM) specification including premixing the material with water at OMC in for all leads & lifts, laying in uniform layers with mechanical paverfinisher in sub- base / base course on well prepared surface and compacting with vibratory roller of 8 to 10 tonne capacity to achievethe desired density, complete as per specifications and directions of Engineer-in-Charge. With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30	Cum	310.00	2,132	6,60,998
14	**ALUMINIUM WORK DOORS AND WINDOWS** Note for all items of this Section :				
14.1	Contractor shall prepare shop drawing based on intent/ concept drawing and submit Engineer In Charge for approvel and shall get approval before mockup/ execution of work. Work shall carry out as per final approved shop drawing and approved mock up. Contractor shall responsible against stability, safety, leakage, etc all complete.Testing work shall be carried out by Contractor as suggested by Engineer In Charge. Providing and fixing aluminium work for doors, windows, ventilators and partitions with any type of appropriate extruded aluminium sections of approved make conforming to IS: 733 and IS : 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold fasteners including necessary filling up of gaps at junctions, at top, bottom and sides with required Silicon rubber/ neoprene gasket, GI tie rod, wool pile etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including adjustable angle cleat, Aluminium snap beading for glazing/paneling, CP brass/ stainless steel screws, all complete as per approved shop drawings and the directions of Engineer-in-charge. Rate shall be inclusive of required size of dash fastner for fixing the frame, packing, backup rod and silicone sealant for both side gap filling and scafolding, epdm gaskets, , cost of sealants, fabrication, aluminium brackets, fasteners with pvc sleeves, s.s. screws, masking tape, protective tape, backer rods, nut / bolts with rod, cleaning of any stain on glazings before handing ove etc. (Only Glass, Jali and iron mongery to be paid for separately) : Contractor shall prepeare and submit shop drawing base on concept drawing. Work shall carried out as per the approved shop drawings and approved sample. Actual weight of installed Aluminium sections shall only be measured and considered for the payment. Aluminium sections of Euro profile type shall be of Indo Alusys /Baruka with minimum thickness to be considered as 1.8 mm Sample board of all aluminium profiles, hardware and fabrication accessories i.e. epdm gasket, s.s. screws, silicon, woolpile, corner bracket etc. of approved make to be submitted to Engineer - in - Charge Façade consultant for approval before any procurement.				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Aluminium profiles to be used as per the profile drawings enclosed. The Glass thickness, Hardware shape / colour / make and mass weight of aluminium door / windows glazing shall be as mentioned in drawing, makes of material. The contractor shall procure samples of the same and get it approved by the Engineer -in- Charge before procurement 'The Contractor must provide details of structural calculations of the member offered, and also provide drawings of individual profiles and also details of any other profiles that may be used - clearly indicating all dimensions, wall thickness and weight Kg./m for all items. 'The Aluminium frame section and thickness of the glass shall be as per design load calculation and wind pressure. Before execution of the work minimum thickness of the glass shall be designed and got to be approved by the EIC. The work shall be carried out only after approval of the shop drawings by the EIC.				
14.1.1	a) For Fixed Portion Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)	Kg	6,800.00	391.80	26,64,240
14.1.2	b) For Shutter Portion Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)	Kg	680.00	452.40	3,07,632
14.2	**Supply & fixing of Ironmongeries for Aluminum doors and Windows (Alu alpha,Schlegel gisse or equivalent)**				
14.2.1	**Single Shutter Openable Door With/ without fixed Window** MULTI POINT LOCKING WITH MORTICE HANDLE (for single leaf door) (with multipoint locking mortice lock, locking point, locking strip, etc. as required) + CYLINDER (with lock shield for cylinder, etc. as required) profiles of up to 75mm with robust spring loaded gearing mechanism. Handle moves to original position and when not pressed down. Material is of Aluminium & Zamak and tested upto 200000 cycles. Multipoint Locking Mortice Locking Body. Materials composition is Nickel & stainless steel and tested upto 200000 cycle ,60mm(30mm+30mm) long cylinder with latch halfway through.Standard cylinder that suits most profile depths. It has security of 5 spring loaded pins. Cover cap for cylinders. Made up of Zamak material Eurogroove compatible locking point (2 /4 point as required). Materials composition is Zamak & stainless steel and tested upto 15000 cycles. Made made up of polymide material. Comes in 20mm width and compatible with 20mm groove on façade vents and Eurogroove profile. D11A, DW2A .etc.any additional door as in GFC	Nos	38.00	9468.39	3,59,799
14.2.2	**Single Shutter Openable Window with/without Fixed glass** MULTI POINT LOCKING WITH MULTIPOINT HANDLE (WITH KEY)				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	(with extensor pin, locking point, locking strip, pull in block, etc. as required) Multi-point locking handle with key and 21mm fork Fork. Width of 14mm. 3 fork lengths available in this handle 21mm, 27mm & 37mm. Material composition is Aluminium,Zamak & Stainless Steel and tested upto 15000 cycles. 23mm pin included.No drilling of hole required and so ease of installation. Adjustment point set. Designed for 20mm & 18mm groove i.e. Eurogroove compatible.Increases weather sealing of window. Material composition is Zamak & Stainless Steel and tested upto 200000 cycles Eurogroove compatible locking point (2 /4 point as required). Materials composition is Zamak & stainless steel and tested upto 15000 cycles. Made made up of polymide material. Comes in 20mm width and compatible with 20mm groove on façade vents and Eurogroove profile. BUTT HINGE Designed for 20mm & 18mm groove i.e. Eurogroove compatible. Designed for use on up to 80kg side hung windows and doors. Tested up to 200000 cycles. RESTRICTOR Eurogroove compatible 8" Detachable Restrictor Assembly, should withsatnd minimum 1000 N, when opened at restricted position, Austenitic 304*, Compatible with all Securistyle heavy duty hingesstainless steel for enhanced corrosion resistance, Tested to BS6375-2 + with release key W12B,W14A & W14B.,etc.any additional door as in GFC	Nos	42.00	6074.73	2,55,138
14.3	Providing and fixing glazing in aluminium door, window, ventilator shutters, fixed glazing 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). Glass shall be of any shade according to described parameter. Sample shall be approved before execution the work. Installed Area of glass (without frame) shall be measured for payment without considering any wastage.				
14.3.1	e) With clear toughened glass panes of 8 mm thickness, Cost of glass including cutting, edge grinding, wasteges, stacking, carrying to heights and fixing in appropriate locations is to be included in the quoted rate as per the details for all items.	Sqm	245.00	1,100	2,69,500
14.3.2	c) For North Light With Performace Low E toughened glass panes of 8 mm thickness having U value 3.9 or better W/sqm.K, Maximum SHGC = 0.4 or better, Minimum VLT = 35% or better, Internal Reflection 15% or better External Reflection 24 % or better, On Clear substrate without any colour tint of approved make and as per approved sample, Cost of glass including cutting, edge grinding, wasteges, stacking, carrying to heights and fixing in appropriate locations is to be included in the quoted rate as per the details for all items.	Sqm	885.00	2020	17,87,700

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
14.3.3	f) With DGU of 6mm internal, with 16 mm gap and 8 mm Perfromace Low E external glass. (6+16+8). All glass to be heat Strenghtened glass having U value 1.4 or better W/sqm.K, Maximum SHGC = 0.25 or better, Minimum VLT = 40% or better, Internal Reflection 14% or better External Reflection 20 % or better, On Clear substrate without any colour tint of approved make and as per approved sample, Cost of glass including cutting, edge grinding, wasteges, stacking, carrying to heights and fixing in appropriate locations is to be included in the quoted rate as per the details for all items.	Sqm	95.00	3,910	3,71,450
14.3.4	Extra for acid etching/sand blasting / frosting of glass as directed by Engineer-In-Charge. and as per approved sample	Sqm	10.00	300.00	3,000
15	**<u>WATERPROOFING WORKS</u>** **General Notes:** 1) The quote shall be based on the waterproofing system 2) The tenderer can propose alternate waterproofing system along with method statement as option for Consultants and Employers Review and Approval, this option shall be submitted which shall be separate and shall not be included in this tender. 3) Method statement shall be submitted for the works before commencement of works 5) All waterproofing system shall have **10 years warranty** from the period of successful completion of all the woks under this tender. 6) The tenderes to list the specialist waterproofing sub contractor details as required under this document 7) The contractors to ensure that all works including their scope of work, plumbing and sanitary scope of works by others are completed before commencement of waterproofing works. 8) Contractor scope is to prepare the base including cleaning and wire-brushing, treating the cracks, construction joints and honeycombs by grouting it with a specialized non-shrink cementitious compound, curing, etc. 9) The contractor to ensure that all punctures, damages to laid waterproofing by other agencies shall be reinstated by the contractors waterproofing specialist at no extra cost and without any cancellation of warranty. 10) Water testing shall be carried out for atleast 24 hours from the time of laying and to be witnessed by Employers Representative 11) If any water leaks are identified during the testing period then the leak area identified shall be pressure grouted with approved material. 12) Extreme care and preparation and completion of waterproofing work should be carried out at junction of sloped roof and wall / parapet wall. **Generally the scope includes** The treatment to include cleaning and wire-brushing the concrete surface, treating all the cracks (wider than hairline), construction joints and honeycombs by grouting with specialized non-shrink cementitious compound, grouting the annular space between the pipe and concrete / masonry, providing The approved Systems are i) SIKA ii) FOSROC iii) BASF or approved equalivalent				-

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
15.1	**Waterproofing for Toilet** 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: 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 Second layerr 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 followwed 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	Sqm	150.00	298.00	44,700
15.2	**Waterproofing for Overhead Tank** Providing and laying waterproofing treatment to the internal surface of water tank with five coats of Tapecrete or equivalent water proofing comprising of four slurry coats of Tapecrete polymer admixed with cement in the proportion 1:2 (one part Tapecrete or equivalent and two parts cement), one putty coat of Tapecrete admixed with silica powder and cement applied on the entire surfaces of the water tanks. After the second coat of tapecrete or equivalent all corners, edges, joints of pipes with concrete etc should be sealed with epoxy putty. The Tapecrete or equivalent treatment shall be applied directly on the smooth RCC surfaces over a primer coat of neat cement slurry admixed with impremeable chemical.	Sqm	120.00	1034.65	1,24,158
15.3	**Terrace Waterproofing with Brickbat Coba** Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs,balconies, terraces etc consisting of following operations: (a) Applying a slurry coat of neat cement using 2.75 kg/sqm of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300 mm height including cleaning the surface before treatment. (b) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115 mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs. (c) After two days of proper curing applying a second coat of cement slurry using 2.75 kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge.	Sqm	2,355.00	1034.65	24,36,601

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	(d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3 mm deep. (e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge : With average thickness of 120 mm and minimum thickness at khurra as 65 mm. (Plan area shall be measured and paid)				
15.4	**AAC Light Weight Block in Sunken Filling** Providing and filling light weight AAC bats (of size 40-60 mm) with cement mortar mixed in the ratio 1:3:6 (1 cement : 3 coarse sand : 6 block bats) including mixing of approved water proofing compound in recommended proportion. The laid brick bat mix shall be well rammed and compacted as required. Further surfaces shall be screeded with cement concrete mix 1:1.5:3 (1 cement : 1.5 coarse sand : 3 stone grit of size 6 mm and below by volume) admixed with approved integral water proofing compound in recommended proportion, laid to an average thickness of 25mm and finished smooth or ready to receive finish material as specified. Care shall be taken prior to filling all pipes passing through sunk portion such that the pipes are pressure tested by maintaining pressure for 24 hours and junctions of pipes passing through walls, slabs are well grouted and sealed.	Cum	241.00	4003.00	9,64,723
16	**ROOFING , CEILING AND PARTITION** Contractor shall submit false ceiling pattern drawing and get approved by Engineer in charge before execution of work.				
16.1	**Aluminum Metal Roofing System** Providing and installation of Aluminum Metal Roofing 65/400 "Self Supported " Secret Fix Standing Roofing System in 0.9mm thick AA 3004 Aluminum alloy . a) **The top layer Kalzip 65/400 profiled sheeting** manufactured from aluminium self-supported standing seam roof system manufactured from aluminium alloy AA 3004 (AlMn1Mg1) as specified in BS EN 1396 :2007),minimum material thickness of 0.9 mm and colour coated finish on the exposed surface. (PVDF std.colour RAL 9006/9010/9007) aluminium self-supported standing seam roof system manufactured from aluminium alloy AA 3004 (AlMn1Mg1) as specified in BS EN 1396 :2007), b) **Vapour Control Layer** – A single layer of double-sided Aluminium foil/ Polyethylene Film c) **Steel Liner** – Kalbau (Kalzip) 35/200, 0.47 mm colour bare Galvalume 1000 mm total cover width x 32-35mm deep ribs spanning up to 1500mm centres (multiple spans) d) **Insulation -** Two layer of 75mm thick each of Mineral wool insulation of 75 mm thickness minimum 60 kg/m3 density with thermal conductivity (K) =0.040 W/mk at 25 degree Celsius. Fire classification with test procedures to BS 476: Parts 6 & 7.	Sqm	1,165.00	5,706	66,47,490

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	e) Eaves: Eave details shall be completed by using Eave Filler, Drip angle.Gable End: The gable end covered using Gable End Clip, Gable End Channel, and Tolerance clip All Aluminium parts shall be from Al 6063/T5 grade. f) Ridge:The ridge will be completed by using related Ridge accessories like Ridge filler,closure etc Clips – The aluminium clips must be used to fix aluminium sheets to the substructure.Appropriate non penetrative ST clips to be used. The clips shall be fixed to purlins with help of SS 304 screws Aluminium welding (also to be point tested for DP test , as per Engineer - In -Charge reqm) as per site requirement Flashing to be made from 0.9 mm thick PVDF Coated Aluminium AA3004 alloy max girth 560mm **Underdeck Lining (as false ceiling) :** Supply and installatiom of colour coated PANELRIB profile sheeting with 1110 mm effective cover width profile with nominal 3.5 mm deep ribs at pitch of nominal 50.50 mm centre to centre distance. The feed material is manufactured out of nominal 0.45 mm Base Metal Thickness (BMT), Hi-strength steel with min. 550 MPa yield strength, metallic hot dip coated with Aluminium-Zinc alloy (55% Aluminium, 45% Zinc) as per AS 1397 - Zincalume AZ150 (Min. 150 gms/sq.mt total on both sides) pre-painted with Super Durable Polyester Colorbond XRW quality paint includes inorganic infrared reflective pigment (High SRI-"Thermatech technology") steel quality paint coat as per AS/NZS 2728 type 3-4 . The paint shall have a total coating thickness of nominal 35 µm, comprising of nominal 20 µm exterior coat on top surface and nominal 5 µm reverse coat on back surface over nominal 5 µm primer coat on both surfaces of approved colour shade by concern authority.				
16.2	**Polycarbonate Sheet** **Location: Passage** Design, Manufacture, Supply and Installation of assembly of co-extruded UV protected 20 mm thick multi-layered panels incorporated into a complete system. Panels shall have six layers in translucent combination to achieve required Lux levels. Panels shall be with grip-lock notch standing seam running lengthwise to accommodate the connectors. Panel system shall be assembled & installed on MS Structure (paid Panel length: 11980mm (Max.) Width: 600-900 mm Panels shall pass dart drop impact test as per IS 14443-97, shall show no sign of breakage on Polycarbonate sheets which have been exposed to UV for a min. of 500 Hours as per ASTM G 155 Panels shall not have Yellowness Index as per ASTM D 1925 of 15 units when tested on a sample exposed to UV for 500 Hours as per ASTM G 155. All the above mentioned test certificates shall be submitted by the manufacturer U value shall not be more than 2.1 W/m2K as per EN ISO 1077-2:2018 Panel shall be with additional End cap/Aluminium U / F Profile / Glazing Bar (mill finish) for ends as required Panel shall be fixed over M S structural steel MS purlin (paid separately) conforming to the detail technical architectural drawings specifications as per approved	Sqm	80.00	4,879	3,90,320
17	**Miscellaneous Works** **Brick Masonry Chamber**				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
17.1	Constructing masonry Chamber 300x300x500 mm inside, in brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand :10 graded stone aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	11.00	1,195	13,149
17.2	Constructing masonry Chamber 450x450x600 mm inside, in brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand :10 graded stone aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12mm thick, finished with a floating coat of neat cement complete as per standard design :				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	5.00	5,500	27,500
17.3	Constructing masonry Chamber 600x600x750 mm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve,with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside	Each	21.00	6,850	1,43,842
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5				
17.4	Constructing masonry Chamber 1630x200x1000 mm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve,with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside	Each	1.00	9,665	9,665
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5				
	Cutout Provision				
17.5	Providing and laying cutout on walls and neatly finish with plaster all complete as per architectural drawings and the directions of Engineer-in-charge				
17.5.1	450mm x 450mm	Nos	1.00	1,200	1,200
17.5.2	800mm x 450mm	Nos	16.00	2,500	40,000
	Core Cutting to 150mm thick Slab/ Wall				
17.6	Supply labour and tools for diamond Core Cutting of concrete wall / slab of average thickness 150mm complete as directed by Engineer.				
17.6.1	For dia 55mm	Nos	10.00	150	1,500
17.6.2	For dia 75mm	Nos	10.00	175	1,750
17.6.3	For dia 125mm	Nos	10.00	225	2,250

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
17.6.4	For dia 150mm	Nos	10.00	300	3,000
17.6.5	For dia 200mm	Nos	10.00	400	4,000
17.6.6	For dia 250mm	Nos	10.00	500	5,000
18	**Acoustic Panel Works** **Acoustic Ceiling Work**				
18.1	Providing & Fixing of Armstrong Wooden finished Suspended Ceiling System with Woodworks Vector edge tiles with Armstrong Prelude 43 exposed grid. The Tile in RG3003 (RG3) perforations with approved laminate (Portland Maple, Sea Beech, Siam Wood & Mystique Walnut) finish would have an NRC of 0.42, Humidity Resistance (RH) of 70% in module size of 600mm x 600mm x 18mm and density of 725 Kgs/M3. The tile edges should feature the vector edges or the engaging edges and the reverse tegular non engaging edge to hide the grid, creating a 6mm shadow reveal and also provide downward mountability without any tools. The grid should be of “Armstrong” make with 24mm wide T -section flanges color white/black having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 43mm and a load carrying capacity of 17.8 Kgs/M2. The T Sections have a Galvanizing of 90 grams per M2 and pullout strength of 100kg. Suspension system for Armstrong grid to be of Armstrong make. INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using Armstrong suspension system (specifications be low) at 1200mm maximum centre. The First/Last Armstrong suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be Armstrong wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers. Vector safety clip should be compulsorily used by fixing it to the tile which prevents accidental dislocation of tile. Installation should be carried out as per Armstrong recommended procedure	Sqm	90.00	5,031	4,52,790

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Axiom Trim Channel				
18.2	Classic Axiom trim (AX2STR42/ AX4STR42/ AX6STR42): 50mm/100mm/150mm wide face with 19.3mm(+/-0.50mm) horizontal legs, straight sections with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip, extruded Aluminum, factory finished (minimum 50 microns factory - applied baked polyester paint).Aluminum Extrusions formed with distinct architectural detail groove on top and bottom flanges and special bosses to receive the tee bar connection clips and splice plates, to provide positive mechanical lock with no visible fasteners. Axiom Splice Plate (AX4SPLICE/AXSPLICE): Formed to fit into special bosses in the Axiom and locked in place with factory-installed screws. These Steel splice plates (AX4SPLICE) are used to align and secure all joints between sections of Axiom trims. Each joint in the 50mm section height/ Knife Edge will require one splice plate whereas 100 mm & 150mm Axiom trims will require 2 splice plate at each joint. Corners are to be formed by mitering the end of axiom and splice plate (AXSPLICE) to be bent at right angle for connecting the end pieces. 1. Axiom Tee-Bar Connection Clip (AXTBC): Commercial quality G.I formed to fit into special bosses and locked in place by factory-installed screws and attached to Armstrong (XL-24 / XL-15/Silhouette/Interlude) suspension system members. T-Bar connection clips are used to attach the Axiom to the supporting Suspension system members. These two-piece Aluminum clips are supplied as an assembled unit with the steel locking screw factory installed. One clip is required at each location where the grid system intersects the Axiom trim. Hanging Grid clips(AXHGC):Classic axioms to be hung independently to the structural soffit by engaging the Hanging Grid Clip into the bosses of the Axiom trim channel and securing it to structural soffit using aircraft cables/GI wire. C) Installation Procedure: 1. Hang the sections of Axiom Trim onto the grid system by engaging the top ear of the connection clip under the boss of the channel trim. Slide the lower leg downward to engage the lower boss on the trim and secure by tightening the locking screw.= 2. Complete the installation of all channel trims sections. Install and secure the splice plates, corner pieces, alignment plates etc. 3. Make adjustments as necessary to properly align the complete installation. 1. Hang the sections of Axiom Trim onto the grid system by engaging the top ear of the connection clip under the boss of the channel trim. Slide the lower leg downward to engage the lower boss on the trim and secure by tightening the locking screw 2. Complete the installation of all channel trims sections. Install and secure the splice plates, corner pieces, alignment plates etc. 3. Make adjustments as necessary to properly align the complete installation	Rm	415.00	1,295	5,37,425
18.3	**Wall Acoustic Panel**				

S.No	ITEM DESCRIPTION	Unit	Quantity	Rate	Amount
	Providing and Fixing Armstrong Channeled Woodworks perforated panels of width 192mm, thickness of 15mm and length 2400 mm or as required by the Engineer -in- Charge made of a Moisture resistant fibre board with minimum 595 Kg/M3 density substrate with a laminated facing as per the approved shade & finish and a melamine balancing layer on the reverse side. The boards shall have a special perforation pattern where the visible surface has a “Helmholtz” fluted perforation of 3mm width and 5mm of visible panel each. The edges of the panels shall be “tongue -and-grooved” to receive special clips for installation. The back of the perforated panel shall have sound absorbing nonwoven acoustical fleece having NRC of 0.65. The panels shall be mounted on special aluminium splines (keel) using clips provided by Armstrong and approved by the Engineer-in-Charge **INSTALLATION:** Install wooden battens (provided by others) of section 50x50mm or as approved by the Architect on the solid wall horizontally using screws and plugs at spacing of 600mm centreto- centre. Screw the aluminium extruded keel for channelled woodworks provided by Armstrong over the lowest and second wooden batten at an on-centre distance of 600mm. Install the Skirting (provided by others) of width 50mm or more as required by the Engineer-in-Charge and insert the tongue end of the panel in the skirting. Place the inside clip on the groove end of the panel along the Al keel and then place the tongue end of the next panel. Continue installing rows of panels by inserting the tongue into the groove of the earlier inserted panel and progressively installing inside clips into the next keel till the actual height is achieved.	Sqm	270.00	4,166	11,24,820

Total (A) = Rs 107518145 /-

B) Electrical Works

S.No	Description of item	Qty	Unit	Rate	Amount
Sub Head - I- WIRING					
1.1	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 steel 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. (Group C)	50	Each	1,213.00	60,650.00
1.2	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: Group C	375	Each	990.00	3,71,250.00
2.1	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed Steel conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required: Group C	100	Each	707.00	70,700.00
2.2	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch 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:Group C	600	Each	555.00	3,33,000.00
3	Wiring for power plug with 2 X 4 Sq.mm. FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit along with 1 no. 4 sq.mm. FRLS PVC insulated copper conductor single core cable for loop earthing as required.	700	Metre	200.00	1,40,000.00
4	Wiring for power plug with 4X 4 Sq.mm. FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit along with 2 Nos. 4 sq.mm. FRLS PVC insulated copper conductor single core cable for loop earthing as required.	250	Metre	308.00	77,000.00
5	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required				
a)	2 X 6 sq. mm + 1 X 6 sq. mm earth wire	100	Metre	249.00	24,900.00
b)	4 X 6 sq. mm + 2 X 6 sq. mm earth wire	40	Metre	394.00	15,760.00
c)	4 X 10 sq. mm + 2 X 6 sq. mm earth wire	900	Metre	543.00	4,88,700.00
d)	4 X 16 sq. mm + 2 X 6 sq. mm earth wire	25	Metre	752.00	18,800.00
6	Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing **raceway/ furniture/ surface/ recessed** steel/ PVC conduit as required				
a)	3 x 1.5 sq. mm	1600	Metre	54.00	86,400.00
b)	6 x 1.5 sq. mm	650	Metre	100.00	65,000.00
c)	9 x 1.5 sq. mm	50	Metre	162.00	8,100.00
d)	3 x 2.5 sq. mm	2150	Metre	75.00	1,61,250.00
e)	6 x 2.5 sq. mm	3600	Metre	142.00	5,11,200.00
f)	9 x 2.5 sq. mm	1150	Metre	225.00	2,58,750.00
g)	3 x 4 sq. mm	50	Metre	117.00	5,850.00
h)	6 x 4 sq. mm	15	Metre	221.00	3,315.00
7	Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.				
a)	20 mm	25	Metre	146.00	3,650.00
b)	25 mm	25	Metre	165.00	4,125.00
c)	32 mm	50	Metre	203.00	10,150.00

S.No	Description of item	Qty	Unit	Rate	Amount
d)	40 mm	25	Metre	292.00	7,300.00
e)	50 mm	25	Metre	368.00	9,200.00
8	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.				
a)	20 mm	3150	meter	84.00	2,64,600.00
b)	25 mm	5650	meter	90.00	5,08,500.00
c)	32 mm	25	meter	92.00	2,300.00
d)	40 mm	25	meter	130.00	3,250.00
e)	50 mm	25	meter	158.00	3,950.00
9	Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required.				
a)	75 mm X 75 mm X 60 mm deep	2	Each	140.00	280.00
b)	100 mm X 100 mm X 60 mm deep	2	Each	160.00	320.00
c)	150 mm X 75 mm X 60 mm deep	2	Each	165.00	330.00
d)	150 mm X 150 mm X 60 mm deep	2	Each	232.00	464.00
e)	180 mm X 100 mm X 60 mm deep	2	Each	183.00	366.00
f)	200 mm X 125 mm X 60 mm deep	2	Each	239.00	478.00
g)	200 mm X 150 mm X 60 mm deep	2	Each	261.00	522.00
h)	200 mm X 150 mm X 75 mm deep	2	Each	268.00	536.00
i)	200 mm X 250 mm X 60 mm deep	2	Each	335.00	670.00
j)	200 mm X 250 mm X 75 mm deep	2	Each	351.00	702.00
k)	200 mm X 150 mm X 100 mm deep	2	Each	308.00	616.00
l)	200 mm X 250 mm X 100 mm deep	2	Each	366.00	732.00
m)	200 mm X 300 mm X 60 mm deep	2	Each	387.00	774.00
n)	200 mm X 300 mm X 100 mm deep	2	Each	403.00	806.00
o)	250 mm X 300 mm X 60 mm deep	2	Each	426.00	852.00
p)	250 mm X 300 mm X 100 mm deep	2	Each	465.00	930.00
10	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.	80	Each	342.00	27,360.00
11	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	70	Each	32.00	2,240.00
12	Supplying and fixing following size/ modules, Gl box along with modular base & cover plate for modular switches in recess etc as required.				
a)	1 or 2 Module (75mmX75mm)	200	Each	243.00	48,600.00
b)	3 Module (100mmX75mm)	2	Each	267.00	534.00
c)	4 Module (125mmX75mm)	2	Each	287.00	574.00
d)	6 Module (200mmX75mm)	50	Each	333.00	16,650.00
e)	8 Module (125mmX125mm)	50	Each	383.00	19,150.00
13	Supplying and fixing following Modular base & cover plate on Existing modular metal boxes etc. as required				
a)	1 or 2 Module	30	Each	114.00	3,420.00
b)	3 Module	2	Each	128.00	256.00
c)	4 Module	2	Each	138.00	276.00
d)	6 Module	50	Each	167.00	8,350.00
e)	8 Module	50	Each	196.00	9,800.00
14	Supplying and fixing following Modular switch/socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required				
a)	5/6 A switch	30	Each	85.00	2,550.00
b)	15/16 A switch	100	Each	132.00	13,200.00
c)	3 pin 5/6 A socket outlet	30	Each	111.00	3,330.00

S.No	Description of item	Qty	Unit	Rate	Amount
d)	6 pin 15/16 A socket outlet	100	Each	175.00	17,500.00
15	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 amps modular socket outlet and 5/6 amps modular switch, connection etc. as required.	60	Each	401.00	24,060.00
16	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 15/16 & 5/6 amps modular socket outlet and 15/16 amps modular switch, connection, painting etc. as required	50	Each	495.00	24,750.00
17	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 be used in non residential buildings).	140	Each	582.00	81,480.00
18	Supplying & fixing suitable size GI box wih modular plate and cover in front on surface or in recess including providing and fixing 25 A modular socket outlet and 25 A modular SP MCB,“C” curve including connections, painting etc. as required.	2	Each	639.00	1,278.00
19	Supplying and fixing DP sheet steel enclosure on surface/recess along with 25/32 A, 240 V “C” curve DP MCB completewith connections, testing and commissioning etc. as required	2	Each	848.00	1,696.00
20	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	2	Each	1,146.00	2,292.00
21	Supplying and fixing 20 amps, 240 volts, SPN industrial type, socket outlet, with 2 pole and earth, metal enc losed plug top along with 20 amps "C" curve, SP, MCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet and complete with connections, testing and commissioning etc. as required.	2	Each	1,232.00	2,464.00
22	Supplying and fixing 20 A, 415 V, TPN Industrial type socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 20 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	1,690.00	3,380.00
23	Supply and fixing for 16 amp single phase(2P+E) switch socket outlets with IP65 Protection in surface/recessed mounting with plug top complete as per specifications and as required.	4	Each	6,132.00	24,528.00
24	Supplying, installation, testing and commissioning of Passive Infrared(PIR) technology based occupency sensor having high performance, non regulating programmable type, suitable for connected load upto 10 amp, for mounting height upto 2.8 meter and for 5 meter diameter coverge area along with necessary fixing arrangements i/c programming at site etc. complete as required.	2	Each	4,538.00	9,076.00
25	Supplying, installation, testing and commissioning of Day light sensor with pre setted Lux level to cut the circuit, programmable type, suitable for connected load upto 10 amp, for mounting height upto 6 meter along with necessary fixing arrangements i/c programming at site etc. complete as required.	4	Each	4,273.00	17,092.00

S.No	Description of item	Qty	Unit	Rate	Amount
26	Installtion, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sqmm FRLS PVC insulated, copper conductor, single core cable, etc as required.	136	Each	171.00	23,256.00
27	Installtion, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sqmm FRLS PVC insulated, copper conductor, single core cable, including providing and fixing phenolic laminated sheet cover on the fan box etc as required.	54	Each	203.00	10,962.00
28	Supplying and fixing extra down rod of 10 cm length G.I. pipe, 15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	114	Each	33.00	3,762.00
29	Supplying and fixing extra conduit down rod of 20 cm length G.I. pipe 15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	76	Each	37.00	2,812.00
30	Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications as required of following sizes				
a)	50 mm wide x 40 mm deep	25	meter	551.00	13,775.00
b)	100 mm wide x 40 mm deep	165	meter	704.00	1,16,160.00
c)	150 mm wide x 40 mm deep	200	meter	855.00	1,71,000.00
d)	200 mm wide x 40 mm deep	100	meter	981.00	98,100.00
31	Supplying and fixing floor recessed junction boxes for GI raceway systems fabricated from 3 mm GI sheets finished with powder coating paint finish of approved colour of teh top cover only with 1, 2 or 3 nos "+", "I", ''L' shaped support in the centre in case required with 3 mm thick neoprene gasketted removable cover fixed by counter sunk cadmium plated screws including the cost of earth links at all joints to ensure earth continuity and including the cost of chasing and making good recess in floor etc complete as required and as below.				
a)	100mm x 100mm x 50 mm deep	4	nos	527.00	2,108.00
b)	150mm x 150mm x 50 mm deep	30	nos	651.00	19,530.00
c)	200mm x 200mm x 50 mm deep	60	nos	804.00	48,240.00
d)	250mm x 250mm x 50 mm deep	50	nos	998.00	49,900.00

S.No	Description of item	Qty	Unit	Rate	Amount
Sub Head - II- SDB, DISTRIBUTION BOARD					
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)				
a)	6 way, Double door	1	Each	1,661.00	1,661.00
b)	8 way, Double door	1	Each	1,760.00	1,760.00
c)	12 way, Double door	2	Each	2,053.00	4,106.00
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)				
a)	6 way (4 + 18), Double door	1	Each	3,693.00	3,693.00
b)	8 way (4 + 24), Double door	4	Each	4,601.00	18,404.00
3	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 CBs and incomer) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.)				
a)	8 way (4 + 24), Double door	1	Each	7,744.00	7,744.00
b)	12 way (4 + 36), Double door	20	Each	9,828.00	1,96,560.00
4	Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in th e existing MCB DB complete with connections, testing and commissioning etc. as required.				
a)	Single pole	680	Each	199.00	1,35,320.00
b)	Duoble pole	3	Each	556.00	1,668.00
c)	Triple pole	1	Each	826.00	826.00
5	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required	55	Each	8.00	440.00
6	Supplying and fixing following rating, four pole, 240 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
a)	40 amps	25	Each	832.00	20,800.00
b)	63 amps	1	Each	839.00	839.00
7	Supplying and fixing following rating, double pole, (single phase and neutral), 240 volts, residual current circuit breaker (RCCB), having a sensitivity current 30 milliamperes in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
a)	25 amps	1	Each	1,927.00	1,927.00
b)	40 amps	57	Each	2,095.00	1,19,415.00
c)	63 amps	1	Each	2,640.00	2,640.00
8	Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with testing and commissioning etc. as required.				

S.No	Description of item	Qty	Unit	Rate	Amount
a)	For 6 way, Double door SPN MCBDB	1	Each	629.00	629.00
b)	For 8 way, Double door SPN MCBDB	1	Each	731.00	731.00
c)	For 14 way, Double door SPN MCBDB	2	Each	864.00	1,728.00
9	Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.				
a)	For 6 way, Double door TPN MCBDB	1	Each	1,062.00	1,062.00
b)	For 8 way, Double door TPN MCBDB	24	Each	1,239.00	29,736.00
10	Supplying and fixing Digital Time Switch 1 channel weekly cycle, 56 adjustabile pre-recorded program, 2modules with impulse and holiday function complete with testing and commissioning etc. as required.	3	Each	6,204.00	18,612.00

S.No	Description of item	Qty	Unit	Rate	Amount
Sub Head - III- LIGHTENING CONDUCTOR					
1	Providing and fixing of lightning conductor finial, made of 25 mm dia 300mm long, G.I. tube, having single prong at top, with 85mm dia 6mm thick G.I. base plate i ncluding holes etc. complete as required.	20	Each	448.00	8,960.00
2	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)	1100	metre	104.00	1,14,400.00
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 vertical run)	175	metre	163.00	28,525.00
4	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.	13	Each	102.00	1,326.00
5	Jointing copper /G.I. tape (with another copper/ GI tape, base of the finial or any other metallie object) by riveting /nut bolting/sweating and soldering etc as required.	20	Each	93.00	1,860.00
6	Providing and laying G.I. tape 32 mm X 6 mm from earth electrode directly in ground as required.	350	meter	176.00	61,600.00
7	Earthing with GI earth pipe 4.5 meter long 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangemnet and watering pipe etc. with charcoal/coke and salt as required.	13	Each	5,308.00	69,004.00

S.No	Description of item	Qty	Unit	Rate	Amount
Sub Head - IV- FITTINGS & ACCESSORIES					
1	Supply, installation, testing , commissioning and numbering of light fixtures suitable for LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of Driver and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect				
a)	Suspended Fixture with 35-45 W LED light fixture, suitable for Suspended mounting decorative, IP 20 min, Lumen Output min 4000lm ,colour temperature 5700 K having efficacy not less than 100 Lumens /watt, THD <10%, CRI =80, EXtruded Aluminium housing, suitable diffuser, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per Wipro CAT no LE14-491-XXX-57+LE14A02C /equivent in Philips/Bajaj. Trunking length 1.5 or more, lumainare length approx 1.2, width of trunking 60 mm, suitable for suspending using 12mm threaded rod (inlcluded suspension system)	270	Each	5,724.00	15,45,480.00
b)	Wall mounted Fixture with 20-25 W LED light fixture, suitable for Wall mounting , IP 20 min, Lumen Output min 2000lm ,colour temperature 6500 K having efficacy not less than 100 Lumens /watt, THD <25%, CRI=80, Polycarbonate housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per Wipro CAT no LL20-221-XXX-65-NE1/equivent in Philips/Bajaj.	50	Each	955.00	47,750.00
c)	Surface Fixture Bulk Head with 10-15W LED light fixture, suitable for Surface mounting, IP65 min , Lumen Output min 720lm ,colour temperature 5700K having efficacy not less than 70 Lumens /watt, THD < 10%, CRI=80, PDC housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no LW07-141-XXX-57-XX/equivalent in PHilips/Bajaj.	75	Each	1,750.00	1,31,250.00
d)	Wall mounted fixture with 10-15W LED light fixture, suitable for Surface mounting, IP65 min , Lumen Output min 650lm ,colour temperature 6000K having efficacy not less than 70 Lumens /watt, THD < 25%, CRI=80, ABS plastic housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no LW01-101-XXX-60-XX/equivalent in PHilips/Bajaj.	45	Each	2,148.00	96,660.00
e)	Surface mounted fixture with 15-20W LED light fixture, suitable for Surface mounting, IP20 min , Lumen Output min 1697lm ,colour temperature 5700K having efficacy not less than 100 Lumens /watt, THD < 10%, CRI=80, PDC Aluminium housing along with CRCA skirting , inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no WIPRO -CRDL 11S023HP57 /erequivalent in PHilips/Bajaj.	80	Each	3,870.00	3,09,600.00

S.No	Description of item	Qty	Unit	Rate	Amount
f)	Recessed mounted fixture with 15-20W LED light fixture, suitable for recessed mounting, IP20 min , Lumen Output min 1527lm ,colour temperature 6000K having efficacy not less than 80 Lumens /watt, THD < 10%, CRI=80, PDC Aluminium housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no WIPRO LD81-171-XXX-60-XX(Iris LED Slim SQ)/equivalent in PHilips/Bajaj.	120	Each	1,883.00	2,25,960.00
g)	Surface mounted fixture with 40-45W LED light fixture, suitable for surface mounting, IP20 min , Lumen Output min 4500lm ,colour temperature 5700K having efficacy not less than 100 Lumens /watt, THD < 10%, CRI=80, CRCA housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no Wipro Immaculate (Surface Mounted)/equivalent in PHilips/Bajaj.	1	Each	7,274.00	7,274.00
h)	Suspended mounted fixture with 40-45W LED light fixture, suitable for Recessed mounting, IP20 min , Lumen Output min 4500lm ,colour temperature 5700K having efficacy not less than 100 Lumens /watt, THD < 10%, CRI=80, PDC Aluminium housing, inbuilt driver,including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable, switch for light control and earthing etc. upto suitable point complete as required as per WIPRO cat no Wipro Immaculate (Suspended Mounted)/equivalent in Philips/Bajaj.	55	Each	7,976.00	4,38,680.00
2	Supply of 1400 mm sweep ceiling fan (high efficiency model) complete with double ball bearing white colour with all accessories as per IS 374 with 2500 mm MS down rod off 15 mm nominal base with 2 mm wall thickness, bolt, check nuts, split pin canopies, blades, safety wire and all other accessories including 3 core flexible cord-including cutting and threading the pipe to the required length	190	Each	2,800.00	5,32,000.00
Sub Head-V- LT Panels					
1	**MAIN LT Panel**				
	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMINGS-1 & II**				

S.No	Description of item	Qty	Unit	Rate	Amount
(i)	2 Nos. 630 Amps, 35 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	Digital Multifuctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 630 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
(v)	1 no LED indicating lamp (for Trip indication)				
(V)	BMS Integration for ON/OFF/TRIP of Incomers				
B	**Bus Couplers :**				
i)	1 No. 630 Amps, 35 kA 4P MCCB without protection and extended rotary handle .				
ii)	2 Nos. Indication lamps (Red for MCCB ON, Green for MCCB OFF)				
iii)	BMS Integration for ON/OFF				
iii)	Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required.				
C	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 630 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
D	**Interlocking :**				
	Incomers and Bus coupler shall be mechanically interlocked such that Incomers are not paralleled.				
E	**OUTGOING SETION -I**				
(i)	1 No. 400 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-400A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter port for IBMS connection along with CT's class 1.0 accuracy 10 VA Burden 400A/5A & CT shorting link. 2 nos ON/OFF LED indicating lamp with BMS integration				
(ii)	1 No. 160 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-160A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 160A/5A & CT shorting link. 2 nos ON/OFF LED indicating lamps with BMS integration				

S.No	Description of item	Qty	Unit	Rate	Amount
(iii)	2 Nos. 125 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-125A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 125A/5A & CT shorting link. each 2nos ON/OFF indicating lamps with BMS integration				
(iv)	1 No. 100 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-100A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 100A/5A & CT shorting link. 2 nos ON/OFF LED indicating lamps with BMS integration				
(v)	1 No. 63 amp 16 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-60A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 60A/5A & CT shorting link. 2nos ON/OFF LED indicating lamps with BMS integration				
F	**OUTGOING SETION -II**				
(i)	1 No. 400 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-400A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection along with CT's class 1.0 accuracy 10 VA Burden 400A/5A & CT shorting link. 2 nos LED ON/OFF indicating lamps with BMS integration				
(ii)	2 Nos. 160 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-160A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 160A/5A & CT shorting link. each 2 nos ON/OFF LED indicating lamps with BMS integration				
(iii)	1 Nos. 125 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-125A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 125A/5A & CT shorting link. each 2 nos ON/OFF LED indicating lamps with BMS integration				

S.No	Description of item	Qty	Unit	Rate	Amount
(iv)	1 No. 63 amp 16 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with1 no Digital ammeter (0-60A) with 3 way selector switch & 1 no. 3 phase 4 wire unbalanced panel mounted, Digital kWH CT operated meter with Port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 60A/5A & CT shorting link. 2nos ON/OFF LED indicating lamps with BMS integration				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	6,20,644.00	6,20,644.00
2	**HVAC PANEL -1**				
	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMING**				
(i)	1 No. 400 Amps, 35 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	1 no Digital Volt Meter (0-500V) with 3 way selector switch, 1 no Digital Ammeter (0-400A) with 3 way selector switch and 1 set of 3 Nos. CT of 400 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
B	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 400 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
C	**OUTGOING**				
(i)	6 Nos. 100 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
(ii)	6 Nos. 63 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				

S.No	Description of item	Qty	Unit	Rate	Amount
(iii)	5 Nos. 32 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
(iv)	7 Nos. 16 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	2,45,730.00	2,45,730.00
3	**HVAC PANEL -2**				
3	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMING**				
(i)	1 No. 400 Amps, 35 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	1 no Digital Volt Meter (0-500V) with 3 way selector switch, 1 no Digital Ammeter (0-400A) with 3 way selector switch and 1 set of 3 Nos. CT of 400 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
B	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 400 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
C	**OUTGOING**				
(i)	5 Nos. 100 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
(ii)	8 Nos. 63 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				

S.No	Description of item	Qty	Unit	Rate	Amount
(iii)	6 Nos. 32 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
(iv)	7 Nos. 16 amp 10 kA TPN MCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	1,93,776.00	1,93,776.00
4	**MLDB-1**				
	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMING**				
(i)	1 No. 100 Amps, 25 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	1 no Digital Volt Meter (0-500V) with 3 way selector switch, 1 no Digital Ammeter (0-100A) with 3 way selector switch and 1 set of 3 Nos. CT of 100 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
B	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
C	**OUTGOING**				
(i)	9 Nos. 40 amp 10 kA TPN MCB with thermal and magnetic release having overcurrent and short circuit protection				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	84,250.00	84,250.00
5	**UPS PANEL**				

S.No	Description of item	Qty	Unit	Rate	Amount
	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMING**				
(i)	1 No. 125 Amps, 25 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	1 no Digital Volt Meter (0-500V) with 3 way selector switch, 1 no Digital Ammeter (0-125A) with 3 way selector switch and 1 set of 3 Nos. CT of 125 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
B	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
C	**OUTGOING**				
(i)	10 Nos. 40 amp 10 kA TPN MCB with thermal and magnetic release having overcurrent and short circuit protection				
(ii)	1 No. 40 amp 10 kA DP MCB with thermal and magnetic release having overcurrent and short circuit protection with 1 no. 1 phase 2 wire panel mounted, Digital kWH CT operated meter with port for IBMS connection alongwith CT's class 1.0 accuracy 10 VA Burden 40/5A & CT shorting link.				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	94,080.00	94,080.00
6	**MPDB1**				

S.No	Description of item	Qty	Unit	Rate	Amount
	Supplying, installation, testing & commissioning of floor mounted cubicall type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 25 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :-				
A	**INCOMING**				
(i)	1 No. 160 Amps, 25 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle .				
(ii)	1 no Digital Volt Meter (0-500V) with 3 way selector switch, 1 no Digital Ammeter (0-160A) with 3 way selector switch and 1 set of 3 Nos. CT of 160 A/5 A Class 1 accuracy and 15 VA burden. -- 1 Set				
(iii)	3 Nos. LED Phase Indication Lamp				
(iv)	2 Nos. LED Indication Lamp (Red for ON and GreenOFF)				
B	**BUSBAR**				
	Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50^0 C. The temperature rise should not be more than 40^0 C over ambient of 50^0 C.				
C	**OUTGOING**				
(i)	15 Nos. 40 amp 10 kA TPN MCB with thermal and magnetic release having overcurrent and short circuit protection				
	The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above	1	each	1,01,100.00	1,01,100.00

S.No	Description of item	Qty	Unit	Rate	Amount
Sub- Head-VI- Cables and Cable Trays					
1	Supply and fixing safety instruction chart in word duly framed with 5 mm thick glass as required, (approx. Front area 1.20 sq.m)	6	each	298.00	1,788.00
2	Providing of set of 4 Nos. 9.5 Litre capacity GI bucket painted in post office red colour with prior coat of red-oxide paint and written with white paint 'FIRE' and mounted on MS angle iron frame with bracket of appropriate size & capacity including filling sand etc.	3	each	3,334.00	10,002.00
3	Providing First Aid Box as approved by St. John Ambulance Brigade/Indian Red Cross conforming to IS 2217-1963.	1	each	636.00	636.00
4	Supply & fixing shock treatment chart duly-mounted on a wooden frame with 5mm thick glass as required. (approximate front area 1.20sq.metre).	2	each	298.00	596.00
5	Supplying rubber gloves and tool kit as required	2	each	2,252.00	4,504.00
6	Supplying of XLPE insulated and PVC sheathed armoured aluminium/Copper power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes cable complete as required				
a)	3.5 core 300 sq mm al	75	Metre	1,034.00	77,550.00
b)	1 core 25 sq mm Cu	125	Metre	236.00	29,500.00
c)	3.5 core 50 sq mm al	15	Metre	221.00	3,315.00
d)	4 core 35 sq mm Al	15	Metre	189.00	2,835.00
e)	4 core 25 sq mm Al	225	Metre	146.00	32,850.00
f)	4 core 16 sq mm Al	75	Metre	113.00	8,475.00
g)	4 core 10 sq mm Al	225	Metre	102.00	22,950.00
h)	4 core 6 sq mm Al	700	Metre	79.00	55,300.00
7	Supplying and making end termination with brass compression gland and aluminium/Cu lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
a)	3.5 core 300 sq mm(70mm)	4	Nos	936.00	3,744.00
b)	1 core 25 sq mm Cu	16	Nos	313.00	5,008.00
c)	3.5 core 50 sq mm(50mm)	2	Nos	329.00	658.00
d)	4 core 35 sq mm (32 mm)	2	Nos	302.00	604.00
e)	4 core 25 sq mm (28mm)	18	Nos	250.00	4,500.00
f)	4 core 16 sq mm (28mm)	4	Nos	250.00	1,000.00
g)	4 core 10 sq mm (25mm)	50	Nos	219.00	10,950.00
8	Laying and fixing of one number PVC insulated and PVC seathed XLPE power cable of 1.1 KV grade of following size on wall surface as required				
a)	Upto 35 sqmm (clamped with 1mm thick saddle)	100	Metre	39.00	3,900.00
9	Laying and fixing of one number PVC insulated and PVC seathed XLPE power cable of 1.1 KV grade of following size on cable tray as required				
a)	Upto 35 sqmm (clamped with 1mm thick saddle)	1265	Metre	33.00	41,745.00
b)	Above 35 sqmm and upto 95 sqmm(clamped with 25x3mm MS flat clam)	15	Metre	74.00	1,110.00
c)	Above 185 sqmm and upto 400 sqmm(clamped with 40x3mm MS flat clam)	75	Metre	150.00	11,250.00

S.No	Description of item	Qty	Unit	Rate	Amount
10	Supplying and installing following size of perforated HOT Dipped Galvanised Iron cable trays (Galvanisation thickness not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with GI suspenders including bolts & nuts, painting suspenders etc as required.				
a)	100 mm width X 50 mm depth X 1.6 mm thickness	15	Metre	599.00	8,985.00
b)	150 mm width X 50 mm depth X 1.6 mm thickness	85	Metre	644.00	54,740.00
c)	300 mm width X 50 mm depth X 1.6 mm thickness	50	Metre	875.00	43,750.00
d)	450 mm width X 50 mm depth X 2.0 mm thickness	10	Metre	1,213.00	12,130.00
e)	600 mm width X 50 mm depth X 2.0 mm thickness	40	Metre	1,646.00	65,840.00
f)	750 mm width X 62.5 mm depth X 2.0 mm thickness	35	Metre	2,079.00	72,765.00
11	Supplying and installing following size of perforated Hot Dipped Galvanised Iron 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.				
a)	100 mm width X 50 mm depth X 1.6 mm thickness	3	Each	1,063.00	3,189.00
b)	150 mm width X 50 mm depth X 1.6 mm thickness	3	Each	1,168.00	3,504.00
c)	300 mm width X 50 mm depth X 1.6 mm thickness	3	Each	1,713.00	5,139.00
d)	450 mm width X 50 mm depth X 2.0 mm thickness	3	Each	2,490.00	7,470.00
e)	600 mm width X 50 mm depth X 2.0 mm thickness	3	Each	3,509.00	10,527.00
f)	750 mm width X 62.5 mm depth X 2.0 mm thickness	3	Each	4,494.00	13,482.00

S.No	Description of item	Qty	Unit	Rate	Amount
Sub Head-VII-EARTHING					
1	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.	2	Set	6,216.00	12,432.00
2	Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.	6	Set	11,794.00	70,764.00
3	Supplying and laying 25 mm X 5 mm copper strip at 0.50 meter below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50 mm)	15	Metre	853.00	12,795.00
4	Supplying and laying 25 mm X 5 mm G.I strip at 0.50 meter below ground as strip earth electrode, including connection/terminating with G.I. nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of G.I. nut bolt & spring washer spaced at 50 mm) meter 85	15	Metre	131.00	1,965.00
5	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	10	meter	1,009.00	10,090.00
6	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	1200	meter	206.00	2,47,200.00
7	Providing and fixing 6SWG G.I. strip on surface or in recess for connections etc. as required.	1200	meter	57.00	68,400.00

S.No	Description of item	Qty	Unit	Rate	Amount
ELV SYSTEM WIRING					
Sub-Head -VIII- DATA / NETWORKING CABLING					
1	Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing **raceway/furniture/** surface/ recessed Steel/ PVC conduit as required.				
a)	1 run of cable	1000	meter	49.00	49,000.00
b)	2 run of cable	1500	meter	82.00	1,23,000.00
c)	3 run of cable	2000	meter	114.00	2,28,000.00
2	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
a)	RJ-45 Computer Socket Outlet	200	Each	482.00	96,400.00
Sub Head IX- AUTOMATIC FIRE DETECTION SYSTEM					
1	Supplying, installation, testing and commissioning of micro processor based intelligent addressable main fire alarm panel, central processing unit with the following loop modules and capable of supporting not less than 240 devices (including detectors) and minimum 120 detectors per loop and loop length up to 2 km, network communication card, minimum 320 character graphics/ LCD display with touch screen or other keypad and minimum 4000 events history log in the non volatile memory (EPROM), power supply unit (230 ± 5% V, 50 hz), 48 hrs back-up with 24 volt sealed maintenance free batteries with automatic charger. The panel shall have facility to connect printer to printout log and facility to have seamless integration with analog/digital voice evacuation system (which is part of the schedule of work under SH: PA System) and shall be complete with all accessories . The panel shall be compatible for IBMS system with open protocol BACnet/ Modbus over IP complete as per specifications.				
1.1	Two Loop Panel.	1	each	2,38,907.00	238907
2	Supplying, installation, testing & commissioning of intelligent analog addressable photothermal detector complete with mounting base complete as required.	28	each	2,846.00	79688
3	Supplying, installation, testing & commissioning of fault isolator complete with base as required.	2	each	3,257.00	6514
4	Supplying, installation, testing & commissioning of addressable fire control module complete as required.	2	each	2,990.00	5980
5	Supplying, installation, testing & commissioning of addressable beam detector with short circuit isolator (inbuilt or seperate) complete with emitter and receiver including connections with remote test features etc complete as required	12	each	74,778.00	897336
6	Supplying, installation, testing & commissioning of addressable manual call point complete as required	2	each	3,859.00	7718
7	Supplying, installation, testing & commissioning of addressable horn cum strobe complete as required.	2	each	3,494.00	6988

S.No	Description of item	Qty	Unit	Rate	Amount
8	Supply and drawing following size of FRLS PVC insulated copper conductor, single core cable in existing surface/recessed steel/PVC conduit as required.	500			
a)	2X1.5sq mm	500	meters	41.00	20500
9	Supply and fixing of following size of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same incase of recessed conduit as required.				
a)	20 mm	400	meters	84.00	33600
Sub-HEAD X- : UPS					
1.00	Supply, installation, testing and commissioning of Modular UPS system comprising of **2X25 kVA/kW** unit with load sharing module with provision for future expendable upto **3X25 KVA/kW** units with load sharing module with a battery backup of **15** minutes duration for full load and with all standards fittings, accessories, protection, instruments, indications and controls including but not restricted to transformer, rectifier, inverter, SMF battery with float cum boost battery charger, static bypass switch, maintenance bypass, output isolation transformer, interconnections etc. including warranty and free all inclusive comprehensive maintenance services for one year after the date of handing over complete as per specifications and as required.	1	Each	9,31,218.00	9,31,218.00
	TOTAL of Sub-Work-D- : UPS				**9,31,218.00**

Total (B) = Rs 13767515 /-

C) FIRE FIGHTING WORKS

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
I.	**FIRE FIGHTING SERVICES**				
1	**TERRACE FIRE PUMP**				
	Supplying, Installation, Testing and Commissioning of electric driven Terrace Pump (with required 415 Volts 3 Phase 50 Hz AC suitable DOL Starter panel of required rating and required electrical cable from Motor to Panel, Panel to pressure switch for Terrace fire pump) suitable for automatic operation and consistingof following : complete in all respect as required: Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical seal and flow of 900 LPM at 35 m. head confirming to IS : 1520 Suitable HP SQ cage induction motor TEFC type suitable for operation on 415 volts, 3 phase 50 Hz. AC with IP55 class of protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325 M.S. Fabricated Common base plate, coupling, coupling guard, foundation bolts etc. as required. Suitable cement concrete foundation duly plastered with anti vibration pads.	Set	1	2,00,000	2,00,000
2	Providing, laying, testing and commissoning of 'C' class heavy duty MS Pipe conforming to IS 1239/3589 i.e. fittings like elbows, tees, flanges, tapers, nuts bolt, gaskets etc. in ground including excavation & providing cement concrete blocks as supports, anticorrosive treatment with coaltar/asphalt tape as per IS 10221, refilling the trench etc. of following sizes complete as required (Underground piping).				-
					-
2.1	150 mm dia	Metre	5	2,500	12,500
					-
2.2	100 mm. dia	Metre	25	1,800	45,000
					-
2.3	80 mm dia	Metre	5	1,500	7,500
					-
3	Providing, laying, testing and commissoning of Class 'C' heavy duty MS Pipe conforming to IS 1239/3589 including fittings, elbows, tees flanges, tapers, nuts bolts, gaskets etc. fixing the pipe on the wall/ceiling/Floor with suitable clamps and Cement Concrete block as per requirementand painting with two or more coats of synathetic enamel paint of required shade complete as required.(Internal)				-
3.1	150 mm dia	Metre	210	2,500	5,25,000
					-
3.2	100 mm dia	Metre	145	1,600	2,32,000
					-
3.3	80 mm dia	Metre	10	1,200	12,000
					-
3.4	25 mm dia	Metre	10	500	5,000
					-
4	Supplying and Fixing single headed Stainless Steel internal hydrant valve with instantaneous Stainless Steel couplings of 63 mm dia with cast iron wheel ISI marked conforming to IS 5290 (Type-A) with blank cap and chain as required .	Each	8	12,000	96,000
					-

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
5	Supplying, fixing, testing and commissioning of wafer type butterfly valve PN 1.6 duly ISI marked complete with Nuts, Bolts, washers, gaskets, conforming to IS 13095, of following sizes as required.				-
					-
5.1	150 mm dia	Each	4	9,000	36,000
					-
5.2	100 mm dia	Each	4	6,000	24,000
					-
5.3	80 mm dia	Each	1	5,000	5,000
					-
5.4	65 mm dia	Each	1	4,200	4,200
					-
6	Providing & fixing C.I horizontal/vertical type non return valve (dual plate) conforming to API 594 with C.I. body, SS Disc, SS stem, EPDM seal, complete with companion flanges, bolts, nuts, washers & inserted rubber gasket complete as required, of class PN 1.6. 150 mm nominal bore	Each	1	15,000	15,000
					-
7	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) : 25 mm dia	Each	8	428	3,426
					-
8	Supplying and fixing 63 mm dia , 15 mtr long RRL hose pipe with 63 mm dia Male and Female Gun metal / SS couplings duly binded with GI wire, rivets etc. conforming to IS 636 (type A) as required.	Each	16	6,000	96,000
					-
9	Supplying and Fixing First-Aid Hose Reel with MS construction spray painted in Post office red, conforming to IS 884 with upto date amendments, complete with the following as required.				-
9.1	30 MTR long 20 mm (nominal internal) dia water hose Thermoplastic (Textile reinforced) Type -2 as per IS: 12585				-
9.2	20 MM (nominal internal) dia gun metal globe valve and nozzle.				-
9.3	Drum and brackets for fixing the equipment on wall.				-
9.4	Connections from riser with 25 m dia stop valve(gun metal) & M.S. Pipe	Set	8	10,000	80,000
					-
10	Supplying & fixing 63 mm dia Stainless Steel branch pipe with 20mm (nominal internal diameter) size Gun Metal nozzle conforming to IS 903, subitable for instantaneous connection to interconnect hose pipe coupling as required.	Each	8	5,000	40,000
					-
11	Providing and fixing 150mm dia three-way fire brigade inlet connection consisting of 63mm size instantaneously make coupling and shall be protected by cap scored with a chain glass bore etc. complete with one 150mm dia sluice valve and 150mm dia non-return valve (To be connected to external ring main/wet riser)	Each	1	30,000	30,000
					-

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
12	**Air pressure vessel for Fire Pump**				-
					-
	Providing and fixing double flanged vertical air vessel fabricated from 10mm M.S. plate with dished ends from 10mm M.S. plate, outside with one coat of primer and two coats of synthetic enamel paint of approved shade, complete with approved quality of pressure switches, pressure gauge and all other required accessories to operate commonly main fire pump, sprinkler pump and Jockey pump at drop of pressure, automatically at required pressure setting (pressure sketch to be issued separately); Recommended dia. : 250mm Height of shell : 1200mm Working pressure :3.5 Kg/Sq.cm Test Pressure : 6 Kg/Sq.cm	Set	1	45,000	45,000
					-
13	Providing and Fixing Copper Alloy Air release valve, having threaded connection including the cost of 25 mm dia Gunmetal Gate valve with required fittings as per standard design.	Each	4	1,150	4,600
					-
14	Providing and fixing standard fire mans axe with heavy duty insulated rubber handle.	Each	8	800	6,400
					-
15	Providing and fixing in position the industrial type pressure gauges with gun metal / brass valves complete as required	Each	1	1,094	1,094
					-
16	Providing and fixing ISI marked portable fire extinguishers of the following type.				-
					-
16.1	CO2 type 4.5 Kg. capacity as per IS: 15683	Each	8	6,345	50,760
					-
16.2	Water CO2 type of 9 lit.as per IS: 15683	Each	4	2,455	9,820
					-
16.3	Dry Chemical Powder ABC type of 6 Kg as per IS:15683	Each	8	3,015	24,120
					-
17	Providing, Installation, Testing and Commissoning of Cast iron y type strainer fabricated out of 1.6 mm thick stainless steel sheet with 3 mm dia holes with stainless steel flange complete in all respect as per direction of engineer in charge 150 mm dia	Each	1	25,000	25,000
					-
18	Providing and Fixing pressure switch in the M.S. Pipe line including connection etc. as required.	Each	1	5,000	5,000
					-

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
19	Providing and fixing heavy duty copper armored cables 1.1 KVA grade including necessary support clamps at ceiling level and connection legs and double compression glands,complete in all respects.				-
					-
19.1	Control cable 6 core 1.5 Sq.mm	Metre	10	345	3,450
					-
19.2	Control cable 4 core 1.5 Sq.mm	Metre	20	300	6,000
					-
19.3	Control cable 2 core 1.5 Sq.mm	Metre	20	255	5,100
					-
20	Providing and fixing heavy duty Aluminum armored cables 1.1 KVA grade including necessary support clamps at ceiling level, connection lugs and double compression glands, complete in all respects.				-
					-
20.1	Power cable 3 core 6 Sq.mm	Metre	5	250	1,250
					-
20.1	Power cable 3 core 35 Sq.mm	Metre	5	390	1,950
					-
20.3	Power cable 3 core 95 Sq.mm	Metre	5	650	3,250
					-
20.4	Power cable 3.5 core 120 Sq.mm	Metre	5	855	4,275
					-
21	Providing and fixing rubber expansion joints (to provide relief from stresses at pipe flanges) as per specification of the manufacturers and direction of Engineer incharge. 150 MM Dia	Each	2	4,200	8,400
					-
22	Supplying and laying of 8 guage GI wire for Earthing including connections as per specification and /or as per direction of Project in-charge.	Metre	10	57	570
					-
23	Providing and fixing 25 mm X 5 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.	Metre	10	483	4,830
					-
24	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	Metre	10	206	2,060
				TOTAL (C)	**16,81,555**

D) HVAC Works					
S No.	**ITEM DESCRIPTION**	**UNIT**	**TOTAL QTY**	**RATE**	**AMOUNT**
a	**EQUIPMENT**				
1	**AIR-COOLED SPLIT UNITS**				
	Supplying,Installing, testing and commissioning of 5 Star, BEE rating (nominal capacity) Air-cooled split type AC unit along with indoor/outdoor units, refrigerent type R-410a or R-32, controls suitable to operate on 230 Volts 50 Hz AC supply etc. complete as required including voltage stabiliser of suitable rating to give constant output of 230V for input range of 180 V to 260 V with time delay, high/low cut off, meter to read input and output voltages, ON/OFF switches etc. as required. Quoted price shall include cost of wireless remote controller, cooling thermostat, refrigerant filling. Unit shall be provided with auto timer setting. As per technical specifications with all the necessary mounting accessories as required for complete installation. The noise level of HI- Wall indoor unit shall not be more than 40 dbA at 1 meter distance.				
1.1	1.0 TR SPLIT AC UNITS	Each	3	45,636	1,36,907
1.2	2.0 TR SPLIT AC UNITS	Each	1	64,732	64,732
2.0	**AIR HANDLING UNITS**				
	Supply, Installing, testing and commissioning of Factory built floor mounted Air Handling Units (AHUs), Double skin type complete with AMCA certified **SISW backward curved high efficiency plug fan with High efficiency EC motor** with potentiometer suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply including necessary controls, fan capacity shall be based on outlet velocity not exceeding 2000 FPM, coil section with DX cooling coil, velocity across cooling coil at 500 FPM, filter sections, HDPE washale MERV-8 pre filter with filtration efficiency of 90% for 10 micron particle size, suitable size mixing box, dampers for fresh air and supply air duct connection, drain connections, stainless steel (18G) drain pan with PUF insulation. Drive system, limit switch, 40 mm thick panels consisting of GI casing of thickness 0.8mm outside & inside layer with factory injected PUF (density-38 kg/m3) between them etc. with thermal break profile conforming to specifications.				
	The actual capacity of air handling units shall be as follows and the coil shall be selected conforming to specifications. The cooling coil shall be provided with hydrophilic coating. Max. Noise level shall be 65 dBA at 1 meter and as per specifications. The above scope shall also include Lifting, shifting, disassembling and reassembling of unit at site as per technical specifications with all the necessary mounting accessories, vibration isolators as required for complete installation. The AHU should be with thermal break profile. The unit shall be provided with potentiometer. The unit shall be provided with BMS premium module for BMS connectivity having the Auto/ manual selection system. The unit shall operate through BMS in Auto mode and through potentiometer in manual mode. The unit shall have pressure measurement ports at suction and discharge of fan to connect the differential pressure sensor. The unit shall include all internal connecting wiring including MPCB isolator for power connection.				
	AHU VRV Refrigerant kit with thermostat, Electronic Expansion valve and Control unit with all accessories and Fittings.				
2.1	2350 CFM, 8.0 HP cooling capacity, TSP 55mm Wg,	**Each**	1	2,17,471	2,17,471
2.2	2100 CFM, 8.0 HP cooling capacity, TSP 55mm Wg,	**Each**	1	1,94,864	1,94,864
2.3	1100 CFM, 6.0 HP cooling capacity, TSP 55mm Wg,	**Each**	2	1,79,980	3,59,960
3.0	**AIR HANDLING UNITS**				

	Supply, Installing, testing and commissioning of Factory built floor mounted Air Handling Units (AHUs), Double skin type complete with AMCA certified **DIDW backward curved high efficiency fan with High efficiency TEFC IE-3 motor** with VFD compatiability and suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply including necessary controls, fan capacity shall be based on outlet velocity not exceeding 2000 FPM, coil section with DX cooling coil, velocity across cooling coil at 500 FPM, filter sections, HDPE washale MERV-8 pre filter with filtration efficiency of 90% for 10 micron particle size, suitable size mixing box, dampers for fresh air and supply air duct connection, drain connections, stainless steel (18G) drain pan with PUF insulation. Drive system, belt guards, limit switch, 40 mm thick panels consisting of GI casing of thickness 0.8mm outside & inside layer with factory injected PUF (density-38 kg/m3) between them etc. with thermal break profile conforming to specifications.				
	The actual capacity of air handling units shall be as follows and the coil shall be selected conforming to specifications. The cooling coil shall be provided with hydrophilic coating. Max. Noise level shall be 75 dBA at 1 meter and as per specifications. The above scope shall also include Lifting, shifting, disassembling and reassembling of unit at site as per technical specifications with all the necessary mounting accessories, vibration isolators as required for complete installation. The AHU should be with thermal break profile.				
	AHU VRV Refrigerant kit with thermostat, Electronic Expansion valve and Control unit with all accessories and refnet.				
3.1	7000 CFM, 24 HP cooling capacity, TSP 55mm Wg,	Nos.	6	2,90,734	17,44,403
3.2	4000 CFM, 20 HP cooling capacity, TSP 55mm Wg,	Nos.	2	1,99,603	3,99,206
3.3	2500 CFM, 10 HP cooling capacity, TSP 55mm Wg,	Nos.	2	1,55,372	3,10,743
3.4	1400 CFM, 8 HP cooling capacity, TSP 55mm Wg,	Nos.	2	1,22,233	2,44,466
4.0	**TREATED FRESH AIR UNITS**				
	Supply, Installing, testing and commissioning of Factory built floor mounted Treated Fresh Air Units (TFA), Double skin type complete with AMCA certified **SISW backward curved high efficiency plug fan with High efficiency EC motor** with potentiometer suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply including necessary controls, fan capacity shall be based on outlet velocity not exceeding 2000 FPM, coil section with DX cooling coil, velocity across cooling coil at 500 FPM, filter sections, HDPE washale MERV-8 pre filter with filtration efficiency of 90% for 10 micron particle size, damper for supply air duct connection, drain connections, stainless steel (18G) drain pan with PUF insulation. Drive system, limit switch, 40 mm thick panels consisting of GI casing of thickness 0.8mm outside & inside layer with factory injected PUF (density-38 kg/m3) between them etc. with thermal break profile conforming to specifications.				
	The actual capacity of units shall be as follows and the coil shall be selected conforming to specifications. The cooling coil shall be provided with hydrophilic coating. Max. Noise level shall be 65 dBA at 1 meter and as per specifications. The above scope shall also include Lifting, shifting, disassembling and reassembling of unit at site. As per technical specifications with all the necessary mounting accessories, vibration isolators as required for complete installation. The Units should be with thermal break profile. The unit shall be provided with potentiometer. The unit shall be provided with BMS premium module for BMS connectivity having the Auto/ manual selection system. The unit shall operate through BMS in Auto mode and through potentiometer in manual mode. The unit shall have pressure measurement ports at suction and discharge of fan to connect the differential pressure sensor. The unit shall include all internal connecting wiring including MPCB isolator for power connection.				
	TFA VRV Refrigerant kit with thermostat, Electronic Expansion valve and Control unit with all accessories and Fittings.				
4.1	2700 CFM, 18.0 HP cooling capacity, TSP 50mm Wg,	Nos.	1	2,04,483	2,04,483

4.2	1800 CFM, 12.0 HP cooling capacity, TSP 50mm Wg,	Nos.	1	1,75,697	1,75,697
5.0	**VRV OUTDOOR UNITS**				
	Supply, installation, testing and commissioning of VRV Air Conditioning top air discharge outdoor units of below mentioned capacity complete with IGBT type inverter based VRV compressor, necessary R 410A refrigerant charge, air cooled condensor with hydrophilic coated coil, propeller type condenser fans, controls, control panel, MS Channel Frame, vibration isolators. These units shall operate for cooling only. These units shall be suitable to operate on 415±10% V, three phase electrical supply.				
	VRV system performance shall be in compliance with the recommendations mentioned in latest version of ASHRAE-90.1				
5.1	24 HP	Nos.	6	4,95,392	29,72,352
5.2	20 HP	Nos.	2	4,11,844	8,23,687
5.3	18 HP	Nos.	1	4,06,929	4,06,929
5.4	12 HP	Nos.	1	2,86,451	2,86,451
5.5	10 HP	Nos.	2	2,75,007	5,50,014
5.6	8 HP	Nos.	4	2,37,270	9,49,080
5.7	6 HP	Nos.	2	1,54,459	3,08,918
6.0	**BMS CONTROLLER:**				
	Supply, Installation, Testing and Commissioning of Controller including accessories which can work as a standalone centralized controller and also can act as an interface between the VRF systems and Bacnet/IP based BMS. It should be able to control/monitor the following data of VRF IDUs/3rd party AHUs upto 64 Nos.	Lot	1	1,05,313	1,05,313
	For 3rd party AHU				
	Controls:				
	On/Off control				
	Temperature setting				
	Operation mode				
	User control restriction				
	Operation mode Lock & set temp. limit				
	Monitoring:				
	On/Off				
	Set temperature				
	Room temperature				
	Operation mode				
	User control restriction				
	Operation mode lock & set temp limit				
	Error information related to EEVs/Temp. Sensors/ODUs				
	For 3rd party TFA				
	Controls:				
	On/Off control				
	Temperature setting				
	Operation mode				
	User control restriction				
	Operation mode Lock & set temp. limit				
	Monitoring:				
	On/Off				
	Set temperature				
	Discharge Air temperature				
	Operation mode				
	User control restriction				
	Operation mode lock & set temp limit				
	Error information related to EEVs/Temp. Sensors/ODUs				
7.0	**Cabinet Fan**				
	Supply, Installing, testing and commissioning of factory built cabinet fan, double skin type complete with Backward curved blower with AMCA certified, fan capacity shall be based on outlet velocity not exceeding 2000 FPM, TEFC High efficiency IE-3 electric motor suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply, drive system, belt guards, limit switch, 25 mm thick panels consisting of GI casing of thickness 0.8mm outside & inside layer with factory injected PUF (density-38 kg/m^3) between them etc. conforming to specifications. The actual capacity of units shall be as follows. Max. noise level shall be 70 dbA at 1 meter as per specifications. The above scope shall also include Lifting, shifting, disassembling and reassembling of unit at site.				
7.1	1500 CFM (25 mm Total Static Pressure) for Toilet Exhaust,	Nos.	1	52,095	52,095

7.2	1600 CFM (25 mm Total Static Pressure) for Toilet Exhaust,	Nos.	1	52,095	52,095
8.0	**Propeller Fan**				
	Supply, installing, testing and commissioning of following Propeller fan Complete with induction Motor suitable for operation with 230 V 1 phase 50 Hz including providing suitable size opening in wall with suitable frame etc as per technical specifications with all the necessary mounting accessories as required for complete installation. The impeller of fan shall be ABS Plastic or powder coated GI sheet.				
8.1	Propeller Fan - 600 cfm	Nos.	8	5,160	41,283
8.2	Propeller Fan - 450 cfm	Nos.	1	4,894	4,894
8.3	Propeller Fan - 50 cfm	Nos.	1	4,255	4,255
9.0	**SCRUBBERS**				
	Corrosion proof, chemical resistant Scrubber unit for fume hood exhaust				
	Supply, installation, testing and commissioning of the Spray type scrubber with nozzle in two banks, Eleminators, water pump 2 Each. (1w+1s), cover pipe, distribution water pipe, filters at air inlet, min. 300mm deep water tank, make up & quick fill water connection with valves/ball valves, drain and overflow connection, all housed in 40 mm thick double skinned casing consisting of 0.8mm thick powder coated GSS outside sheet & 0.8mm thick FRP coated GSS inside sheet with factory injected PUF (density-38 kg/m3) between them complete in all respects including FRP coated plug fan with High Efficiency Weather proof, spark proof EC Motor with potentiometer of IP:55 protection suitable for 415 +10% Volts, 3 phase, 50 cycles power supply, mounted on a common base with spring type vibration isolators, multi sheave pullies for fan and fan motor. The unit shall be provided with potentiometer. The unit shall be provided with BMS premium module for BMS connectivity having the Auto/ manual selection system. The unit shall operate through BMS in Auto mode and through potentiometer in manual mode. The unit shall have pressure measurement ports at suction and discharge of fan to connect the differential pressure sensor. The unit shall include all internal connecting wiring including MPCB isolator for power connection. The fan capacity shall be based on outlet velocity not exceeding 2000 FPM. as per specifications and drawings. The complete unit shall be corrosion proof, chemical resistant from inside having 5mm thick FRP coating on casing, fan, supports, etc. and all piping, valves, hardware, nut, bolt etc. shall be made of SS 316. Capacity as under:				
9.1	2700 CFM at Terrace Level (55 mm Total Static Pressure)	Nos.	1	3,28,717	3,28,717
	Rate (In Words) : Rupees				
9.2	1800 CFM at Terrace Level (55 mm Total Static Pressure)	Nos.	1	3,03,722	3,03,722
	Rate (In Words) : Rupees				
10.0	**VAV BOXES WITH CONTROLS**				
	Supply, Installation, Testing & Commissioning of VAV boxes of following capacities as per Specifications and requirements mentioned below:				
	VAVs shall be pressure independent type & low velocity type				
	VAV Boxes shall be slow reacting type capable of delivering variable air volume type by the action of opposed blade volume control damper				
	VAV boxes shall be supplied with end flanges for attachment to flanged duct ends and shall be complete with all internal Acoustic treatment.				
	The casing shall be minimum 25 mm thick with insulation sandwich between double skin type of 22 SWG Galvanized sheet steel construction with a completely sealed, easily removable.				
	VAV shall be electronically controlled networkable controller type complete with low leakage damper, actuator, Microprocessor unit, wall/ ceiling mounted thermostat with ON/OFF Switch, control transformer, unit hander brackets etc.				
	VAV Boxes shall also be able to reset any air flow between zero and the maximum air quantity that the boxes can handle without changing orifices or other parts, but the boxes shall be factory set at 10% of the maximum flow as minimum flow.				
	The noise level from the VAV boxes shall not exceed 35dbA at 1 RM distance.				

	The quoted price shall be inclusive of the digital thermostat for each VAV unit required for the functioning of the VAV system				
	The thermostat and the entire control mechanism shall be fully compatible with BMS System through BACNET/MSTP protocol. Datas like temperatures, set points, damper position shall be monitored through BMS system				
	The capacities of the units with the above specification are as follows as per technical specifications with all the necessary mounting accessories as required for complete installation.				
	The VAV shall be suitable to operate on 230 V, single phase electrical supply				
10.1	1350 CFM	Sets	2	23,871	47,742
10.2	900 CFM	Sets	2	23,871	47,742
10.3	600 CFM	Sets	2	23,169	46,338
10.4	350 CFM	Sets	7	22,467	1,57,267
10.5	300 CFM	Sets	5	22,467	1,12,334
10.6	150 CFM	Sets	10	22,467	2,24,668
b)	**PIPING**				
1	**SPLIT AC REF. PIPING**				
	Supply, installation, testing and commissioning of **liquid / gas copper refrigerant piping** of following sizes along with necessary fittings to inter connect the condensing unit and the evaporating unit insulated using 13mm thick nitrile rubber insulation covered with interwoven glass fabric for UV and mechanical protection and necessary supports.				
1.1	15.9 mm Ø	meter	11	354	3,892
1.2	12.7 mm Ø	meter	20	296	5,926
1.3	9.5 mm Ø	meter	11	239	2,626
1.4	6.4 mm Ø	meter	20	181	3,623
2	**VRV AC REF. PIPING**				
	Supplying, Installing, testing and commissioning of **liquid / gas refrigerant hard copper piping** of following sizes along with necessary fittings duly insulated with 19mm thick nitrile rubber insulation covered with interwoven glass fabric for UV and mechanical protection and necessary supports. The insulation over the exposed pipe work shall be finished with one coat of 500 micron (0.5 mm) WFT Fire Retardant coating confirming to "Surface spread flame as per ASTM E 84, Fungal Resistance -ASTM D 3273 & ASTM G21, Weathering Resistance - ASTM D 6695, Surface Flammability - ASTM E 84, Resistance to fire at liquid stage-ASTM D 3278, Content of VOC- EPA 24, Resistance to water vapour permeance-ASTM E 96, Algal Resistance -ASTM D 5589, Rain Water Resistance-As per ASTM D 6904, Antimicrobial Efficacy -ASTM E 2315, Fungal Resistance -ASTM G21.				
2.1	34.9 mm Ø	RM	49	1,142	55,938
2.2	28.6 mm Ø	RM	28	838	23,472
2.3	22.2 mm Ø	RM	11	580	6,379
2.4	19.1 mm Ø	RM	47	513	24,089
3	Supplying, Installing, testing and commissioning of **liquid / gas refrigerant Soft copper piping** of following sizes along with necessary fittings duly insulated with 19mm thick nitrile rubber insulation covered with interwoven glass fabric for UV and mechanical protection and necessary supports. The insulation over the exposed pipe work shall be finished with one coat of 500 micron (0.5 mm) WFT Fire Retardant coating confirming to "Surface spread flame as per ASTM E 84, Fungal Resistance -ASTM D 3273 & ASTM G21, Weathering Resistance - ASTM D 6695, Surface Flammability - ASTM E 84, Resistance to fire at liquid stage-ASTM D 3278, Content of VOC- EPA 24, Resistance to water vapour permeance-ASTM E 96, Algal Resistance -ASTM D 5589, Rain Water Resistance-As per ASTM D 6904, Antimicrobial Efficacy -ASTM E 2315, Fungal Resistance -ASTM G21.				
3.1	15.9 mm Ø	RM	68	504	34,279
3.2	12.7 mm Ø	RM	9	381	3,425

3.3	9.5 mm Ø	RM	58	305	17,673
4	**SPLIT AC CONDENSATE DRAIN PIPING**				
	Supplying, Installing, testing and commissioning of following sizes **Extra Hard uPVC** drain piping for condensate complete with 9 mm thick nitrile rubber insulation in form of pipe sleeves covered with interwoven glass fabric for UV and mechanical protection, all required fittings and providing clean out plug at suitable location for roding the pipe when required as per technical specifications with all the necessary mounting accessories as required for complete installation.				
4.1	25 mm dia	meter	32	326	10,447
5	**AHU & TFA CONDENSATE DRAIN PIPING**				
	Supplying, Installing, testing and commissioning of following sizes **GI 'B' Class (Medium class)** drain piping for condensate complete with 9 mm thick nitrile rubber insulation in form of pipe sleeves covered with interwoven glass fabric for UV and mechanical protection, all required fittings and providing clean out plug at suitable location for roding the pipe when required as per technical specifications with all the necessary mounting accessories as required for complete installation.				
5.1	32 mm dia	meter	25	556	13,908
5.2	25 mm dia	meter	59	491	28,992
c)	**AIR DISTRIBUTION SYSTEM:**				
	Rectangular GSS Sheet Metal Duct				
1	Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes,hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.As per technical specifications with all the necessary mounting accessories as required for complete installation.				
	Note:- The zinc coating of G.I. sheet shall be 120 GSM				
1.1	Thickness 0.63 mm sheet	Sqm.	1918	983	18,85,394
1.2	Thickness 0.80 mm sheet	Sqm.	138	1,154	1,59,252
2	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes,hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.As per technical specifications with all the necessary mounting accessories as required for complete installation.				
	Note: Plenums, collars and irregular shape duct pieces shall be site fabricated as per requirement.				
	Note:- The zinc coating of G.I. sheet shall be 120 GSM				
2.1	Thickness 0.63 mm sheet	Sqm.	213	942	2,00,646
2.2	Thickness 0.80 mm sheet	Sqm.	15	1,104	16,560
3	**Insulated Single walled spiral ducts**				
	Supply, fabrication, Installing, testing and commissioning factory fabricated Single walled spiral ducts complete with 9mm thick internal nitrile rubber insulation, Duct sheet should be min. 120 GSM zinc coating, all duct fittings (bends, reducers, couplings, end caps, collars) in GI, With supporting clamp at 2.5/rmt spacing of spiral round duct as per technical specification and as required with the approved shop drawings as per technical specifications with all the necessary mounting accessories as required for complete installation.				
	(FACTORY FABRICATED DUCTS AS PER "SMACNA" STANDARDS & SPECIFICTIONS)				
	Note:- The zinc coating of G.I. sheet shall be 120 GSM				
	The ducting shall be provided with suitable thickness powder coating. The colour of coating shall be finalized and approved by architect. Cost of ducting includes powder coating of approved colour and no extra cost shall be paid.				
3.1	24 Gauge GSS Ducting	Sqm.	695	1,700	11,81,500
3.1	22 Gauge GSS Ducting	Sqm.	98	1,900	1,86,200
4	**Acoustic Lining for Ducts**				

	Supplying, installing & testing of acoustic lining Class '1' open cell nitrile rubber within supply and return air ducts as per the specifications. All ducts shown cross hatched on the approved shop drawings shall be provided with acoustic lining of open cell nitrile rubber insulation with density 140-180 Kg/ cum as per technical specifications with all the necessary mounting accessories as required for complete installation. The thermal conductivity of insulation shall not be more than 0.045 W/m°k @ 0°C mean temperature. THe material shall have anti microbial property approved by EPA.				
4.1	15mm thick	Sqm.	160	1,094	1,75,006
5	**Thermal Insulation for Internal Ducts**				
	Supply, Installing, testing and commissioning of duct thermal insulation, elastomeric Closed cell nitrile rubber with aluminium foil faced, class 'O' on ducts complete as per technical specifications with all the necessary mounting accessories as required for complete installation. The thermal conductivity of insulation shall not be more than 0.035 W/m°k @ 0°C mean temperature and density of insulation shall be 40-60 Kg/Cum.				
5.1	19 mm thick	Sqm.	213	697	1,48,461
6	**Thermal Insulation for Exposed Ducts**				
	Supply, Installing, testing and commissioning of duct thermal insulation, elastomeric Closed cell nitrile rubber class 'O' on ducts complete as per technical specifications with all the necessary mounting accessories as required for complete installation. The thermal conductivity of insulation shall not be more than 0.035 W/m°k @ 0°C mean temperature and density of insulation shall be 40-60 Kg/Cum. The insulation over the exposed duct work shall be finished with two coats of 500 micron (0.5 mm) WFT Fire Retardant coating confirming to "Surface spread flame as per ASTM E 84, Fungal Resistance -ASTM D 3273 & ASTM G21, Weathering Resistance - ASTM D 6695, Surface Flammability - ASTM E 84, Resistance to fire at liquid stage-ASTM D 3278, Content of VOC- EPA 24, Resistance to water vapour permeance-ASTM E 96, Algal Resistance -ASTM D 5589, Rain Water Resistance-As per ASTM D 6904, Antimicrobial Efficacy -ASTM E 2315, Fungal Resistance -ASTM G21, sandwiched with 10 Mil Class E Glass Cloth.				
6.1	19 mm thick (for Ducts in Non conditioned space)	Sqm.	1855	763	14,14,651
7	**FIRE DAMPERS**				
	Supplying, Fixing,testing and commissioning of fire dampers in supply air duct/main branch and return air path as and where required of required sizes i/c control wiring,the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed in the event of fire signal complete as required and as per specifications.				
7.1	Fire damper	Sqm.	9.5	9,883	93,889
7.2	Actuator	Each	34	9,212	3,13,208
8	**Volume Control Duct Dampers**				
	Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets,nuts, bolts, screws linkages, flanges etc., As per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	0.5	6,103	3,051
	GRILLES AND DIFFUSERS				
9	**Supply/ Return Air Grilles**				
	Supply, Installing, testing and balancing of powder coated extruded aluminum Grills of non-flammable material frames etc as specification The grilles shall be continuous throughout and the supply & return air grilles shall form part of the continuous grilles complete as required. In accordance with the approved shop drawings.As per technical specifications with all the necessary mounting accessories as required for complete installation.				

9.1	Supplying & fixing of powder coated extruded aluminium Supply/Exhaust Air Grills with aluminium volume control dampers as per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	17	8,480	1,44,160
9.2	Supplying & fixing of powder coated extruded aluminium Return Air Grills with louvers but without volume control dampers complete as per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	14	5,507	77,098
9.3	**Supply Air Diffusers**				
	Supplying, fixing testing commissioning of supply/Exhaust air diffusers of powder coated aluminium with aluminium volume control dampers with anti smudge ring & removable core as per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	15	11,363	1,70,445
9.4	**Return Air Diffusers**				
	Supplying, fixing testing commissioning of Return air diffusers of powder coated aluminium without volume control dampers with anti smudge ring & removable core.As per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	9	7,559	68,031
10	Fabrication, Installation and Testing of polypropylene glass lined FRP coated duct for fume/ vent hood handling as per technical specifications with all the necessary mounting accessories as required for complete installation.	Sqm.	52	4,636	2,41,094
11	**Flexible Connection:**				
	Supplying, fabricating, installing and testing of 150mm long silicon based flexible connection with both side flanges constructed of fire resistant material as per the drawings/ specifications. Quantity is mentioned considering perimeter length as per technical specifications with all the necessary mounting accessories as required for complete installation.	meter	46	850	39,078
d)	**ELECTRICAL WORKS FOR HVAC: 3-Phase supply, VFD Starter for AHUs**				
1	Supply of HVAC dedicated VFDs with minimum IP 54 rating (Additional Enclosures not acceptable) with disconnect switch inbuilt with VFD, complying with the tender specifications and having:				
	5% non-saturating dual reactors on both rails of DC bus. Swinging chokes which do not provide full harmonic filtering throughout the entire load range are not acceptable. VFDs with saturating (non-linear) DC reactors to provide additional 3% AC chokes.				
	Shall comply with requirements of IEC 61800-3 : 2004, Category C1 with 50m motor cable(Unrestricted Distribution).				
	VFD shall be suitable to satisfactory work on 415 ± 10% voltage range.				
	Three-feedback PID controllers to control the speed of the VFD & other functions.				
	VFD must have min. 2 PID controllers inbuilt to control Chilled water valve, VFD speed etc. as per requirement.				
	Alpha numeric Graphical Display with inbuilt energy meter, ammeter, voltmeter etc. and shall be capable of displaying any 5 parameters simultaneously.				
	BMS compatibility : RS-485 connector with BacNet over IP communication protocol				
	VFD shall be capable of withstanding 100 K Amperes Short circuit current at Output terminals				
	The complete VFD shall be factory manufactured and tested and no external component shall be allowed. Test certificate of each VFD (serial Numberwise) shall be furnished by supplier.				
	The VFD shall be provided with following min. number of IOs: 2 AI 2 AO 6 DI 3 DO				
1.1	1 No. IP-55 variable frequency drive with mains disconnect switch suitable for *0.75 KW* motor.	Each.	2	30,075	60,149

1.2	1 No. IP-55 variable frequency drive with mains disconnect switch suitable for *1.5 KW* motor.	Each.	2	37,800	75,601
1.3	1 No. IP-55 variable frequency drive with mains disconnect switch suitable for *2.2 KW* motor.	Each.	2	40,992	81,984
1.4	1 No. IP-55 variable frequency drive with mains disconnect switch suitable for *3.7 KW* motor.	Each.	6	46,687	2,80,124
2	**Starter Panels for fans:** 1 Each. 4 A TPN MPCB having short circuit(min 50 KA) and overload protection with DOL starter with contactor, SPPR suitable for 0.55 KW motor with ON/OFF/ Trip indication lamps and push buttons, Digital ammeter with CTs and selector switch, potential free contacts for remote operation in each feeder and Auto Manual Selector Switch as required including auxiliary relay with contacts for smoke signal.As per technical specifications with all the necessary mounting accessories as required for complete installation.	Each.	2	22,888	45,776
3	**FUME HOOD EXHAUST SCRUBBER PANEL**				
	Incomer (1 No.):	Set	2	49,989	99,977
	16A, TP MPCB having short circuit (min 50 KA)				
	Metering:				
	Multifunction meter of 0-500 Volts and 0-16 Amps protected by 2 amp MCB.				
	CL-1 CTs and selector switch.				
	Phase indicating lamps and shall be protected by 2Amps MCBs.				
	Bus Bars:				
	20Amps TP Aluminium busbars, colour coded with heat shrinkable insulation sleeves				
	Outgoing:				
	One (1) No. 10A TP MPCB having short circuit (min 50 KA) and overload protection. (Feeder for Scrubber Fan)				
	One (1) Each. 4A TP MPCB having short circuit (min 50 KA) and overload protection with DOL starter with contactor, SPPR suitable for 0.75 KW motor with ON/OFF/ Trip indication lamps and push buttons, Digital ammeter with CTs and selector switch, potential free contacts for remote operation in each feeder and Auto Manual Selector Switch as required including auxiliary relay with contacts for smoke signal. (for Scrubber Pumps with change over arrangement). As per technical specifications with all the necessary mounting accessories as required for complete installation. This shall also include providing single phase, 220V AC supply with breaker for pumps with switchover arrangement.				
4	**Cabling:** Supply, Laying, installation, testing and commissioning of following 1100 volt grade PVC FRLS sheathed XLPE 2XFY insulated copper conductor armoured cables as per specification in existing RCC/PVC pipe/Burried in ground or on cable trays, includes anchor fasteners with clamps, saddles fixing bolts, 1.2 mm thick aluminium engraved cable tags at both ends etc. As per technical specifications with all the necessary mounting accessories as required for complete installation.				
4.1	3 C x 4 Sq.mm cable	meter	180	172	30,960
4.2	3 C x 2.5 Sq.mm cable	meter	545	125	68,125
5	**Control Cables:** Supplying, laying, testing and commissioning of the following sizes of 1.1 KV grade PVC insulated copper flexible conductor unarmoured stranded control cable with proper connections, cable termination complete as required.As per technical specifications with all the necessary mounting accessories as required for complete installation.				
5.1	3C x 1.5 Sq.mm Cable	meter	280	90	25,200
5.2	3C x 2.5 Sq.mm Cable	meter	50	150	7,500

6	Cable end termination of the following XLPE/2XFY/YWY insulated sheathed copper conductor armoured cables of 1100 volt grade including supplying and fixing of crimping lugs, Single compression glands with earthing facility and cable sockets etc. complete as required.As per technical specifications with all the necessary mounting accessories as required for complete installation.				
6.1	3 C x 4 Sq.mm cable	Each.	18	245	4,410
6.2	3 C x 2.5 Sq.mm cable	Each.	34	229	7,786
7	**Cable Tray:** Supply, Installation, testing & Commisioning of factory fabricated galvanized Bolted Rung type Hot dip GI perforated cable trays, with all accessories like Anchor fastener, radial bends, coupler plate, Horizontal & Vertical Mounting, Tee, Reducer, Four way cross & all supports of the following sizes & as per Submitted Detail Specification. Hot dipped galvanized iron (galvanisation thickness not less than 65 microns & Cost of support of Cable Tray shall include the item) .				
7.1	150 mm width x50 mm depth x 1.6 mm thick	meter	374	268	1,00,232
7.2	100 mm width x50 mm depth x 1.6 mm thick	meter	325	239	77,675
8	**Earthing System**: Supply, installation, testing and commissioning of following sizes of G.I. strip/ wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable complete as required including inter connection between length at joints, all the necessary mounting/ fixing accessories etc. as required for proper installation as per technical specifications. with 6 SWG wire	meter	1090	37	40,330
9	**Supply, installation, testing and commissioning of following cables:**	meter	135	52	7,020
	2 Core 1.0 Sqmm, unarmoured ATC conductor multistranded, cable.				
10	Supplying and laying of following sizes of FR PVC conduit on surface/recess including cutting/ filling chases along with conduit accessories etc. complete as required: with 20 mm dia	meter	465	46	21,390
			TOTAL (D)		Rs **1,96,65,457**

E) Plumbing Works					
S. No.	**Description of item**	**Unit**	**Quantity**	**Rate**	**Amount (Rs.)**
1	**SANITARY INSTALLATION**				
1.1	Providing and fixing white vitreous china **laboratory sink** with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good the wall wherever required : Size 600x450x200 mm	Each	1	2392.60	2392.60
1.2	Providing & fixing white vitreous china **wall hung type European type water closet** with C.P. bolts, nuts, C.I. chair or other hanging arrangement, with white solid plastic seat and cover with lid, C.P. brass hinge rubber buffers, with accessories,C.I/M.S. brackets painted with two coats of enamel paint of approved shade over a coat of primer. C.P. brass screws and wooden cleats, including cutting and making good the wall and floors wherever required **(HINDWARE TWILIGHT 92092)**	Each	16	12364.75	197835.94
1.3	Providing and Fixing Concealed in wall **Flushing Cistern with dual flush Actuator Plate** (plastic body in approved finish), flush-stop function, noise less float valve and fast filling action with all component parts of high quality including fixing frame and set complete in all respects as per direction of the engineer-in-charge **(HINDWARE CONCEALO).**	Each	16	7046.65	112746.37
1.4	Providing and Fixing white vitreous china two piece **floor mounted water closet** including exposed cistern, Flat Back wash basin 650x350 mm with one pair of mounting brackets , complete with fittings and seat cover, two no hinged rail 76 cms and five nos of grab bar 60 cms for **Handicaped Toilet complete in all respest as per direction of the engineer-in-charge (CERA CRUISE SET).**	Set	1	29785.38	29785.38
1.5	Providing and Fixing White vitreous china **Under counter wash basin** with C.I. brackets painted white, 32mm dia. C.P. waste, C.P chain and rubber plug, C.P. cast brass bottle trap with C.P. connecting pipe to wall and C.P wall flange and rubber adapter for waste connection complete including cutting and making good the walls wherever required **(HINDWARE "GARNET" CAT NO: 10080, BOTTLE TRAP: JAQUAR ALD-769L, WASTE COUPLING: HINDWARE F850002)**	Each	16	5798.49	92775.88
1.6	Providing and Fixing vitreous china **urinal** with in built Bottle Trap, C.I. hangers, 15mm dia inlet to built in spreaders with inbuilt waste with C.P flange, complete including cutting and making good the walls and floors wherever required **(JAQUAR URS-WHT-132530)**	Each	10	8186.33	81863.28
1.7	Providing and Fixing **electrical operated concealed automatic flushing system** for urinals, including front S.S plate 125 x 125mm chrome sensor with CP brass body, ball valve etc,complete in all respect including cutting and making good the walls wherever required **(Make: HINDWARE ELECTRIC SENSOR)**	Each	10	6153.77	61537.73

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
1.8	Providing and fixing stone slab with table rubbed, edges rounded and polished, of size 75x50 cm deep and 1.8 cm thick, fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth. Granite Stone of approved shade	Sqm	8	2831.95	22655.60
1.9	Providing and fixing CP Brass 32mm size Bottle Trap of approved quality & make and as per the direction of Engineerin-charge	Each	28	795.15	22264.20
1.10	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: White glazed fire clay kitchen sink of size 600x450x 250 mm	Each	2	2433.25	4866.50
1.11	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 : 510x1040mm bowl depth 200 mm (Kitchen sink with drain board)	Each	1	3772.35	3772.35
1.12	Providing and Fixing central hole C.P. brass Sink Cock including cutting and making good the walls wherever required complete in all respects as per direction of the Engineer-in-charge **(JAQUAR FLR- 5173B).**	Each	1	3065.20	3065.20
1.13	Providing and fixing Chrome plated **Health Faucet** with 8 mm dia, 1 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per instructions of the engineer-in-charge **(JAQUAR ALD-573)**	Each	17	1465.65	24916.13
1.14	Providing & fixing CP brass pillar cock for wash basin including cutting & making good the walls wherever required complete in all respects as per Engineer-in-charge **(JAQUAR FLR-5011N).**	Each	17	1122.42	19081.14
1.15	Providing & fixing CP brass **pillar cock for lab sink** including cutting & making good the walls wherever required complete in all respects as per Engineer-in-charge **(JAQUAR FLR-CHR-5166).**	Each	1	3472.95	3472.95
1.16	Providing and Fixing CP **Emergency Shower** with pull chain comprising of 150 mm dia CP shower complete as per instructions of the engineer-in-charge **(VIJAY Cat No: 1023)** or as per equivalent make .	Each	12	5552.75	66633.02
1.17	Providing & Fixing CP **self closing eye wash fountain** with CP waste, CP chain & rubber plug, CP cast brass bottle trap & CP connecting pipe to wall and CP wall flange & rubber adopter for waste connection complete in all respects including cutting & making good the walls wherever required **(Make VIJAY Cat. No. 1036).**	Each	12	8581.75	102980.96
1.18	Providing and Fixing Bib **cock** Auto closing system with CP Wall flange for drinking water purpose complete as per direction of the engineer-in-charge **(Make JAQUAR PRS-031L65)**	Each	1	2325.06	2325.06
1.19	Providing and Fixing 15mm C.P. brass **angle valve** with wall flange and C.P copper connecting pipe 450 mm long nut and rubber, washer with C.P. brass flange complete, including cutting and making good the walls, wherever required **(Make: JAQUAR "FLORENTINE" Cat No: FLR5053 N)**	Each	78	794.34	61958.22

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
1.20	Providing and Fixing 15mm C.P brass bib cock complete, including cutting and making good the walls wherever required (Make: JAQUAR FLR-5047N). - Short body	Each	17	794.95	13514.20
1.21	Providing and Fixing C.P cast brass **double coat hook** fixed to PVC cleats with C.P. brass screws including cutting and making good the walls wherever required **(Make: CERA F5004108)**	Each	17	761.35	12942.98
1.22	Providing and Fixing C.P brass **Aerosol perfume dispenser**, fixed to wooden cleats / Rawl Plug with C.P brass screws, complete including cutting and making good the walls wherever required **(Make: EURONICS Cat No: EA 24).**	Each	17	1903.04	32351.62
1.23	Providing and fixing toilet paper holder : C.P. brass	Each	17	385.35	6550.95
1.24	Providing and fixing Stainless Steel Body **Auto hand drier** to be operated with 220 volts, single phase, with fully hygienic condition, with all accessories including cutting and making good the walls, wherever required complete as per instructions of the engineer-in-charge **(JAQUAR HDR-SAP-M99ACS).**	Each	5	17089.67	85448.34
1.25	Providing and Fixing straight / offset type flexible single body push fit type WC pan connector with factory supplied seal guard with integral Single mould sealing fins made of flexible EVA body, including bush / adaptor for use with C.I. Pipe as supplied with the pan connector **(Make: Viega Cat No: 103668).**	Each	17	1641.50	27905.44
1.26	Providing & fixing **Stainless Steel fabricated wall-hung single-piece Water Trough with 6 nos. drinking water fountain stations,** complete including 32mm dia SS manifold waste system, SS waste 'jali', supporting SS brackets etc, as per approval of the Engineer-in-Charge/Architect as per shape size and dimensions given in attached Architectural Drawing for following sizes, but not limited to: 2815mm x 250mm x 430mm	Each	1	617441.79	617441.79
2	**SOIL & WASTE**				
2.1	Providing and Fixing soil, waste and vent pipes:				
	100 mm dia	Metre	265	921.65	244237.25
	Centrifugally cast (spun) iron socket & spigot (S&S) pipe as per IS: 3989				
2.2	Painting sand cast iron/ centrifugally cast (spun) iron soil, waste vent pipes and fittings with two coats of synthetic enamel paint of any colour such as chocolate grey, or buff etc. over a coat of primer (of approved quality) for new work : 100 mm dia	Metre	265	40.65	10772.25
2.3	Providing and fixing 100mm dia. M.S. holder-bat clamps of approved design to Sand Cast iron/cast iron (spun) pipe embedded in and including cement concrete blocks 10X10X10cm of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including cost of cutting holes and making good the walls etc.	Each	10	167.35	1673.50
2.4	Providing and fixing bend of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete.	Each	17	384.90	6543.30
	100 mm dia Sand cast iron S&S as per IS - 3989				
2.5	Providing and fixing plain bend of required degree.				
	100 mm dia Sand cast iron S&S as per IS - 3989	Each	17	334.95	5694.15
2.6	Providing and fixing heel rest sanitary bend for Centrifugally cast (spun) iron				
	100 mm Dia	Each	5	370.95	1854.75
2.7	Providing and fixing single equal plain junction of 100x100x100mm for Centrifugally cast (spun) iron S&S as per IS: 3989 with access door, insertion rubber washer 3mm thick, bolts and nuts complete.	Each	15	623.00	9345.00
2.8	Providing and Fixing double equal plain junction of 100x100x100x100 mm size Sand Cast iron S & S as per IS: 3989 .	Each	2	747.30	1494.60
2.9	Providing and fixing 100mm dia door piece, insertion rubber washer 3 mm thick, bolts and nuts Centrifugally cast (spun) iron S&S IS: 3989 complete	Each	10	512.65	5126.50
2.10	Providing and Fixing 100 mm dia Terminal guard Centrifugally cast (spun) iron S&S IS: 3989.	Each	2	333.80	667.60
2.11	Providing and Fixing collar 100 mm dia of Sand cast iron S&S as per IS: 3989	Each	8	351.20	2809.60
2.12	Providing and fixing M.S. stays and clamps for sand cast iron/centrifugally cast (spun) iron pipes of diameter: 100mm	Each	2	62.00	124.00

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
2.13	Providing & fixing G.I. pipe to IS:1239 (heavy duty Class C) complete with G.I. fittings, clamps and hinges, structural supports etc. as required including cutting the masonary walls, floors & RCC slab & walls and making good with PCC 1:3:6 for waste pipes, bath wastes, overflow, kitchen equipment waste connections and condensate drainage, as directed by the engineer-in-charge including painting the pipe with synthetic enamel paint of approved quality.				
2.13.1	32mm dia	Metre	20	564.00	11280.00
2.13.2	40mm dia	Metre	10	686.00	6860.00
2.13.3	50mm dia	Metre	35	895.00	31325.00
2.14	Providing and Fixing floor trap of self cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors.	Each	26	1034.45	26895.70
	100 mm inlet and 100 mm outlet Sand cast iron S&S as per IS: 3989				
2.15	Providing joints with approved type sealent compound (Drip Seal joints) to sand cast iron/centifugally cast spun iron pipes & fittings of Diameter				
	100 mm dia	Kg	500	365.27	182637.02
2.16	Providing and Fixing Floor drain by fixing G.I. Reducing elbow of 100 x 50 mm in cement concrete 1:2:4 at all levels (exlcuding cost of grating) for connection to floor traps in sunken portions, complete as per required slope as per drawings and as per approval of the engineer-in-charge.	Each	12	1037.71	12452.56

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
2.17	Providing and fixing G.I. Inlet fitting with maximum 3 inlets 32,40 & 50 mm size fabricated from 100 mm dia G.I.pipes and welded G.I. sockets as per site locations, fixed to C.I. Trap and set in cement concrete as per drawing complete as per approval of the engineer-in-charge.	Each	26	2160.91	56183.76
2.18	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) Single socketed pipes.110 mm dia	Metre	245	236.35	57905.75
2.19	Providing and fixing on wall face unplasticised - PVC moulded fittings/ accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.				
2.19.1	Coupler 110 mm dia	Each	25	102.65	2566.25
2.19.2	Single pushfit Coupler				
	110 mm dia	Each	23	94.55	2174.65
2.19.3	Single tee with door				
	110x110x110 mm dia	Each	23	181.55	4175.65
2.19.4	Bend 87.5 deg				
	110 mm bend	Each	23	113.10	2601.30
2.19.5	Shoe plain				
	110 mm shoe	Each	23	98.00	2254.00
2.20	Providing and fixing unplasticised -PVC pipe clips of approved design to unplasticised - PVC rain water pipes by means of 50x50x50 mm hard wood plugs, screwed with M.S. screws of required length, including cutting brick work and fixing in cement mortar 1:4 (1 cement : 4 coarse sand) and making good the wall etc. complete.				
	110 mm dia	Each	77	181.40	13967.80
2.21	Providing and fixing to the inlet mouth of rain water pipe cast iron grating 15 cm diameter and weighing not less than 440 grams.	Each	23	40.90	940.70
2.22	Providing and fixing 100 mm diameter and 60 cm long rain water spout in cement mortar 1:4 (1 cement : 4 fine sand).				
	Stone ware spout	Each	15	90.85	1362.75
2.23	Providing,fixing,testing & commissioning of **HDPE pipe** with electroweld sleeve coupling with high impact resistance with density 955kg/m3.The pipe has been produced according to DIN 8047/45 .acid resistance,suitable for pressureless discharge for waste water complete with all required fittings like Rubber adaptor , tees,bends,branch,reducers,end caps etc. with or without access doors jointed. Fixed to walls, ceiling and under floor with clamps,angles,nuts,bolts complete including cutting and making good the floors and walls where required complete outer diameter. **(For LABS)**				
2.23.1	40 MM OD	Metre	10	527.00	5270.00
2.23.2	50 MM OD	Metre	10	567.00	5670.00
2.23.3	75 MM OD	Metre	310	754.00	233740.00
2.23.4	110 mm OD	Metre	30	1451.00	43530.00
2.23.5	160 mm OD	Metre	235	3505.00	823675.00
2.24	Providing and Fixing **HDPE deep seal P trap** of self cleansing design with or without vent arm with provision for connecting HDPE inlet fitting complete including cost of cutting and making good the walls and floors wherever required (For LABS).	Each	6	3505.00	21030.00
2.25	Providing & fixing **HDPE Multi floor trap** of self cleansing design haivng water seal not less than 50mm with necessary distance piece & making connection with grating, making necessary slab/ wall holes & cutting walls, grouting alround gaps between pipes and slab with M-15 cement concrete and making brick masonry support of 350x350 mm up to bottom of trap etc. complete as per specifications & drawing provided at all places, all levels & all height (For LABS).110 mm inlet and 75 mm outlet	Each	6	4043.00	24258.00
2.26	Providing and fixing 100 mm dia cast brass cleanout plug / floor cleanout with suitable insert keys for opening, male threaded joint with G.I. socket caulked to spun soil pipe including cost of joint etc.complete as directed by Engineer-in-charge.110 MM Dia	Each	15	1595.00	23925.00

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
2.27	Providing and Fixing **SS Grating with frame and SS Screws** casted heavy duty 125-150 mm dia including cutting and making good the walls and floors wherever required complete in all respects .	Each	50	1657.00	82850.00
3.0	**WATER SUPPLY**				
3.1	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :	Metre	115	138.05	15875.75
	Pipes etc., not exceeding 80mm dia				
3.2	Providing and fixing **Chlorinated Polyvinyl Chloride (CPVC) pipes**, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. **Concealed work, including cutting chases and making good the walls etc.**				
3.2.1	15 mm nominal outer dia Pipes	Metre	215	246.20	52933.00
3.2.2	20 mm nominal outer dia Pipes	Metre	40	284.85	11394.00
3.2.3	25 mm nominal outer dia Pipes	Metre	55	333.60	18348.00
3.2.4	32 mm nominal outer dia pipes	Metre	30	412.90	12387.00
3.2.5	40 mm nominal outer dia pipes	Metre	15	450.00	6750.00
3.2.6	50 mm nominal outer dia pipes	Metre	5	520.00	2600.00
3.3	Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc.				
	Internal work - Exposed on wall				
3.3.1	20mm dia Nominal Bore	Metre	10	224.15	2241.50
3.3.2	25mm dia Nominal Bore	Metre	30	247.85	7435.50
3.3.3	32mm dia Nominal Bore	Metre	250	308.35	77087.50
3.3.4	40mm dia Nominal Bore	Metre	90	394.15	35473.50
3.3.5	50mm dia Nominal Bore	Metre	290	472.40	136996.00
3.3.6	65mm dia Nominal Bore	Metre	465	950.00	441750.00
3.3.7	80mm dia Nominal Bore	Metre	10	1134.00	11340.00
3.3.8	100mm dia Nominal Bore	Metre	10	1507.00	15070.00
3.4	Making connection of Distribution branch with main of following sizes by providing and fixing tee, including cutting and threading the pipe etc. complete.				
3.4.1	25 to 40 mm nominal bore	Each	1	394.15	394.15
3.4.2	50 to 80 mm nominal bore	Each	1	771.20	771.20
3.5	Providing and fixing G.I. pipes complete with G.I. fittings including trenching				
	External works				
3.5.1	40 mm dia nominal bore	Metre	60	301.05	18063.00
3.5.2	50 mm dia nominal bore	Metre	60	342.70	20562.00
3.6	Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work :				
3.6.1	20mm dia Nominal Bore	Metre	10	11.80	118.00
3.6.2	25mm dia Nominal Bore	Metre	30	15.50	465.00
3.6.3	32mm dia Nominal Bore	Metre	250	18.40	4600.00
3.6.4	40mm dia Nominal Bore	Metre	90	21.75	1957.50
3.6.5	50mm dia Nominal Bore	Metre	290	25.75	7467.50
3.6.6	65mm dia Nominal Bore	Metre	465	28.00	13020.00
3.6.7	80mm dia Nominal Bore	Metre	10	30.00	300.00
3.6.8	100mm dia Nominal Bore	Metre	10	35.00	350.00

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
3.7	Painting G.I. pipes and fittings with two coats of anti-corrosive bitumastic paint of approved quality :				
3.7.1	40mm dia Nominal Bore	Metre	60	12.35	741.00
3.7.2	50mm dia Nominal Bore	Metre	60	14.80	888.00
3.8	Providing and filling sand of grading zone V or coarser grade, allround the G.I. pipes in external work :				
3.8.1	40mm dia Nominal Bore	Metre	60	72.25	4335.00
3.8.2	50mm dia Nominal Bore	Metre	60	74.95	4497.00
3.9	Providing and fixing G.I. Union heavy class in G.I. Pipe including cutting and threading the pipe and making long screws etc. complete (new work)				
3.9.1	20mm dia Nominal Bore	Each	1	170.95	170.95
3.9.2	25mm dia Nominal Bore	Each	1	205.80	205.80
3.9.3	32mm dia Nominal Bore	Each	1	240.65	240.65
3.9.4	40mm dia Nominal Bore	Each	1	298.75	298.75
3.9.5	50mm dia Nominal Bore	Each	1	384.90	384.90
3.10	Providing and fixing forged brass lever operated flow control **ball valve** of full flow with forged brass ball (Machined to mirror smooth finsh with hard chrome plated) and spindle with setting and gland of superior quality having minimum working pressure of 10 kg/cm2 etc. complete in all respect.				
3.10.1	15 mm nominal bore	Each	2	349.61	699.22
3.10.2	20 mm nominal bore	Each	5	475.39	2376.94
3.10.3	25 mm nominal bore	Each	15	716.09	10741.33
3.10.4	32 mm nominal bore.	Each	5	1168.65	5843.26
3.10.5	40 mm nominal bore	Each	20	1666.65	33332.95
3.10.6	50 mm nominal bore	Each	10	2359.74	23597.45
3.11	Providing and fixing C.I butterfly valve, wafer end type class PN 1.6 as per I.S:13095 or BS:5155, including necessary nuts, bolts, gaskets & flanges etc., complete.				
3.11.1	65 mm nominal bore	Each	5	4009.74	20048.70
3.11.2	80 mm nominal bore	Each	5	4166.53	20832.66
3.11.3	100 mm nominal bore	Each	5	4848.94	24244.70
3.12	Providing and fixing 15 mm dia Horizontal / Vertical type gun metal non- return valve of approved quality (screwed end)	Each	10	803.28	8032.77
3.13	Providing & fixing butterfly valve (with motorized actuator) of rating PN 1.6, wafer type, in cast iron body with Ductile Iron disc, EPDM seal, SS single piece shaft, conforming to IS-13095 of the following sizes complete with cast iron hand level companion flanges, bolts, nuts, washers & inserted rubber gaskets, as required and as per enclosed specification, with single phase Electrical Actuator, of 15Nm- 400Nm Torque, made of aluminium alloy (resistant to heat, acid , alkali, corrosion), and weather proof heavy duty motor, with stabilized start speed to effectively avoid water hammering, with waterproofing seal (IP 67) for all housing seals, low noise level, built –in thermal protection complete as per approved type and specifications as per instructions of the engineer - in - charge.				
3.13.1	32 mm dia	Each	2	10285.44	20570.89
3.13.2	40 mm dia	Each	2	10285.44	20570.89
3.14	Providing and fixing gunmetal float valve of approved superior quality with low or high pressure plastic float, complete in all respects. (Rate inclues of any fitting required for fixing of float valve)				
3.14.1	32 mm dia	Each	2	4555.50	9111.00
3.14.2	40 mm dia	Each	2	5926.07	11852.14

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
3.15	Constructing masonry Chamber 30x30x50 cm inside, in brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12mm thick, finished with a floating coat of neat cement complete as per standard design :				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	2	1195.35	2390.70
3.16	Constructing masonry **Chamber 60x60x75 cm** inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design :				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	1	6849.60	6849.60
3.17	Providing and fixing 750 mm long **hot dipped G.I. Puddle flanges** for water tanks as per I.S. 1239 (Class C) with 6mm thick M.S. Plate of suitable size and welded alround the pipe fixed in walls, beams and top slab of R.C.C tanks, complete with all details in all respects and as per drawing.				
3.17.1	25mm dia	Each	1	977.08	977.08
3.17.2	32mm dia	Each	1	1182.66	1182.66
3.17.3	40mm dia	Each	1	1251.19	1251.19
3.17.4	50mm dia	Each	5	1456.78	7283.89
3.17.5	65 mm dia	Each	4	1867.95	7471.80
3.17.6	80mm dia	Each	8	2347.65	18781.19
3.17.7	100mm dia	Each	1	2895.88	2895.88
3.17.8	150mm dia	Each	1	3855.28	3855.28
3.18	Providing and fixing Stainless Steel pipes (Grade SS-316) confirming to JIS 3448 standard complete with Press Type fittings with SC-Contur in accordance with DVGW regulation JWWA G116 such as sockets, bends, elbows, tees, reducers, unions, Flanges, clamps/structural steel supports,hangers etc. necessary adapters for GI to SS / other metals and for connections to CP fittings, jointing, sundries,cutting holes in walls/floors/slabs & making good, complete in all respects.				
3.18,1	15 mm	Metre	10	761.42	7614.16
3.18,2	20 mm	Metre	25	1232.55	30813.73
3.18,3	25 mm	Metre	240	1562.68	375043.56
3.18,4	32 mm	Metre	20	2363.27	47265.39
3.19	Providing and fixing **insect-proof coupling to vent pipes of overhead tank** with threaded or flanged joints, including G.I. flanges, nuts, bolts, 3mm thick	Each	6	1004.49	6026.94
	80 mm dia				
3.20	Providing, fixing and testing, double flanged Water Flow Meter complete with digital display provision & including Pulse generator and Remote Totalizer complete in all respect as per manufacturers specification, instructions and				
3.20.1	40 mm dia	Each	1	36801.88	36801.88
3.20.2	50 mm dia	Each	1	43654.73	43654.73

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
3.21	**Hydropneumatic Booster system for Top Floors at Terrace Level (Domestic Water Supply)**				
	Providing, fixing and commissioning suitable complete composite hydropneumatic system consisting of horizontal /vertical multistage centrifugal pump having stainless steel (SS 304) impellers, shaft and housing, with single mechanical seal and pressurised tank of 50 liters capacity, complete with all standard accessories including pressure switch, pressure gauges, non-return & isolating valves on suction and delivery side with nuts, bolts & washer including mild steel flanges, where ever required with 3 mm thick rubber insertion, with necessary protection and operational devices i.e alternate pumping operation and shut-off during dry running conditions etc. with suitable electrical motor to be operated on 210/220 OR 400/440 volt 50 cycle AC supply, suitable for following duty and with total no. of pumps - 2 nos.(1 working+1standby) complete with Control Unit Panel, manifolds & chassis, as per the approval of Project-in-charge complete with base frame, nuts, bolts and washer, necessary RCC foundation as per requirement.				
	No. of Pumps/Set : 2 (1 Working + 1 Stand by)				
	Capacity : app. 150 lpm per pump				
	Head : app. 20-25 m	Set	1	200432.16	200432.16
3.22	Supply, installation, testing and commissioning of R.O. Plant capacity of 200 LPH (Complete system to be compact type, skid-mounted / cabinet enclosed, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components:-				
A)	Raw Water pumps of horizontal, centrifugal type suitable for a flow rate of 400 LPH at 25m head. The Pump construction shall be of SS-304 & impeller shall be also SS-304. The motor shall be TEFC suitable for a supply of 415V/3-phase/50Hz supply. The pump shall be supplied complete with base channel coupling foundations, bolts, pressure gauge at inlet and outlet of each pump. -- 2 Nos.				
B)	Activated Carbon Filter (Manual type) for online installation before the Micron Filters) suitable for a flow rate of 400 LPH. The material of construction shall be composite FRP. The unit shall be supplied complete with multi-port valves, inlet and outlet branches removal caps of replacement of elements inlet and outlet pressure indicators. -- 1 Set				
C)	Dosing System for Antiscalant , SMBS & PH consisting of one HDPE tank of 100 litre capacity with a positive displacement diaphragm dosing pump having variable flowrate of 0-6 LPH. The motor shall be suitable for operation at 240V/single phase/50Hz supply. the pump shall be supplied complete with necessary polypropylene piping, valves, strainers & injection fittings. -- 2 Set.				
D)	Micron cartridge filter suitable for a flowrate of 400 LPH to achieve particle filtration of less than 5 microns. The unit shall be supplied complete with inlet and outlet branches removal cap for replacement of element, inlet and outlet pressure indicators. (One for the pressure treatment & other for CIP system) MOC: Polypropylene -- 2 sets				
E)	R.O High Pressure feed pumps of vertical, multistage centrifugal type suitable for a flowrate of 400 LPH of required Head (or as per deisgn calcualtion). The pump construction shall be of SS-304 & impeller shall be also SS-304. The motor shall be of TEFC suitable for a supply of 415V/3 phase/50 Hz supply. the pump shall be supplied complete with base channel coupling foundation, bolt, pressure gauge at inlet and outlet of each pump. - 2 Nos.				
F)	R.O. modules made out of Spiral Wound Thin Film composite suitable to withstand pressure of 20kg/sq.cm. Suitable BSPT/NPT connections shall be used for connecting feed & reject ends. the modules shall be supplied complete with all necessary instrumentation, valves for sampling, drain, reject & permeate, epoxy-coated structural steel bases and supports, as per following system capacity requirements:				
	(i) Total net treated water output of system = **200 LPH**				
	(ii) System recovery = **50 - 60 %**				
	(iii) Filtration area per membrane = **85 sq.ft.**				
	(iv) Number of membranes = The total number of membranes required shall be as per requirements, supported by calculations from the vendor.				
G)	Clean in place pump of horizontal end suction suitable for a flow rate of 400 LPH at required head with 100 ltr. HDPE tank. The pump construction shall be of stainless steel SS-304. The motor shall be TEFC suitable for a supply of 415V/3 phase/50Hz supply. The pump shall be supplied complete with base channel, coupling, foundation bolts, pressure gauge at inlet & outlet of the pump. -- 1 Set				

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
H)	Centralised PLC control panel along with touch-screen digitial display board along with all digital sensors for TDS & Flow, made out of CRCA sheet min. 2mm thick having main contactors for all pumps (listed above) including SPP, 3 phase thermal overload relay. The control panel for monitoring and control of P.O. system shall include all required signal lamps, HRC fuses, Annunciation box with Hooter. All control and power cabling along with double earthing between the panel shall be included in the scope of supply of the contractor. An emergency stop push button shall be provided in the panel. The MCC panel shall have the following interlocks:-				
i)	High Pressure Pump unit trip in case of Low suction pressure.				
ii)	High Pressure Pump unit trip in case of High discharge pressure.				
iii)	Special anti-scalant dosing pump trips in case high pressure pump trips and vice versa.				
iv)	High Pressure pump trip in case of high conductivity in permeate.				
v)	SHC dosing pump trips incase high pressure pump trips and vice versa.				
vi)	In all above cases Annuciator box indicates nature of malfunctioning.				
vii)	The System should display the TDS of Raw Water & R.O. Water, Flow Rate of Inlet, Outlet & Reject Water simultaneously.				
I)	Instrumentation mounted in R.O. system/panel as follows:-				
i)	Digital Flow meters to measure and control the flow of feed/product/reject				
ii)	Pressure Gauges made out of SS316 (glycerine filled) of pricol/equivalent				
iii)	Digital Conductivity probes for conductivity display -- 1 Nos.				
iv)	Pressure Switches to control pressure and given High/Low pressure trip. (Danfoss/Switzer/Square D make) -- 4 Nos.				
v)	Level switches to control water level in the output storage tank and soft Water Tank. -- 2 Nos. 1 Nos.				
vi)	ORP with dump valve. -- 1 Set				
J)	First fill of all chemicals and lubricants to commission and operate the plants. -- 1 Lot				
k)	All interconnecting piping work with valves:-				
i)	Low Pressure Side till R.O. feed water pump. Piping shall be of extra strong PVC and all valves shall be of extra strong PVC and all valves shall be PVC ball valves. -- 1 Lot				
ii)	High Pressure side piping from the R.O. high pressure pumps to the reject stream control valves shall be of SS - 304 using all SS fittings ball valves of suitable pressure rating shall be used till 25 mm size, above 25 mm, flanged globe/ wafer butterfly valves in SS construction shall be used. Rejects pressure control valves shall be globe valve and feed flow control valve shall be of SS-304. -- Lot				
	(As per complete RO plante sets)				
	(for above from "A" to "K" complete)	Set	1	401919.65	401919.65
3.23	Complete SS treated water storage tank of capacity 500 Litres including all inlet/outlet connections, accessories, valves, double seal manhole covers, insulation etc. The HDPE tank must be ozone resistant and to be used as ozone contact tank. Fabrication to be done as per approved shop drawing.	Set	1	201747.90	201747.90
3.24	Supply, Installation, Testing and Commissioning of Water Chiller System complete in all respects having following technical & operational Parameters, for cooled water production :-				
	Flow rate of outlet cooled water : 200 LPH				
	Cooling Capacity : 5 TR				
	Refrigerant = R 22				
	Power = 3 Ph/440 V / 50 Hz				
	MOC : MS Powder Coated				
	Inbuilt storage Tank Capacity = 200 Liter				
	Water Temperature Inlet = 35 + 5 C				
	Outlet Temperature = 20 + 3 C	Set	1	157341.44	157341.44

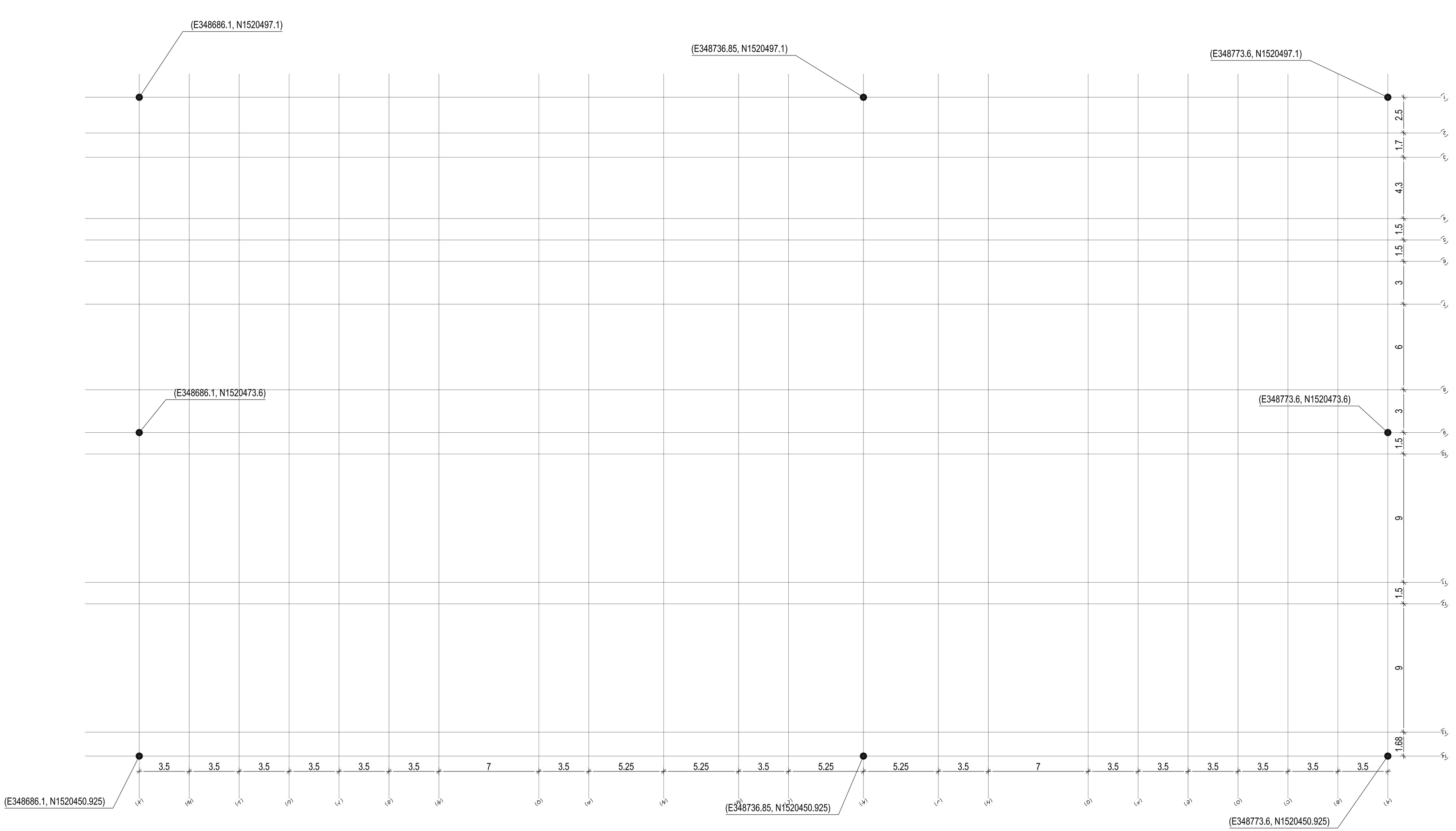
S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
4	**SEWERAGE AND DRAINAGE SYSTEM**				
4.1	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) up to haunches of pipes including bed concrete as per standard design :				
4.1.1	150 mm diameter	Metre	25	479.85	11996.25
4.1.2	200 mm diameter	Metre	285	564.00	160740.00
4.1.3	250 mm diameter	Metre	300	656.60	196980.00
4.1.4	300 mm diameter	Metre	10	757.60	7576.00
4.2	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 ::				
4.2.1	150 x 100 mm size P type.				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	4	1623.25	6493.00
4.2.2	180x150 mm size P type				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	4	1723.65	6894.60
4.3	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete :				
4.3.1	200 MM Dia RCC Pipe	Metre	30	400.00	12000.00
4.3.2	250 MM Dia RCC Pipe	Metre	300	482.05	144615.00
4.3.3	300 MM Dia RCC Pipe	Metre	10	518.55	5185.50
4.4	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), 100 mm foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making				
	Inside size **90x80 cm** and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) :				
4.4.1	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	2	8634.10	17268.20

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
4.4.2	Extra depth for Manholes				
	Size 90x80 cm				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Metre	1	5718.60	5718.60
4.5	Constructing brick masonry circular type **manhole 0.91m** internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand), in side 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 mix (1 cement : 3 coarse sand : 6 graded stone aggregate 40mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, all complete as per standard design :				
	0.91 m deep with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg., 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 12mm thick cement plaster at the external surface shall be paid for separately) :				
4.5.1	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	13	8683.75	112888.75
4.5.2	Extra depth for circular type Manhole 0.91 internal dia (at bottom) with beyond 0.91 m to 1.67 m				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Metre	5	4911.80	24559.00
4.6	Constructing brick masonry circular **manhole 1.22m** internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand) inside cement plaster 12mm 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 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, all complete as per standard design :				
	1.68 m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg. fixed in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm 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) :				
4.6.1	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	1	16560.80	16560.80
4.6.2	Extra depth for Circular type Manhole 1.22 m internal dia (at Bottom) beyond 1.68 to 2.29 m:				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Metre	1	6362.65	6362.65

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
4.7	Constructing brick masonry circular m**anhole 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 necessarychannel 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 I.S. 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) :				
4.7.1	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Each	1	35380.05	35380.05
4.7.2	Extra depth for circular type manhole 1.52 m internal dia (at bottom) beyond 2.30 m:				
	With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	Metre	1	15028.55	15028.55
4.8	Providing **orange colour safety foot rest** of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm 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 manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.	Each	75	327.90	24592.50
4.9	Constructing brick masonry catch basin with FPS (non-modular) bricks in cement mortar 1:5 (1 cement: 5 coarse sand), 150mm thick foundation concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40mm nominal size) inside and outside plaster in cement mortar 1:3 (1 cement: 3 coarse sand). inside finished with floating coat of neat cement, making haunches and channel in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) neatly finished, complete as per standard design including excavation, refilling and disposal of surplus earth.				
4.9.1	**Size 450x450x450mm** inside with precast S.F.R.C. grating of approved design and sample fixed in RCC slab in cement 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) including centering, shuttering all complete as per site conditions.	Each	5	7850.00	39250.00
4.9.1.1	Extra for 450X450X450mm catch basin chamber depth exceeding 45cm up to 60cm	Metre	1	1478.16	1478.16
4.9.2	**Size 600x600x600mm** inside with precast S.F.R.C. grating of approved design and sample fixed in RCC slab in cement 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) including centering, shuttering all complete as per site conditions.	Each	5	9970.00	49850.00
4.9.2.1	Extra for 600X600X600mm catch basin chamber depth exceeding 60cm up to 75cm	Metre	2	10831.08	21662.15
4.9.3	**Size 750x750x750mm** inside with precast S.F.R.C. grating of approved design and sample fixed in RCC slab in cement 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) including centering, shuttering all complete as per site conditions.	Each	12	11820.00	141840.00
4.9.3.1	Extra for 750X750X750mm catch basin chamber depth exceeding 75cm up to 90cm	Metre	1	0.00	0.00
4.9.4	**Size 900x900x900mm** inside with precast S.F.R.C. grating of approved design and sample fixed in RCC slab in cement 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) including centering, shuttering all complete as per site conditions.	Each	7	16505.00	115535.00
4.9.4.1	Extra for 900X900X900mm catch basin chamber depth exceeding 75cm up to 90cm	Metre	1	1057.20	1057.20

S. No.	Description of item	Unit	Quantity	Rate	Amount (Rs.)
4.10	Providing and laying High density Polythene (HDPE Pipes) material grade PE - 80, working pressure rating PN 4 (0.4 maximum permissible working pressure) confirming IS - 14333 including all fittings and jointed by Butt welding method including testing of joints etc. complete as required.				
4.10.1	160 mm OD	Metre	15	1711.08	25666.19
4.10.2	200 mm OD	Metre	255	2604.33	664104.51
4.11	Contsruction of Neutralization chamber of size 2 m x1 m (Internal) with effective depth of 1 m with fly ash lime brick in Cement 1:4 (1 Cement: 4 Coarse sand) over a bed of 150 mm thick PCC 1:4:8 (1 Cement: 4 Coarse sand: 8 graded stone aggregate 40 mm nominal size) including a baffle wall of Brick work, covered with RCC slab of 150 mm thickness, of 1:2:4 mix (1 Cement: 2 Coarse sand: 4 graded stone aggregate of 20 mm nominal size) including centering, shuttering and reinforcement complete with providing and fixing Foot rests @300 mm C to C with Two 600x600 mm MS fabricated Heavy duty Manhole Covers with Lifting arrangement, including 150 mm dia Inlet & Outlet pipes complete . (For lab waste & kitchen waste)	Each	3	87695.85	263087.56
4.12	Constructing brick masonry septic tank with 75 class designation bricks in cement mortar 1:4 (1 Cement : 4 Coarse Sand) foundation concrete 1:4:8 (1 cement: 4 coarse sand: 8 graded stone aggregate with 40 mm nominal size) inside and outside plastering 12 mm thick with cement mortar 1:3 (1 Cement: 3 Coarse Sand) with water proofing compound finished with a floating coat of neat cement inside and making connection for pipe in Cement Mortar 1:3 (1 Cement: 3 Coarse Sand) neatly finished complete as per standard design including disposal of surplus earth.				
	Cover of Septic tank to be RCC 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate with 20 mm nominal size) with a provision of 2 Nos. SFRC cover and frame (Heavy Duty) HD-20 grade designation confirming to IS: 12592, including centering, shuttering and re-inforcement all complete as per attached sketch.				
	Internal size 5 m x 4 m x 1.5 m effective depth [overall depth shall be as per	Each	1	250000.00	250000.00
4.13	Supply of all materials and labour for construction of soak pit consisting of inner core of Brick Honey comb work with 75x 75 mm openings, filled with brick blast loosely filled with another layer of Brick Blast 50-80 mm nominal size and final covering with brick blast 40 mm nominal size. The covering of the pit will be RCC slab 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate with 20 mm nominal size) having central opening of 670x670 mm or 670 mm dia with removable RCC precast cover complete in all respect as per attached sketch.				
	Size 3 m dia and 2.00m effective depth	Each	1	150000.00	150000.00
4.14	Providing and Fixiing medium duty, water tight double sealed Ductile iron 560 mm dia. Circular Manhole cover and frames specially casted for placing over the OH Water tanks with lifting and locking arrangements as per approved sample, complete in all respect including fixing in PCC as per site Requirement .	Kg	500.00	90.00	45000.00
4.15	Providing and fixing M.S. holder bat clamp of approved design to sand cast iron/ cast iron (spun) pipes comprising of M.S. flat brackets made of 50x5 mm flat of specified shape, projecting 75 mm outside the wall surface and fixed on wall with 4nos, 6mm dia expansion hold fasteners, including drilling necessary holes in brick wall/ CC/ RCC surface and the cost of bolts etc. The pipes shall be fixed to the already fixed brackets with the help of 30 mm x1.6 mm galvanised M.S. flats of specified shape and of total length 420 mm and shall be fixed with M.S. nuts, bolts, & washers of size 25x6 mm, one bolts on each side of the pipe.				
4.15.1	Total bracket length 580 mm of approved shape and design (for single 100 mm dia pipe)	each	25.00	179.40	4485.00
4.15.2	Total bracket length 810 mm of approved shape and design (for two 100 mm dia pipes)	each	25.00	216.30	5407.50
4.15.3	Total bracket length 1040 mm of approved shape and design (for three 100 mm dia pipes)	each	10.00	253.15	2531.50
4.16	Providing and fixing cast iron side wall parapet drain with aluminium grate duly painted with Four (4) S.S. Screws complete in all respect for connecting the roof rain water drain to vertical rain water pipe.				
	100 x 280mm	Each	23	1500.00	34500.00
				Total (E) = Rs 9010219/-	

Grand Total (A+B+C+D+E) = Rs 151642892 /-



ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

NOTES

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- All Dimensions are in Millimeters unless stated otherwise.
- All Levels are in Millimeters and relate to ..... Datum level.
- The contractor shall verify all dimensions, details,specifications & site conditions & shall report any error, omission and/or anomaly to the Campus Designer before commencement of work.
- For construction purposes, the dimensions shall not be measured directly of the drawings. The drawings shall not be used for construction until they are issued for construction.
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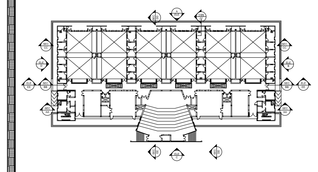
-All shop drawings should be provided to the Campus Designer for approval

KEY PLAN:



PEB

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
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TECHNICAL PROJECTS CONSULTANTS, 1839GA201301

MECHANICAL ENGG CONSULTANTS:
M.L.ENGINEERING CONSULTANTS PVT.LTD., NEW DELHI-110013

ELECTRICAL ENGG CONSULTANTS:
PARIKH KISHOR ASSOCIATES PVT. LTD, NEW DELHI-110021

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
AKULA CONSULTANTS, NEW DELHI-110092

Architect's Signature | Client's Signature

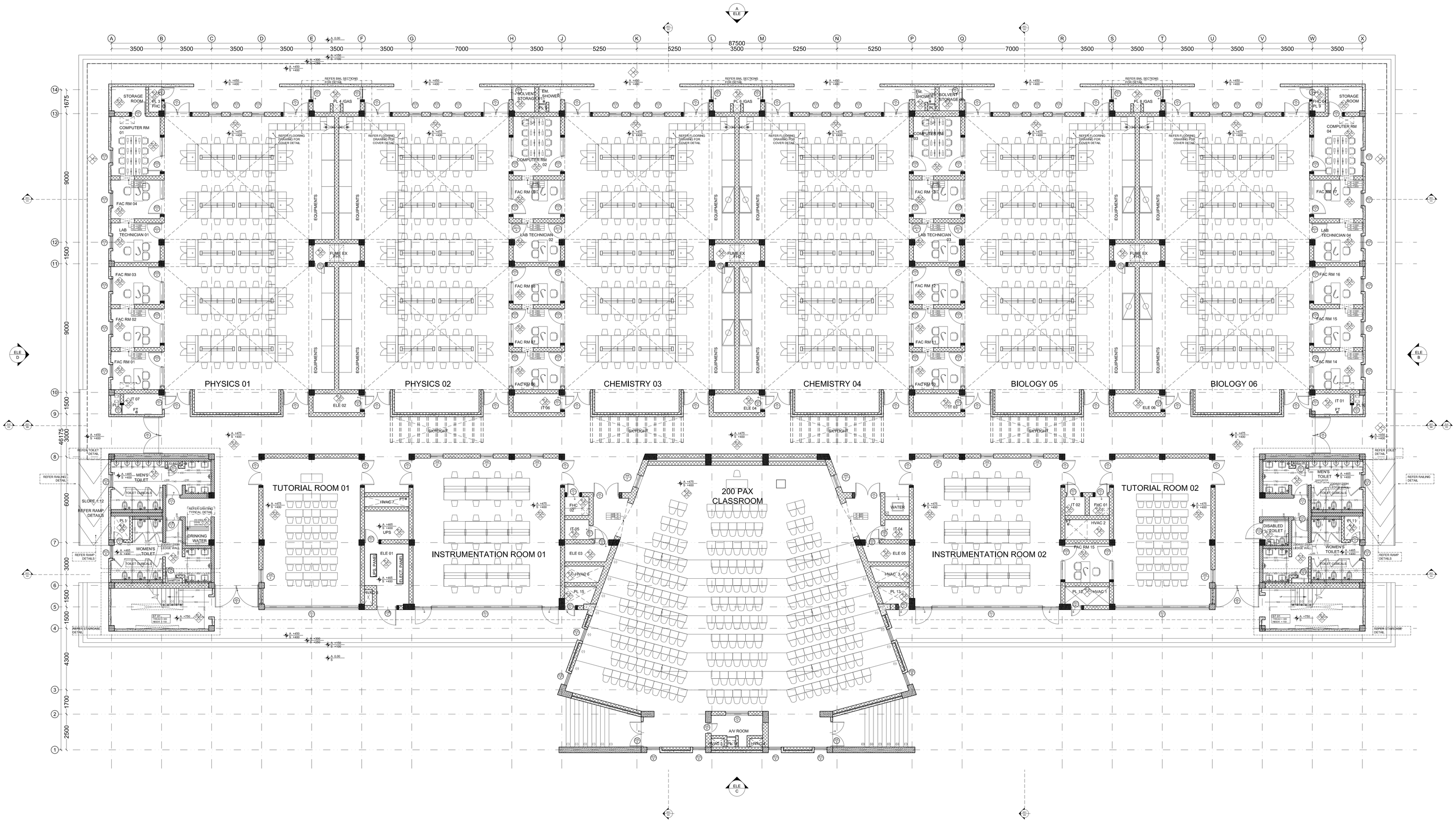
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
PEB SETTING OUT PLAN

Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. **UGL-AR-100**
Drawn by FF	
Checked by VB	Revision No. R0

AUTHORITY:



ABSOLUTE LEVEL ±0.00 IS 81.4

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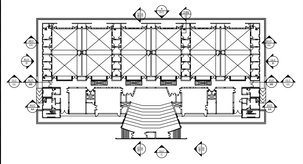
KEY PLAN:



UGL

DOOR - WINDOW SCHEDULE

Concrete Threshold to be placed in all locations where Door have Threshold / Cills

DOOR SCHEDULE

Concrete Threshold to be placed in all locations where Door have Threshold / Cills

DOOR TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) MM	LINTEL (ROUGH) LEVEL MM	THRE SHOLD / CILL (ROUGH) LEVEL MM
D0A	1000	2100	2100	0
D0B	750	2100	2100	0
D0BA	1800	2100	2100	0
D1A	1000	2100	2100	0
D1B	900	2100	2100	0
D2A	1000	2400	2400	300
D4A	2600	2400	2400	0
D5B	2100	2400	2400	0
SD7A	750	2100	2100	0
SD7C	1000	2100	2100	0
FD8B	1050	2100	2100	300
FD7A	1650	2100	2100	0
FD7B	1000	2100	2100	0
FD8A	1050	2100	2100	300
D10A	1000	2100	2100	0
D7BA	1000	2100	2100	0
D7AA	1700	2100	2100	0
D12A	2600	3040	2600	150
GR1F	900	2850		0
GT1D	675	3250		0
GR1V	2600	3080		490

WINDOW SCHEDULE

Concrete window Cills to be placed in all locations where Window opening is in AAC or Brick Wall

WINDOW TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) H) MM	LINTEL (ROUGH) LEVEL MM	CILL (ROUGH) LEVEL MM
W10A	900	2325	2800	475
W14A	900	2325	2800	475
W14B	900	2390	4270	1875
W15A	10400	1480		1020
W15B	9900	1480		1020
W15C	10400	2110		1020
W15D	9900	2110		1020
W9F	800	2325	2800	475
W9H	1800	1980	4270	2275
GL1A	10100	2325	2800	475
GL1B	9600	2325	2800	475

FIXTURES LEGEND

	KITCHEN SINK AS/ SPECS
	FLOOR TRAP AS/ SPECS
	WATER CLOSET AS/ SPECS
	WASH BASIN AS/ SPECS
	SOAP DISPENSER AS/ SPECS
	HAND DRYER AS/ SPECS
	PARAPET DRAIN AS/ SPECS

HATCH LEGEND

	EXPOSED CONCRETE
	NON EXPOSED CONCRETE
	AAC
	BRICK WALL

ISSUES

DATE	REVISION	DESCRIPTION
31 DEC 2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. HEMOKING TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagarlpudi, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Panipoot Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI,DELHI

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT LTD, NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
ELECTRICAL CONSULTANTS, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.E.P CONSULTANTS, NEW DELHI-110058

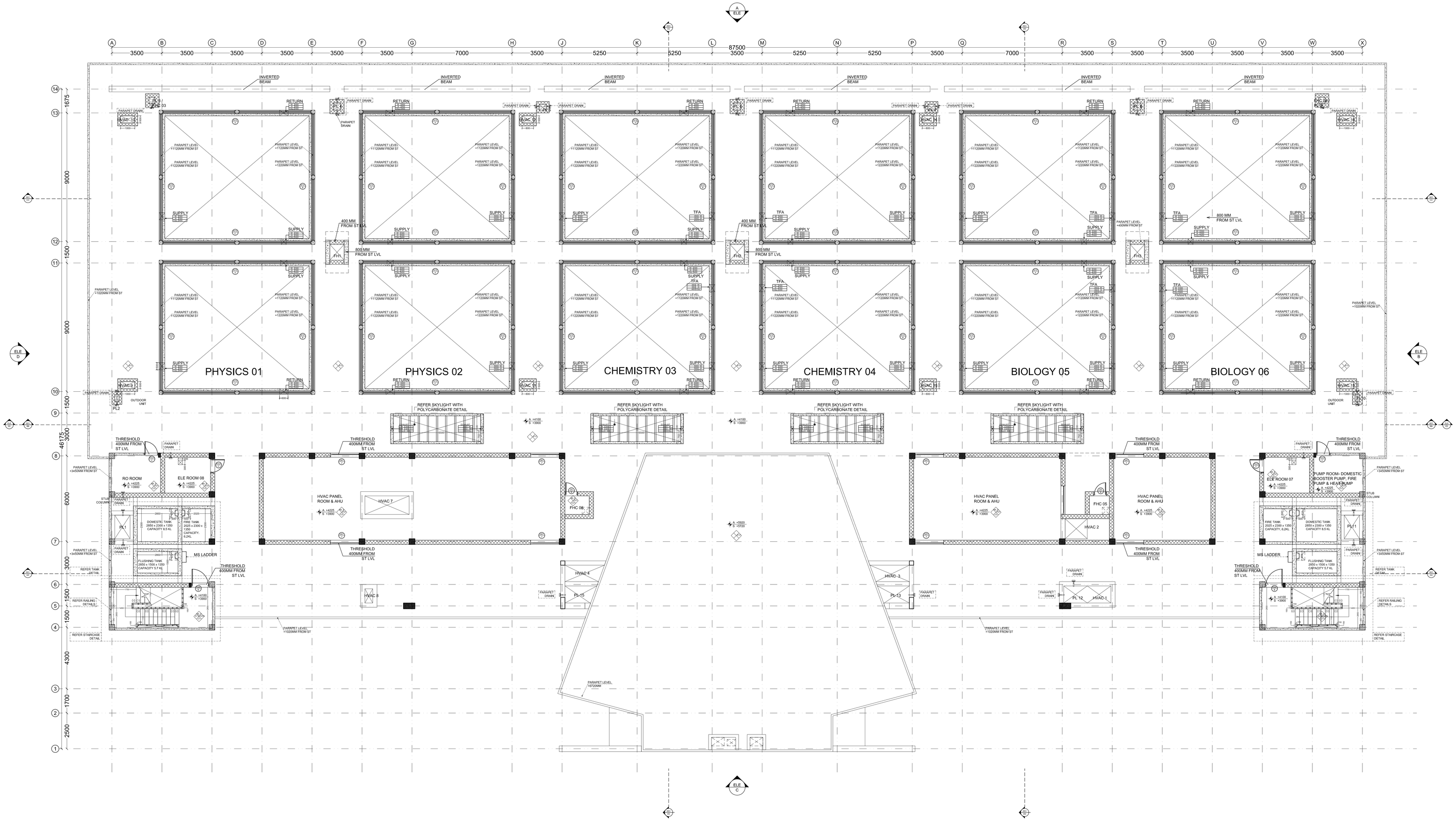
Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL GROUND FLOOR PLAN

Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-201
Drawn by FF	
Checked by VB	Revision No. R0
AUTHORITY:	



ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

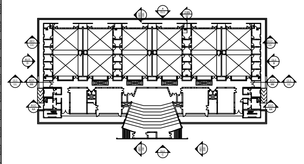
NOTES

- Dimensions are not to be scaled.
- All Dimensions are in Millimeters unless stated otherwise.
- All Levels are in Millimeters and relate to ..... Datum level.
- The contractor shall verify all dimensions, details,specifications & site conditions & shall report any error, omission and/or anomaly to the Campus Designer before commencement of work.
- For construction purposes, the dimensions shall not be measured directly of the drawings. The drawings shall not be used for construction until they are issued for construction.

-These drawings are to be read in co-ordination with HVAC, Electrical, Plumbing drawings & all relevant sections of specifications..

-All shop drawings should be provided to the Campus Designer for approval

KEY PLAN:



UGL

DOOR - WINDOW SCHEDULE

Concrete Threshold to be placed in all locations where Door have Threshold / Cills

DOOR SCHEDULE

Concrete Threshold to be placed in all locations where Door have Threshold / Cills

DOOR TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) MM	LINTEL (ROUGH) LEVEL MM	THRESHOLD / CILL (ROUGH) LEVEL MM
D24A	1000	2100	2100	0
D24B	700	2100	2100	0
D24A	1800	2100	2100	0
D24B	1800	2100	2100	0
D5A	900	2100	2100	0
D5B	900	2100	2500	400
D6A	2800	2400	2400	0
D6B	3100	2400	2400	0
SD7A	700	2100	2100	0
FD7C	1000	2100	2500	0
FD7D	1000	2100	2500	400
FD21A	1400	2100	2100	0
FD21B	1000	2100	2100	0
FD21C	1800	2100	2500	400
D19A	1000	2100	2100	0
D19B	1000	2100	2100	0
D17A	1200	2100	2500	400
D4/2A	2400	2400	2800	150
GR1F	900	2800		0
GR1G	675	3250		0
GR1J	3300	3000		400

WINDOW SCHEDULE

Concrete window Cills to be placed in all locations where Window opening is in AAC or Brick Wall

WINDOW TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) H) MM	LINTEL (ROUGH) LEVEL MM	CILL (ROUGH) LEVEL MM
W12B	900	2325	2800	475
W14A	900	2325	2800	475
W14E	900	2395	4270	1875
W15A	1040	1480		1020
W15B	1800	1480		1020
W15C	1940	2110		1020
W15D	1800	2110		1020
W9F	800	2325	2800	475
W8H	1800	1980	4270	2275
GL1A	12100	2325	2800	475
GL1B	9600	2325	2800	475

FIXTURES LEGEND

	KITCHEN SINK AS/ SPECS
	FLOOR TRAP AS/ SPECS
	WATER CLOSET AS/ SPECS
	WASH BASIN AS/ SPECS
	SOAP DISPENSER AS/ SPECS
	HAND DRYER AS/ SPECS
	PARAPET DRAIN AS/ SPECS

HATCH LEGEND

	EXPOSED CONCRETE
	NON EXPOSED CONCRETE
	AAC
	BRICK WALL

ISSUES

DATE	REVISION	DESCRIPTION
31 DEC 2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
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Permanent Campus: Jagarupalli, Yerpedu - Kalavasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI/DELHI

MECHANICAL ENGG CONSULTANTS:
M. L. ENGINEERING CONSULTANTS PVT LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
ELECTRICAL CONSULTANTS, NEW DELHI-110019

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
HVLC CONSULTANTS, NEW DELHI-110034

Architect's Signature | Client's Signature

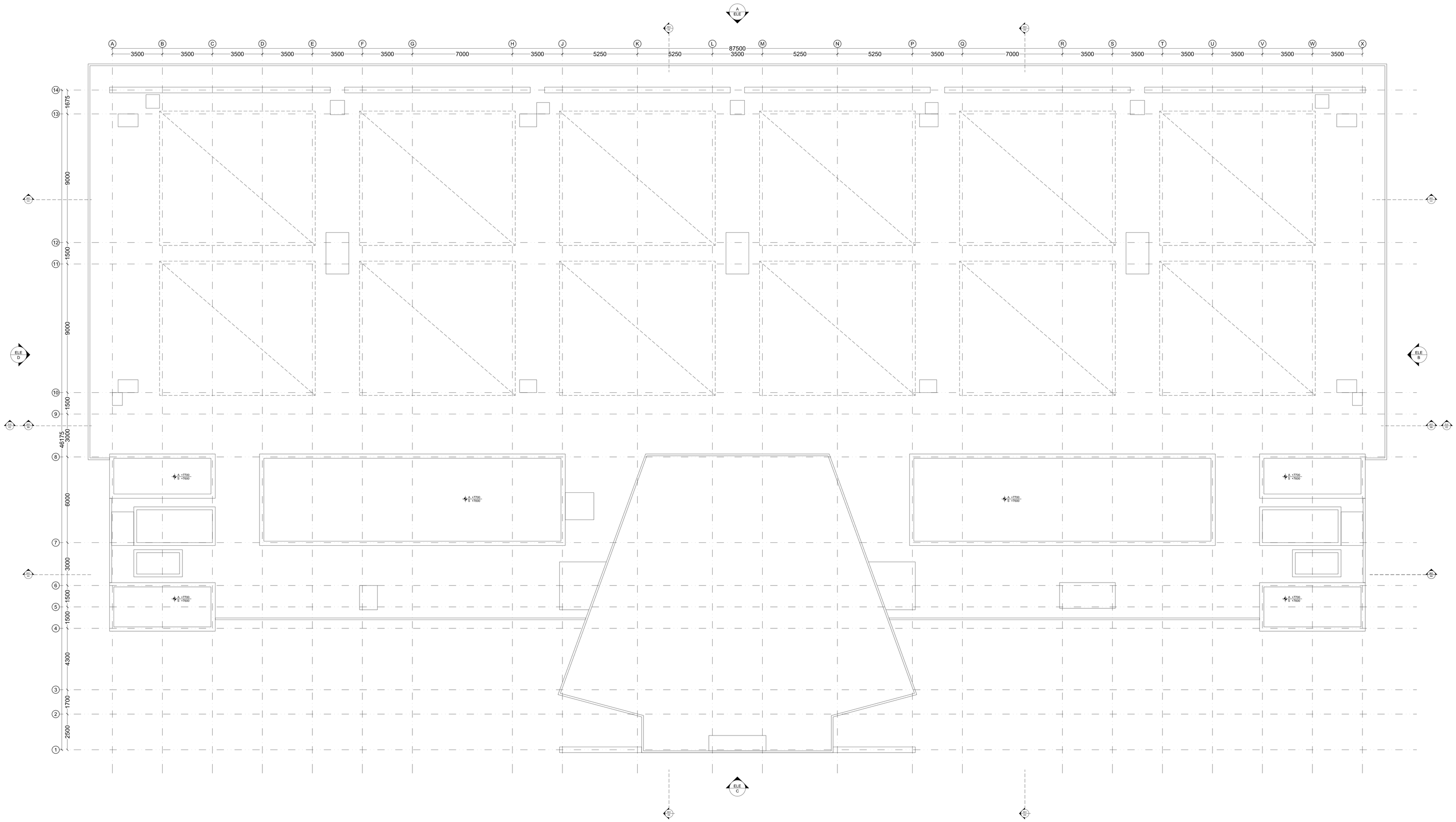
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL TERRACE FLOOR PLAN

Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-202
Drawn by FF	
Checked by VB	Revision No. R0

AUTHORITY:



ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

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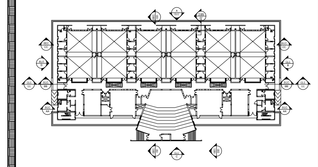
KEY PLAN:



UGL

DOOR - WINDOW SCHEDULE

DOOR SCHEDULE

Concrete Threshold to be placed in all locations where Door have Threshold / C.lls

DOOR TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) MM	LINTEL (ROUGH) LEVEL MM	THRESHOLD / CILL (ROUGH) LEVEL MM
D2A1	750	2100	2100	0
D2A2	750	2100	2100	0
D2BA	1800	2100	2100	0
D4A	1500	2100	2100	0
D5A	900	2100	2100	0
D6A	2400	2400	2400	400
D6	2400	2400	2400	0
D6B	1700	2400	2400	0
D6C1A	750	2100	2100	0
D6C1B	750	2100	2100	0
D6B	3250	2100	2500	400
D7D1	1800	2100	2100	0
D7D1B	1000	2100	2100	0
D7D1A	1000	2100	2500	400
D7B1	1000	2100	2100	0
D7BA	1000	2100	2100	0
D7C1	1150	2100	2100	0
D12A	2400	2540	2800	100
GR1F	900	3000		0
GR1A	900	3000		400
GR1C	2000	3000		400

WINDOW SCHEDULE

Concrete window Cills to be placed in all locations where Window opening is in AAC or Brick Wall

WINDOW TAG	WIDTH (ROUGH) MM	HEIGHT (ROUGH) H) MM	LINTEL (ROUGH) LEVEL MM	CILL (ROUGH) LEVEL MM
W10B	900	2325	2800	475
W14A	900	2325	2800	475
W14B	900	2395	4270	1875
W15A	10400	1480		1020
W15B	9900	1480		1020
W15C	10400	2110		1020
W15D	9900	2110		1020
W9F	900	2325	2800	475
W9H	1800	1995	4270	2275
GL1A	12100	2325	2800	475
GL1B	9600	2325	2800	475

FIXTURES LEGEND

	KITCHEN SINK AS/ SPECS
	FLOOR TRAP AS/ SPECS
	WATER CLOSET AS/ SPECS
	WASH BASIN AS/ SPECS
	SOAP DISPENSER AS/ SPECS
	HAND DRYER AS/ SPECS
	PARAPET DRAIN AS/ SPECS

HATCH LEGEND

- EXPOSED CONCRETE
- NON EXPOSED CONCRETE
- AAC
- BRICK WALL

ISSUES

DATE	REVISION	DESCRIPTION
31 DEC 2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL;
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagarlamudi, Yerravaripalem Mandal, Chandragiri Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Panchsheel Enclave, G.K. I
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NEW DELHI-110021

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT. LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
HUMAN ENGINEERING SOLUTIONS PVT. LTD., NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.E.P. CONSULTANTS, NEW DELHI-110048

Architect's Signature | Client's Signature

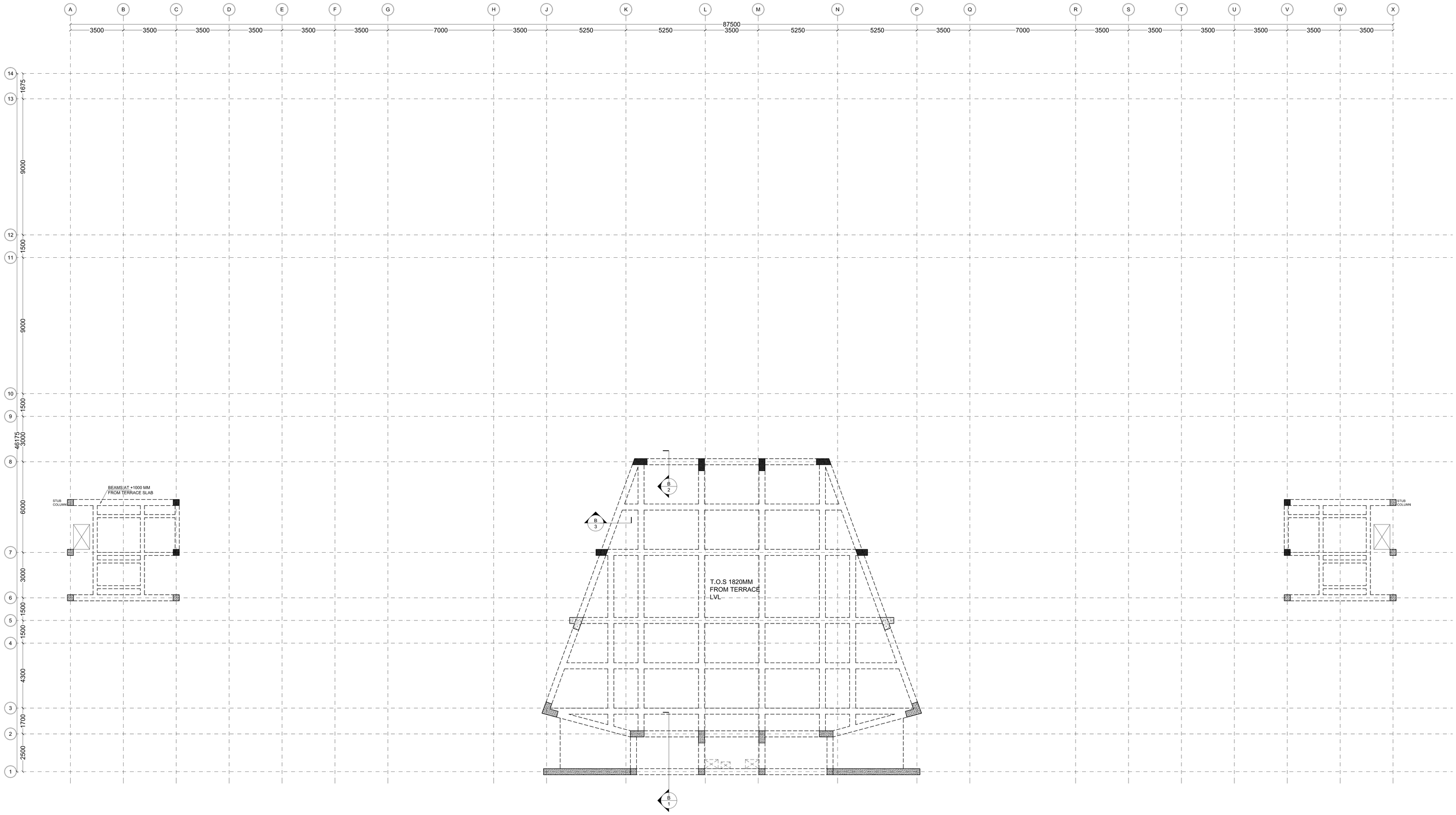
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL MUMTY FLOOR PLAN

Document Release Type
TENDER

Job No. 2018/07	NORTH N
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-202
Drawn by FF	
Checked by VB	Revision No. R0

AUTHORITY:



UGL TANK LEVEL BEAM LAYOUT PLAN WITH SLEEVES AND CUTOUTS

DATE: 31 DEC 2018

NOTES

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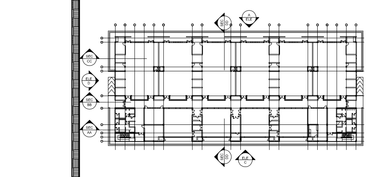
KEY PLAN:



UGL

HATCH LEGEND

EXPOSED CONCRETE
NON EXPOSED CONCRETE
AAC
BRICK WALL

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2019	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagarlapalli, Yerpedu – Kallahasti Main Road, Tirupati, A.P.
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ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Panchsil Enclave, G.K. I
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI(WIP)

MECHANICAL ENGG CONSULTANTS:
M. / S. ENGINEERING CONSULTANTS PVT. LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
HARMAN DESIGN ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.E.P. CONSULTANTS, NEW DELHI-110058

Architect's Signature | Client's Signature

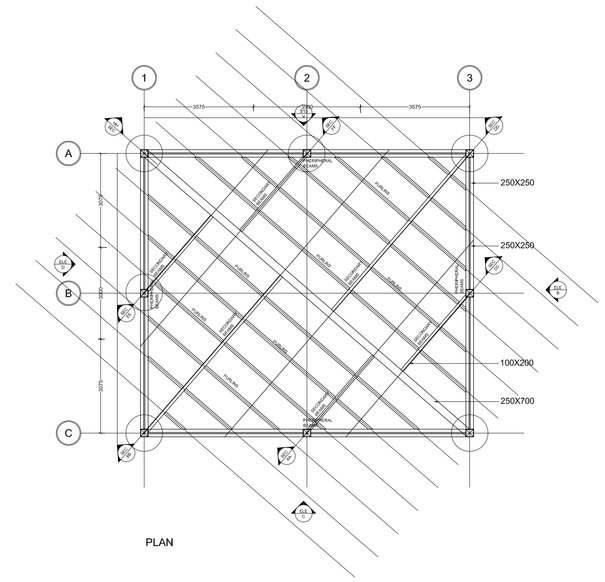
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL TANK LEVEL BEAM LAYOUT PLAN WITH SLEEVES AND CUTOUTS

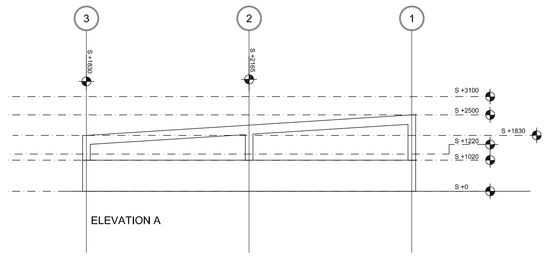
Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-202-BML
Drawn by FF	
Checked by VB	Revision No. R0

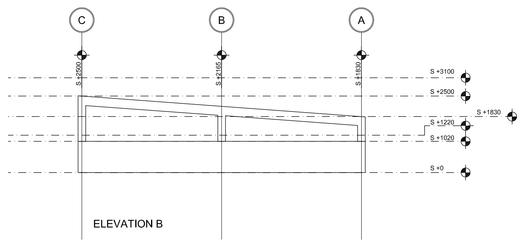
AUTHORITY:



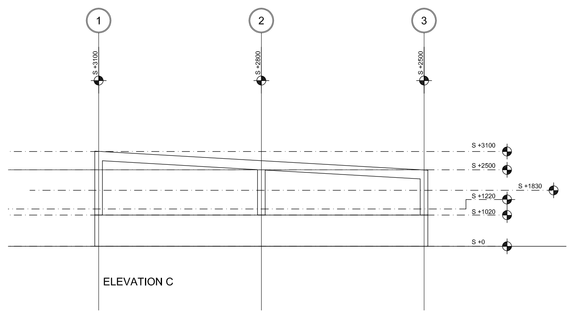
PLAN



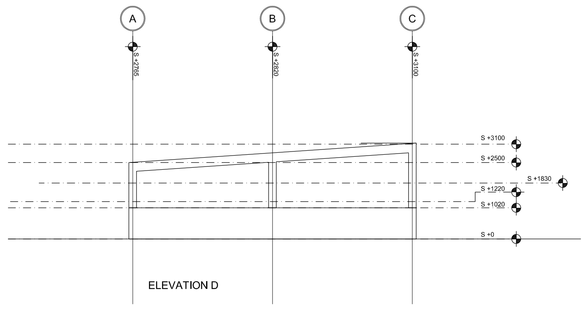
ELEVATION A



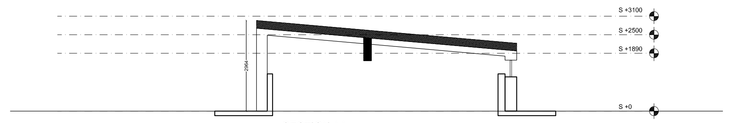
ELEVATION B



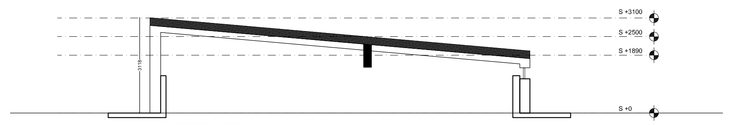
ELEVATION C



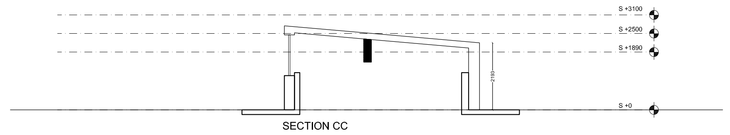
ELEVATION D



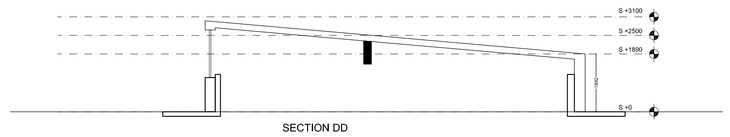
SECTION AA



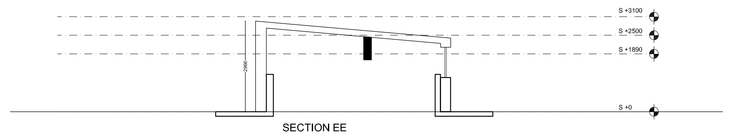
SECTION BB



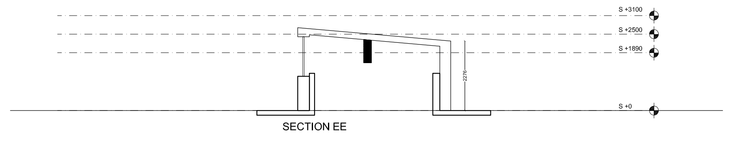
SECTION CC



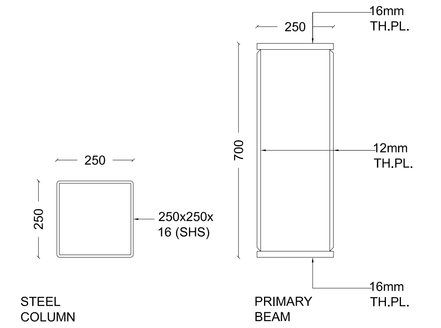
SECTION DD



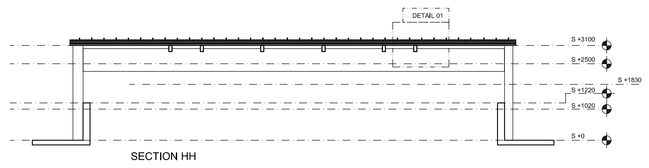
SECTION EE



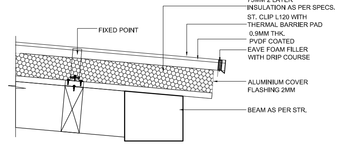
SECTION EE



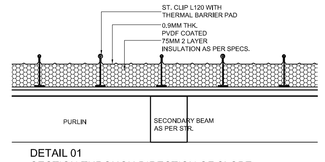
STEEL COLUMN | PRIMARY BEAM | PERIPHERAL BEAM (COLUMN TO COLUMN) | SECONDARY BEAM | PURLIN



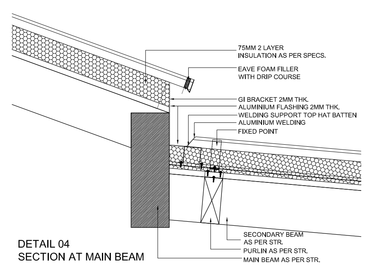
SECTION HH



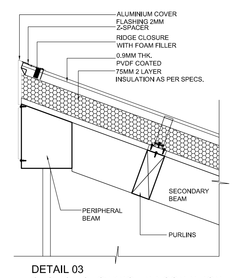
DETAIL 02
SECTION SHOWING END CONDITION



DETAIL 01
SECTION THROUGH DIRECTION OF SLOPE



DETAIL 04
SECTION AT MAIN BEAM



DETAIL 03
SECTION SHOWING END CONDITION

ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

NOTES

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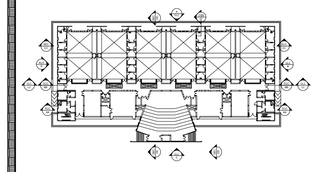
KEY PLAN:



UGL

DOOR - WINDOW SCHEDULE

NOTE: CONTRACTOR TO SUBMIT FABRICATION SHOP DRAWINGS SHOWING PROVISIONS FOR ELECTRICAL RECEPTACLES AND CRITICAL JOINERY DETAILS FOR ARCHITECT'S APPROVAL.

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus, Yerpedu Jagampalli, Yerpedu – Kalahasti Main Road, Tirupati, A.P.
Transit Campus, Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Panipath Enclave, G.K. 1
New Delhi 110048
Phone : 011 – 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI(2015)

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT. LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
KARMAN KRUSH ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
A.K.G. CONSULTANTS, NEW DELHI-110058

Architect's Signature | Client's Signature

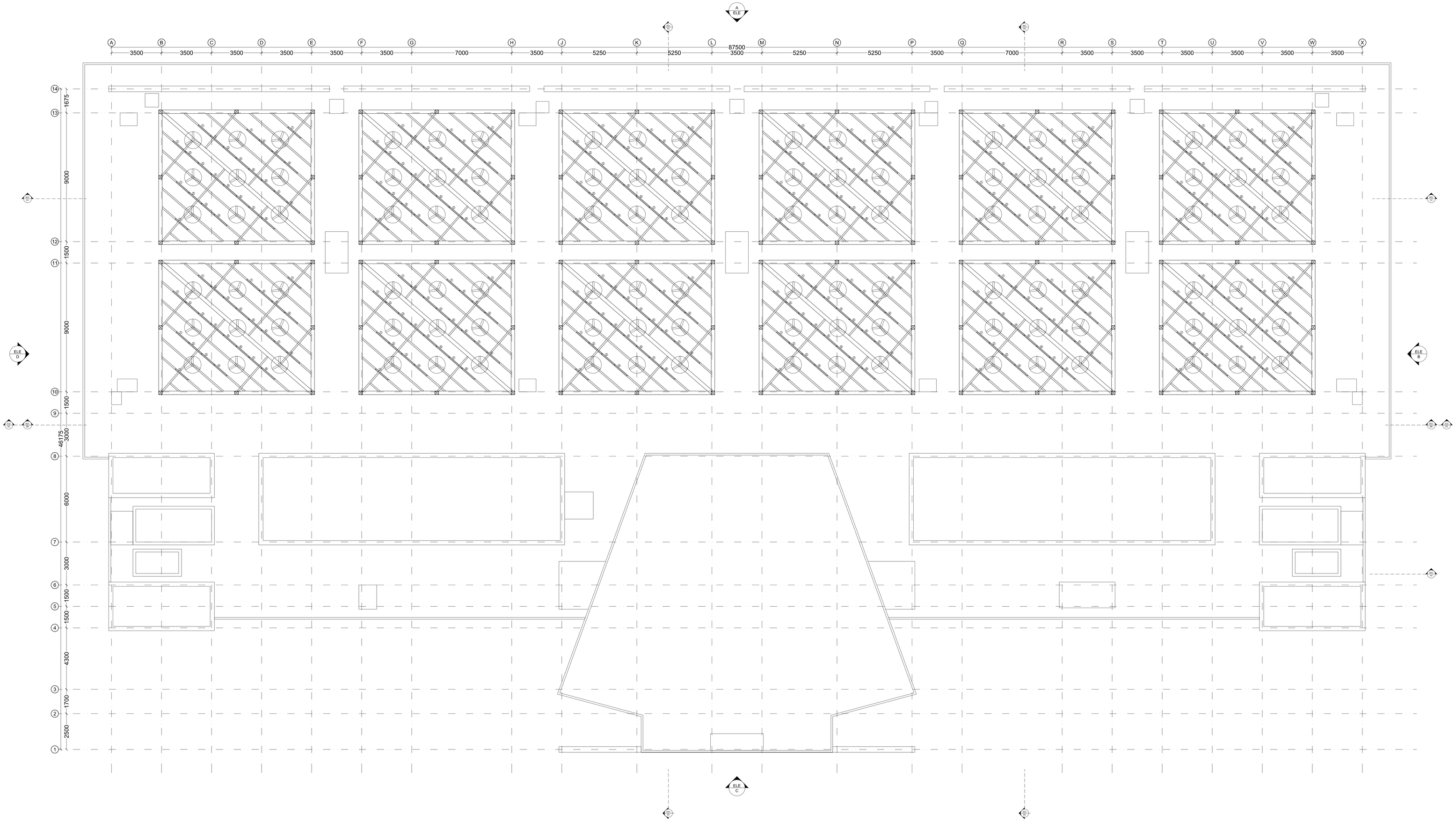
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL STRUCUTRAL METAL ROOF DECK PLAN & DETAILS

Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-204-A
Drawn by FF	
Checked by VB	Revision No. R0

AUTHORITY:



ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

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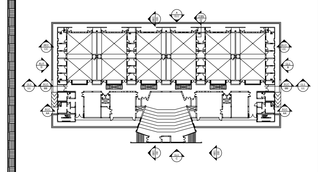

UGL

DOOR - WINDOW SCHEDULE

NOTE: CONTRACTOR TO SUBMIT FABRICATION SHOP DRAWINGS SHOWING PROVISIONS FOR ELECTRICAL RECEPTACLES AND CRITICAL JOINERY DETAILS FOR ARCHITECT'S APPROVAL.

FIXTURES LEGEND

	KITCHEN SINK AS/ SPECS
	FLOOR TRAP AS/ SPECS
	WATER CLOSET AS/ SPECS
	WASH BASIN AS/ SPECS
	SOAP DISPENSER AS/ SPECS
	HAND DRYER AS/ SPECS
	PARAPET DRAIN AS/ SPECS

HATCH LEGEND

	EXPOSED CONCRETE
	NON EXPOSED CONCRETE
	AAC
	BRICK WALL

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2018	R0	TENDER

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Drawing Title
UGL STRUCUTRAL METAL ROOF DECK PLAN

Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-204
Drawn by FF	
Checked by VB	Revision No. R0

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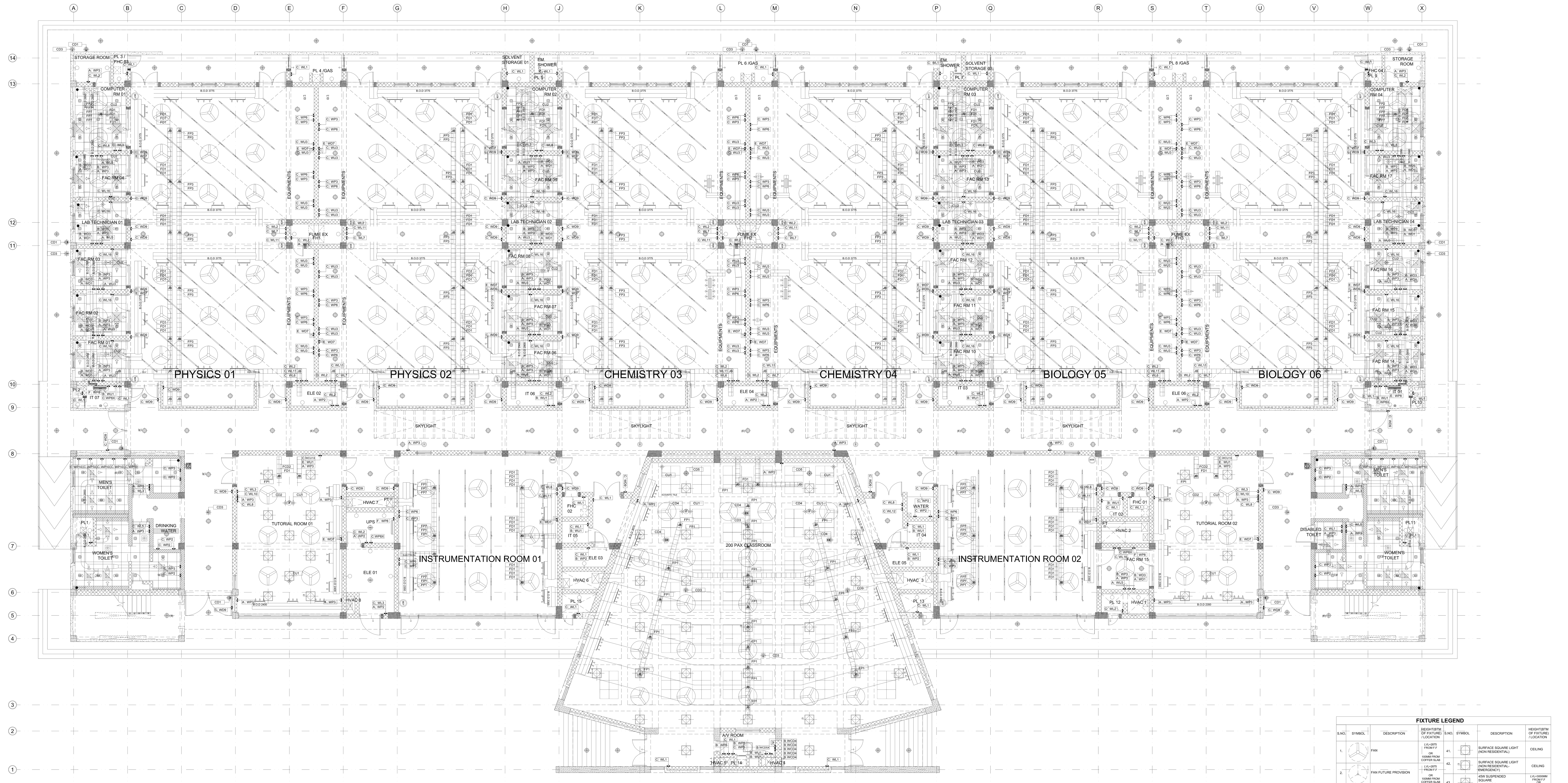

TAG	HEIGHTS
A	300
B	850
C	1200
D	1500
E	2250
F	2800
G	3900

NOTES	MODULE SIZE	NAME	LIGHT SWITCH	FAN (WITH 2 MODULE REGULATOR)	FAN SWITCH ONLY (NO REG CONTROL)	SPARE
			1	3	1	1
	2	WL1	1			1
	2	WL2	2			
	4	WL3	3			1
	4	WL4	4			
For large spaces	6	WL5	5			1
For large spaces	6	WL6	6			
For large spaces	8	WL7	8			
For medium size spaces	6	WL8		2		
For medium size spaces	10	WL9		3		1
For medium size spaces	12	WL10		4		
For large spaces fan wth reg	4	WL11			4	
For large spaces fan wth reg	6	WL12			6	
For large spaces fan wth reg	8	WL13			8	
	4	WL14	1	1		
	6	WL15	2	1		1
	6	WL16	3	1		
	8	WL17	4	1		1
	8	WL18	1	2		1
	8	WL19	2	2		

NOTES	MODULE SIZE	NAME	BELL SWITCH (2 MODULE)	6 AMP. SOCKET & SWITCH	6 AMP. SOCKET & SWITCH (UPS)	6 AMP. SOCKET & SWITCH (IP65 GRADE)	16 AMP. SOCKET & SWITCH	16 AMP. SOCKET & SWITCH (UPS)	6 AMP SOCKET ONLY	6 AMP SOCKET ONLY (UPS)	6 AMP SWITCH ONLY (FOR LEFT COLUMN)	16 AMP SOCKET ONLY	1 6 AMP SWITCH ONLY (FOR LEFT COLUMN)	25 AMP AC SOCKET	25 AMP AC SWITCH	POWER FOR URINAL SENSOR	SPARE
			2	3	3	3	3	3	2	2	1	2	1	2	2	1	1
	5	WP1	1	1													
	4	WP2		1													1
	6	WP3		2													
	9	WP4		3													
	6	WP5		2													
	6	WP6		1			1										
	2	WP7							1								
	4	WP7X		1							1						
	2	WP7Y									2						
	2	WP8										1					
	1	WP8X											1				
	2	WP8Y											2				
	3	WP8Z											3				
	2	WP9												1			
	2	WP9X													1		
	4	WP9Y													2		
	6	WP9Z													3		
	1	WP10														1	
	3	WP11				1											
	6	WU1						2									
	4	WU2			1												1
	6	WU3			2												
To be divided in modules of 6	6	FP1		2													
To be divided in modules of 6	12	FP2		4													
To be divided in modules of 6	9	FP3		2	1												
To be divided in modules of 6	18	FP4		4	2												
To be divided in modules of 6	24	FP5		6	2												
To be divided in modules of 6	36	FP6		10	2												
To be divided in modules of 6	12	FP7			4												
Always install in sets of 2 nos- in a space	2	CU1								1							
	2	WCU1X									2						
	4	WCU1Y									4						
	6	WCU1Z									6						
	3	CU2		1													

NOTES	MODULE SIZE	NAME	DATA (CAT 6 from IT Rack)	IP TEL (CAT 6 from IT Rack)	IPTV (CAT 6 from IT Rack)	DTH TV (COAXIAL Convert from IT Rack)	WIFI (POE from IT Rack)	CCTV (POE from IT Rack)	RFID (POE from IT Rack)	HDMI CABLE(LED SCREEN TO CONF TABLE)	HDMI CABLE (PROJECTOR TO CONF TABLE)	HDMI CABLE (PROJECTOR TO WALL MIXER)	HDMI CABLE (WALL MIXER TO TABLE)	AUDIO CABLE (SPEKAER / MIC TO MIXER)	SPARE
			1	1	1	1	1	1	1	1	1	1	1	1	1
	1	WD1	1												
	2	WD2	2												
	2	WD3	1	1											
	3	WD4	2	1											
	1	WD5			1										
	2	WD6			1	1									
	1	WD7					1								
	1	WD8						1							
	1	WD9							1						
LED screen wall	1	WD10								1					
laptop end floor	1	FWD10								1					
	1	CD1						1							
Projector ceiling	1	CD2									1				
Projector laptop end floor	1	FCD2									1				
	1	CD3					1								
Projector end	1	CD4										1			
Mixer end	1	WCD4										1			
Spekaer end / Mic End	1	CD5												1	
Spekaer end / Mic End	1	WCD5												1	
Mixer end	2	WCD5X												2	
Mixer end	4	WCD5Y												4	
Mixer end	6	WCD5Z												6	
Floor to floor - HDMI in Raceway	1	FD7											1		
Floor to floor - HDMI in Raceway	1	FD7X											1		
Conference table	2	FD1	2												
Small central table	3	FD2	2	1											
large central table	6	FD3	5	1											
office/student desk for open style	6	FD4	4	2											
office/student desk for open style	12	FD5	8	4											
office/student desk for open style	18	FD6	12	6											

FIXTURE LEGEND

S.NO.	DESCRIPTION	HEIGHT(BTM OF FIXTURE) / LOCATION
1.	FAN	LVL+2875 FROM F.F OR 100MM FROM COFFER SLAB
2.	FAN FUTURE PROVISION	LVL+2875 FROM F.F OR 100MM FROM COFFER SLAB
3.	CEILING SUSPENDED LIGHT	-
4.	CEILING SURFACE LIGHT	-
5.	LINEAR SUSPENDED LIGHT	LVL+3200 FROM F.F
6.	LINEAR SUSPENDED LIGHT (EMERGENCY)	LVL+3200 FROM F.F
7.	LINEAR SUSPENDED LIGHT (EMERGENCY)	-
8.	STEP LIGHT	-
9.	BUILDING UPLIGHTER (GROUND)	-
10.	WALL MOUNTED TUBE LIGHT	LVL+2600MM FROM F.F
11.	WALL MOUNTED TUBE LIGHT(H)	LVL+2600MM FROM F.F
12.	WALL MOUNTED TOILET(ABOVE MIRROR)	LVL+2050MM FROM F.F
13.	ATRIUM-H(SUSPENDED)	-
14.	ATRIUM-H(SUSPENDED-EMERGENCY)	-
15.	DOUBLE HEIGHT INFORMAL-H(SUSPENDED)	-
16.	DOUBLE HEIGHT INFORMAL-H (EMERGENCY-SUSPENDED)	-
17.	SINGLE HEIGHT INFORMAL(SUSPENDED)	-
18.	SINGLE HEIGHT INFORMAL (SUSPENDED - EMERGENCY)	-
19.	WALL MOUNTED BULK HEAD(SHAFT)	LVL+2600MM FROM F.F
20.	WALL MOUNTED(MOON LED-EXTERNAL)	LVL+2600MM FROM LANDING F.F
21.	WALL MOUNTED(MOON LED-EXTERNAL EMERGENCY)	LVL+2600MM FROM LANDING F.F
22.	SURFACE MOUNTED(MOON LED-EXTERNAL)	CEILING
23.	SURFACE MOUNTED(MOON LED-EXTERNAL EMERGENCY)	CEILING
24.	SURFACE MOUNTED INTERNAL-H	CEILING
25.	SURFACE MOUNTED INTERNAL-H (EMERGENCY)	CEILING
26.	SURFACE MOUNTED INTERNAL	CEILING
27.	SURFACE MOUNTED INTERNAL (EMERGENCY)	CEILING
28.	FALSE CEILING-ROUND(RECESSED)	-
29.	FALSE CEILING- ROUND (RECESSED-EMERGENCY)	-
30.	FALSE CEILING- SQUARE (RECESSED)	IN FALSE CEILING (AS/SEC)
31.	FALSE CEILING- SQUARE (RECESSED)	IN FALSE CEILING (AS/SEC)
32.	FLOOD LIGHT	LVL+15000MM (AT PARAPET LEVEL)
33.	32W SUSPENDED HIGHBAY LUMINAIRE	-
34.	32W SUSPENDED HIGHBAY LUMINAIRE (EMERGENCY)	-
35.	EXHAUST FAN	-
36.	OCCUPANCY DETECTOR	CEILING
37.	HOOTER	LVL+2700MM FROM F.F
38.	MANUAL CALL POINT	LVL+1200MM FROM F.F
39.	CEILING MOUNTED WIFI ROUTER	CEILING
40.	WALL MOUNTED WIFI ROUTER	LVL+2250MM FROM F.F
41.	SURFACE SQUARE LIGHT (NON RESIDENTIAL)	CEILING
42.	SURFACE SQUARE LIGHT (NON RESIDENTIAL-EMERGENCY)	CEILING
43.	45W SUSPENDED SQUARE LIGHT(NON RESIDENTIAL)	LVL+3000MM FROM F.F OR 200MM FROM COFFER SLAB
44.	45W SUSPENDED SQUARE LIGHT(NON RESIDENTIAL-EMERGENCY)	LVL+3000MM FROM F.F OR 200MM FROM COFFER SLAB
45.	FALSE CEILING SQUARE LIGHT(NON RESIDENTIAL)	-
46.	FALSE CEILING SQUARE LIGHT(NON RESIDENTIAL-EMERGENCY)	-
47.	30W SUSPENDED 2'X2' (NON RESIDENTIAL)	-
48.	30W SUSPENDED 2'X2' (NON RESIDENTIAL) (EMERGENCY)	-
49.	30W SURFACE 2'X2' (NON RESIDENTIAL)	CEILING
50.	30W SURFACE 2'X2' (NON RESIDENTIAL) (EMERGENCY)	CEILING
51.	24W FALSE CEILING 2'X2' (NON RESIDENTIAL)	-
52.	24W FALSE CEILING 2'X2' (NON RESIDENTIAL) (EMERGENCY)	-
53.	RACEWAY	-
54.	WALL MOUNTED CCTV ROUTER	LVL+2250MM FROM F.F
55.	CEILING MOUNTED CCTV	CEILING
56.	FLOOR JUNCTION BOX	-
57.	FLOOR JUNCTION BOX IP-44	-
58.	CEILING MOUNTED TRACK LIGHT(SURFACE)	-
54.	TREE UPLIGHTER(GROUND)	-
59.	CEILING MOUNTED HVAC FRESH AIR GRILL	CEILING
60.	SPLIT AC INDOOR UNIT	LVL+2750MM FROM F.F / LVL+2400MM FROM F.F FOR FAC RM
61.	SPLIT AC OUTDOOR UNIT	-
62.	WALL MODULE	AS HEIGHT LEGEND
63.	CEILING MODULE	CEILING
64.	FLOOR MODULE	FLOOR
65.	MULTI-SENSOR	CEILING
67.	DAYLIGHT SENSOR	CEILING
68.	SPEAKER	CEILING
69.	MIC	-
70.	MIXER	-
71.	PROJECTOR	CEILING
72.	WALL MOUNTED SPEAKER	-
73.	BEAM DETECTOR RECEIVER/TRANSMITTER	LVL + 2250 FROM F.F

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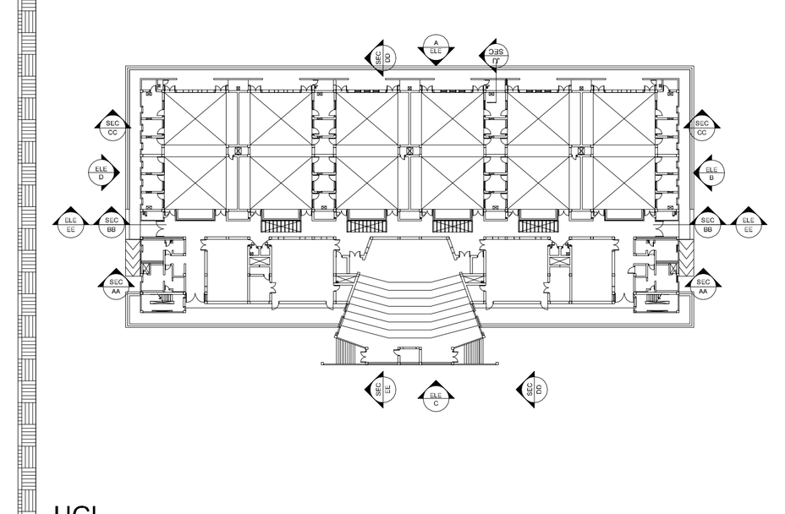

UGL

HATCH LEGEND

- EXPOSED CONCRETE
- NON EXPOSED CONCRETE
- AAC
- BRICK WALL

ISSUES

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PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.K.G CONSULTANTS, NEW DELHI-110030

Architect's Signature | Client's Signature

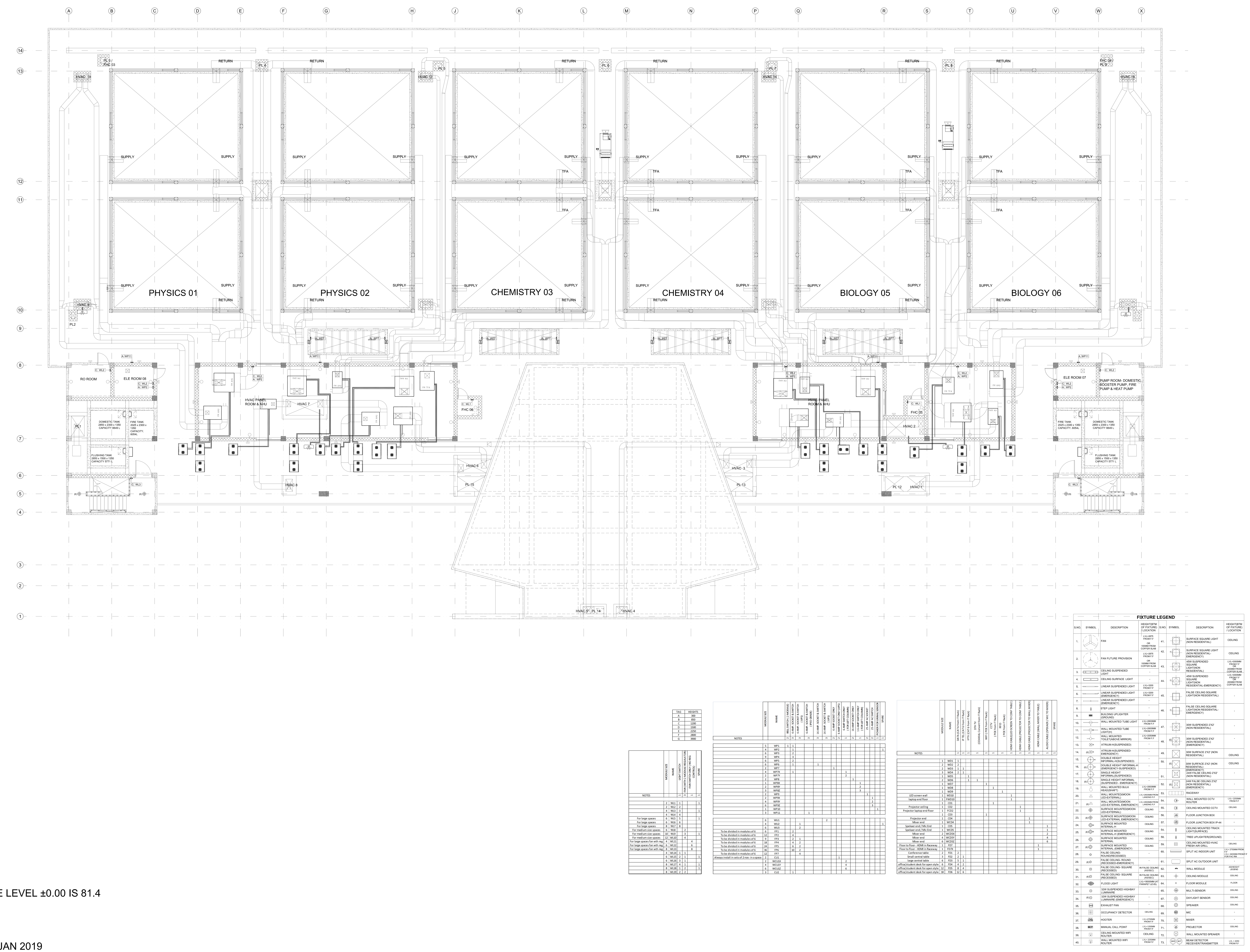
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL GROUND FLOOR RCP & ARCHITECTURAL ELECTRICAL

Document Release Type
TENDER

Job No. 2018/07
NORTH N
Scale 1:100 ON A0 SHEET
Drawing No. UGL-AR-201-RCP & ARE
16 JAN 2019
Drawn by SC
Checked by VB
Revision No. R0
AUTHORITY:

DATE: 16 JAN 2019



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UGL

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PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
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Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL TERRACE FLOOR RCP & ARCHITECTURAL ELECTRICAL

Document Release Type
TENDER

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Scale 1:100 ON A0 SHEET
16 JAN 2019
Drawn by SC
Checked by VB
NORTH N
Drawing No. UGL-AR-202-RCP & ARE
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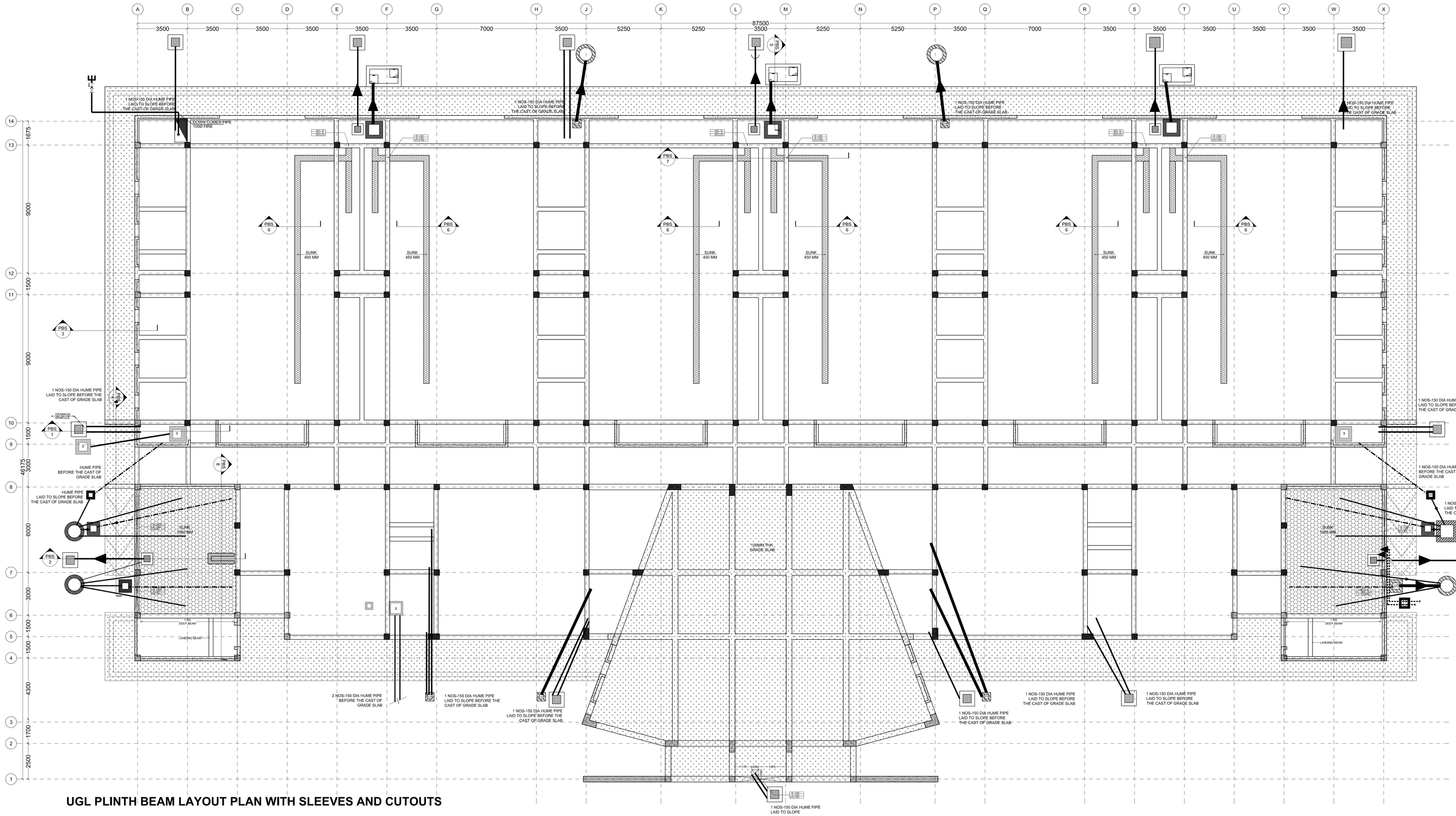
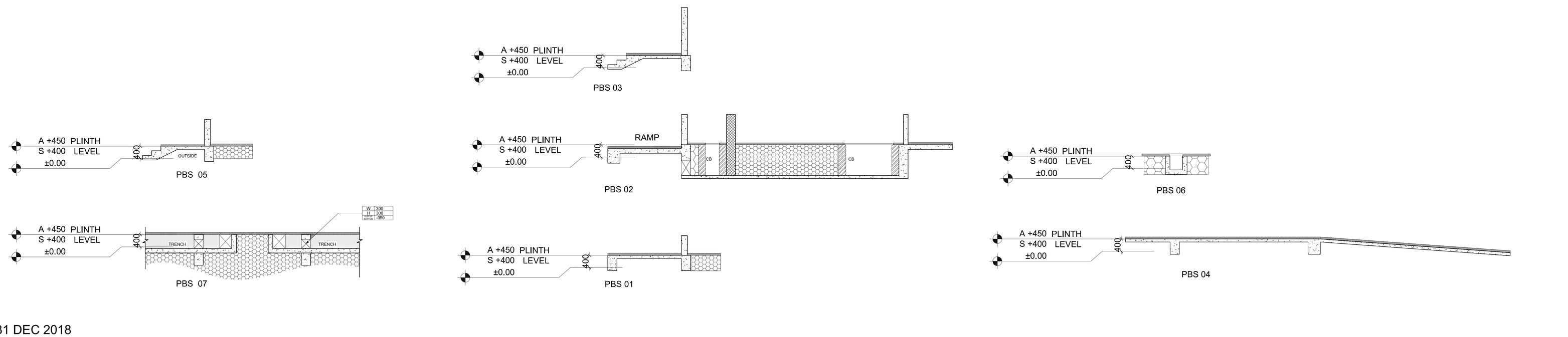


UGL PLINTH BEAM LAYOUT PLAN WITH SLEEVES AND CUTOUTS



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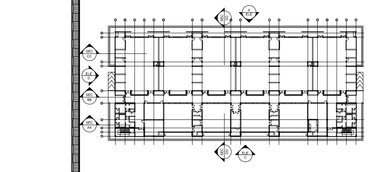

UGL

HATCH LEGEND

- EXPOSED CONCRETE
- NON EXPOSED CONCRETE
- AAC
- BRICK WALL
- 100MM THICK GRADE SLAB

ISSUES		
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UGL PLINTH BEAM LAYOUT PLAN WITH SLEEVES AND CUTOUTS

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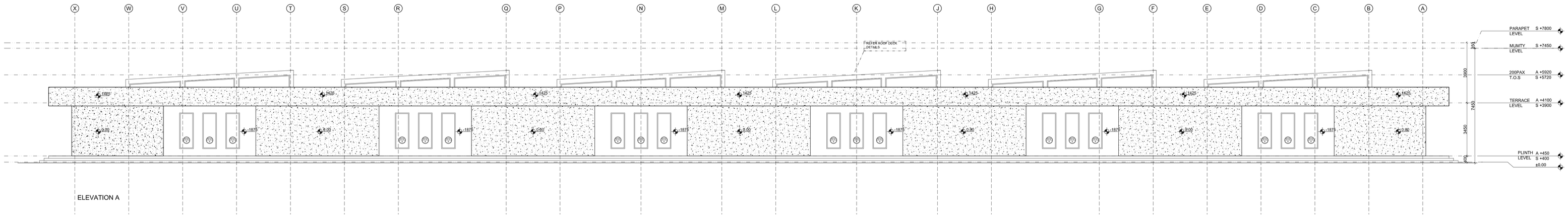
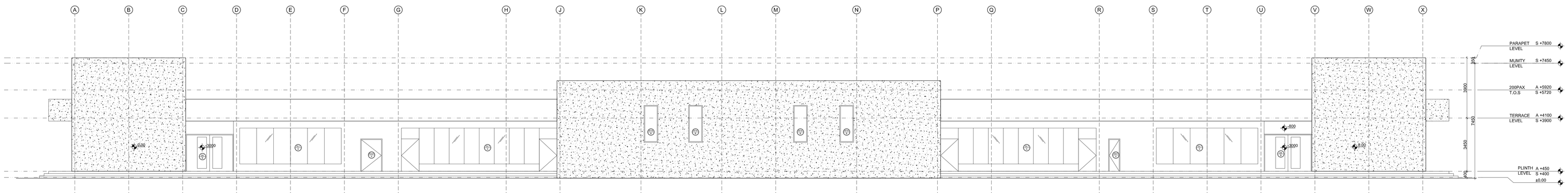
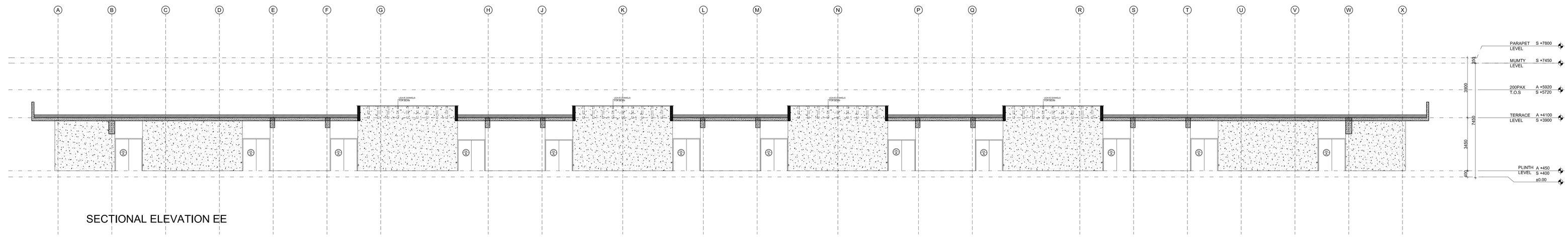


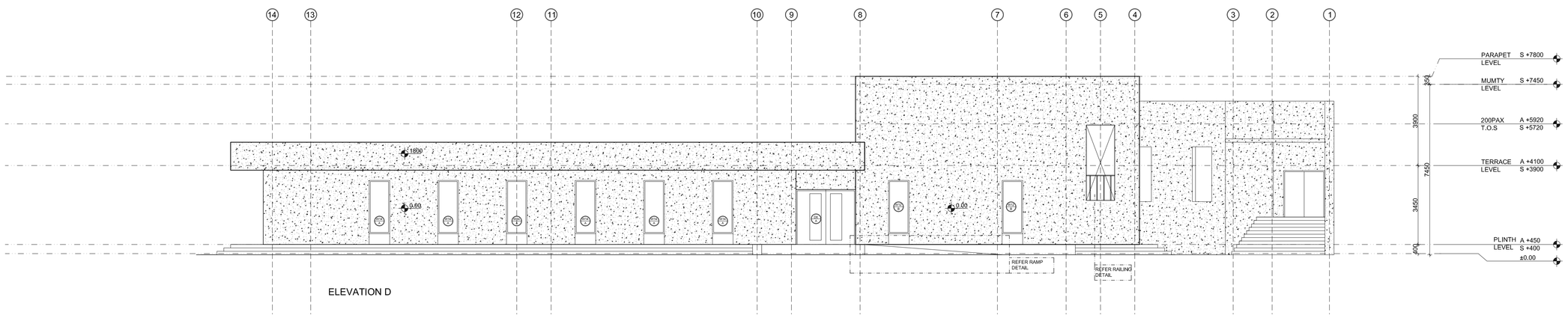
ELEVATION A



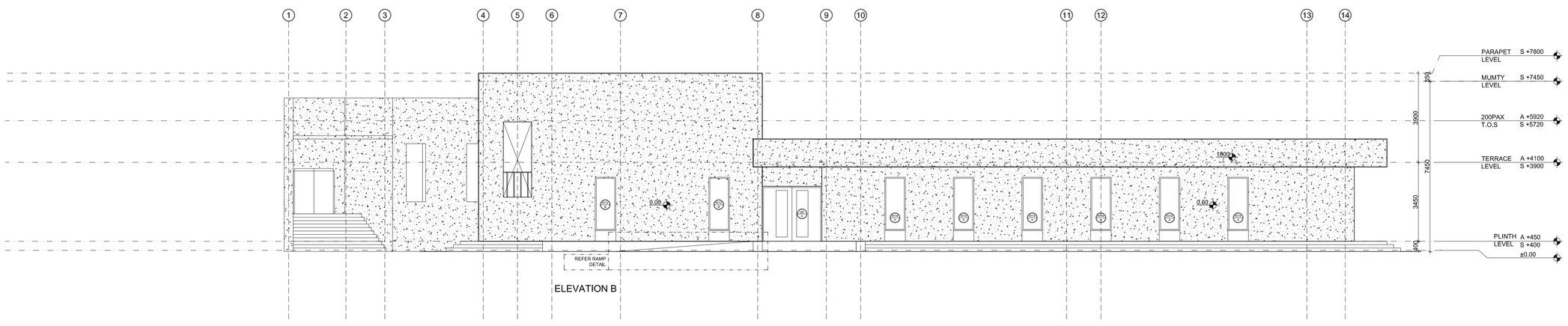
ELEVATION C



SECTIONAL ELEVATION EE



ELEVATION D



ELEVATION B

ABSOLUTE LEVEL ±0.00 IS 81.4

DATE: 31 DEC 2018

NOTES

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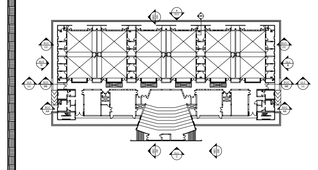
KEY PLAN:



UGL

NOTE:
CONTRACTOR HAS TO SUBMIT SHOP DRAWINGS FOR EXPOSED CONCRETE SHUTTERING AS PER THE METHODOLOGY USED FOR APPROVAL

ISSUES		
DATE	REVISION	DESCRIPTION
31 DEC 2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagampalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangallam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI/DELHI

MECHANICAL ENGG CONSULTANTS:
M. / . ENGINEERING CONSULTANTS PVT LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
RAMAKRISHNA RAIKES INSTITUTE PVT. LTD, NEW DELHI-110001

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:

Architect's Signature | Client's Signature

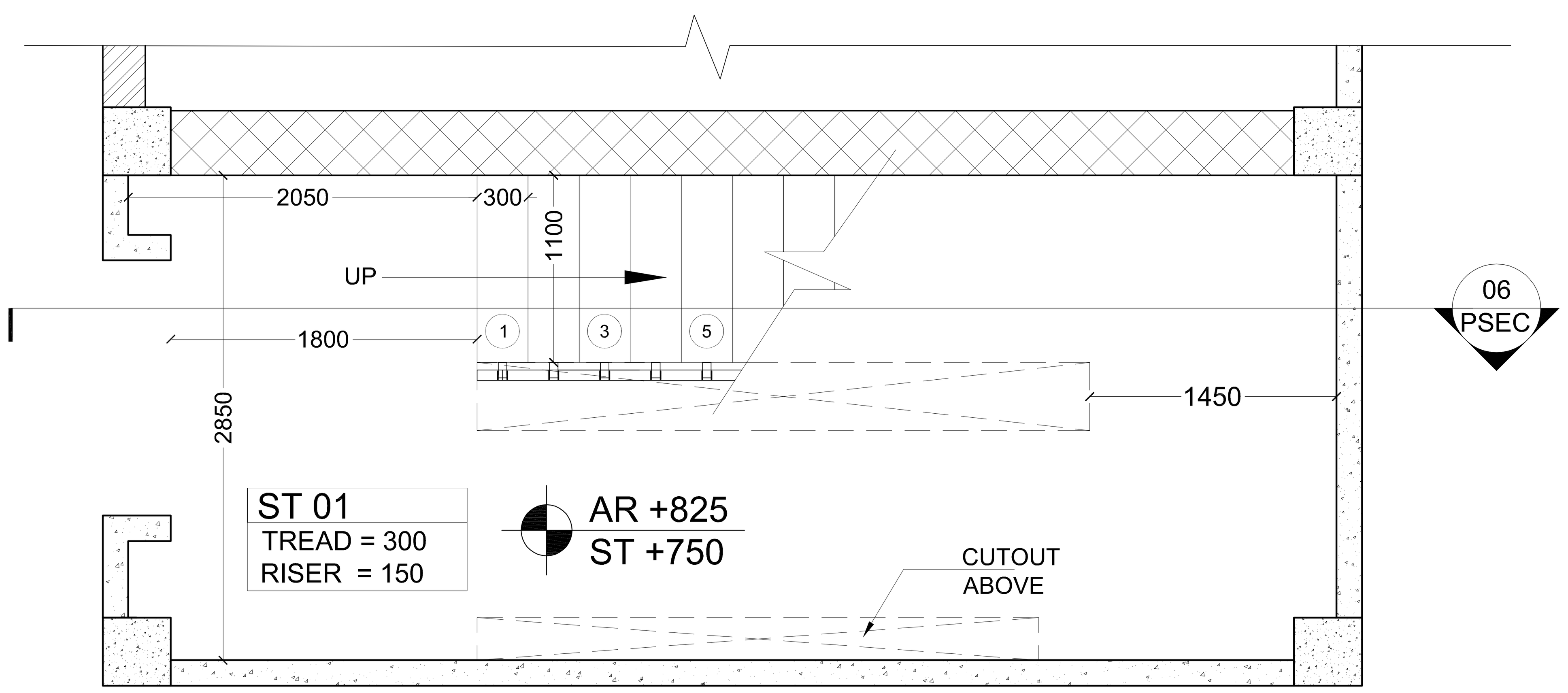
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL ELEVATION & SHUTTERING - ELEVATION A & ELEVATION B & ELEVATION C & ELEVATION D & ELEVATION E

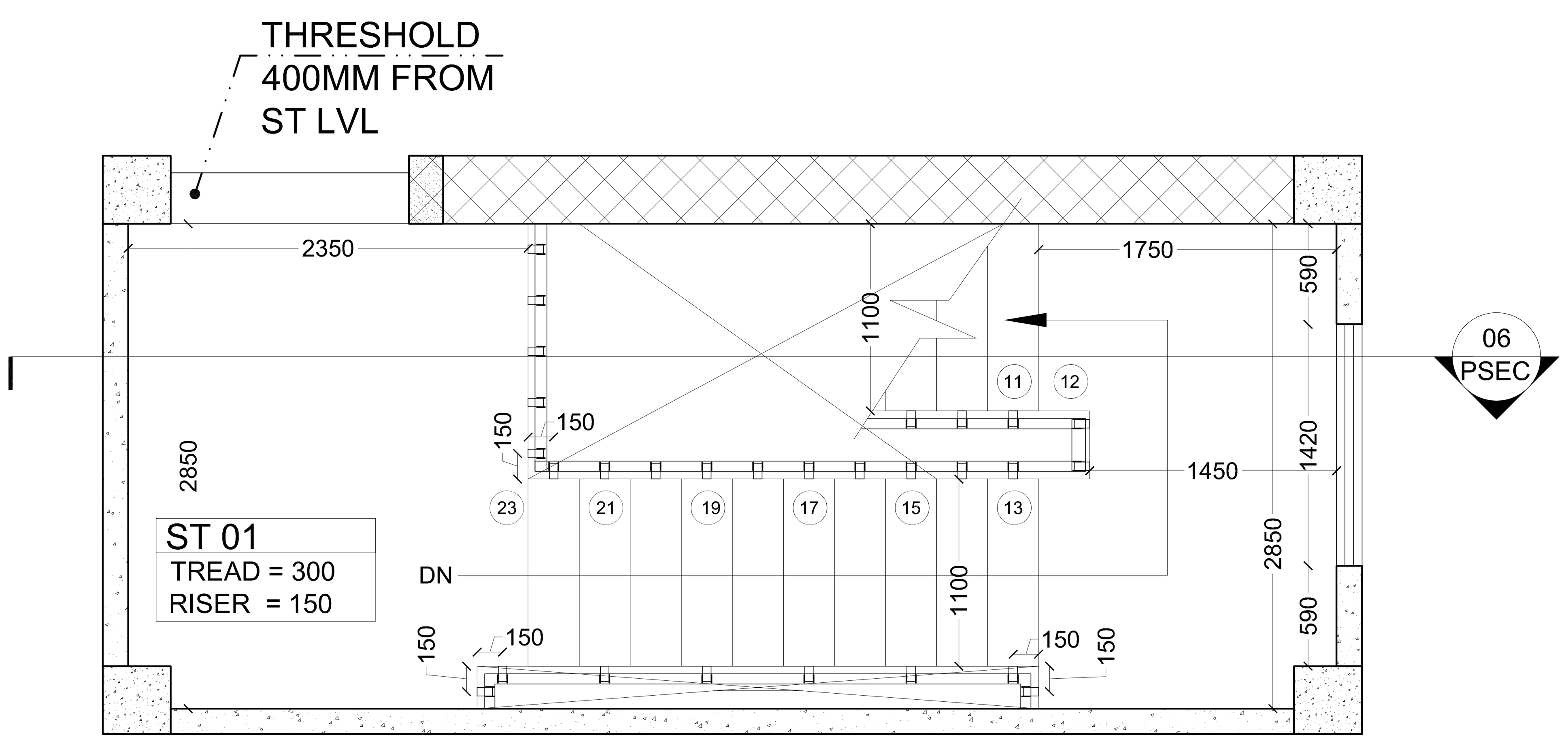
Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A0 SHEET	
31 DEC 2018	Drawing No. UGL-AR-401
Drawn by FF	
Checked by VB	Revision No. R0

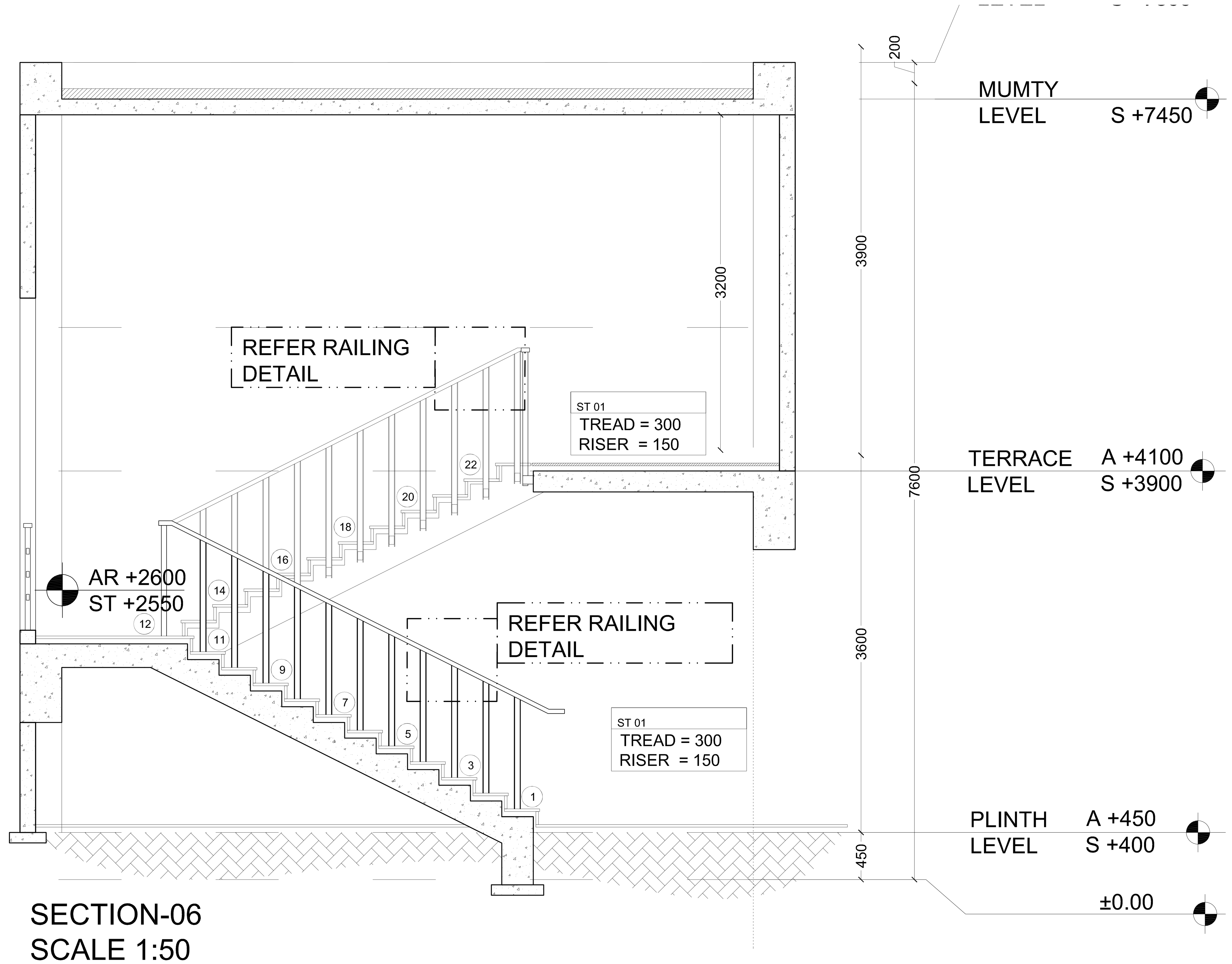
AUTHORITY:



GROUND FLOOR PLAN
SCALE 1:50



TERRACE FLOOR PLAN
SCALE 1:50



SECTION-06
SCALE 1:50

DATE: 31 DEC 2018

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KEY PLAN:

UGL

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2018	R0	TENDER

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jaganpalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA-201301
MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT LTD., NEW DELHI-110019
ELECTRICAL ENGG CONSULTANTS:
KANWAR KRISHEN ASSOCIATES PVT. LTD, NEW DELHI-110027
PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.K.G CONSULTANTS, NEW DELHI-110030

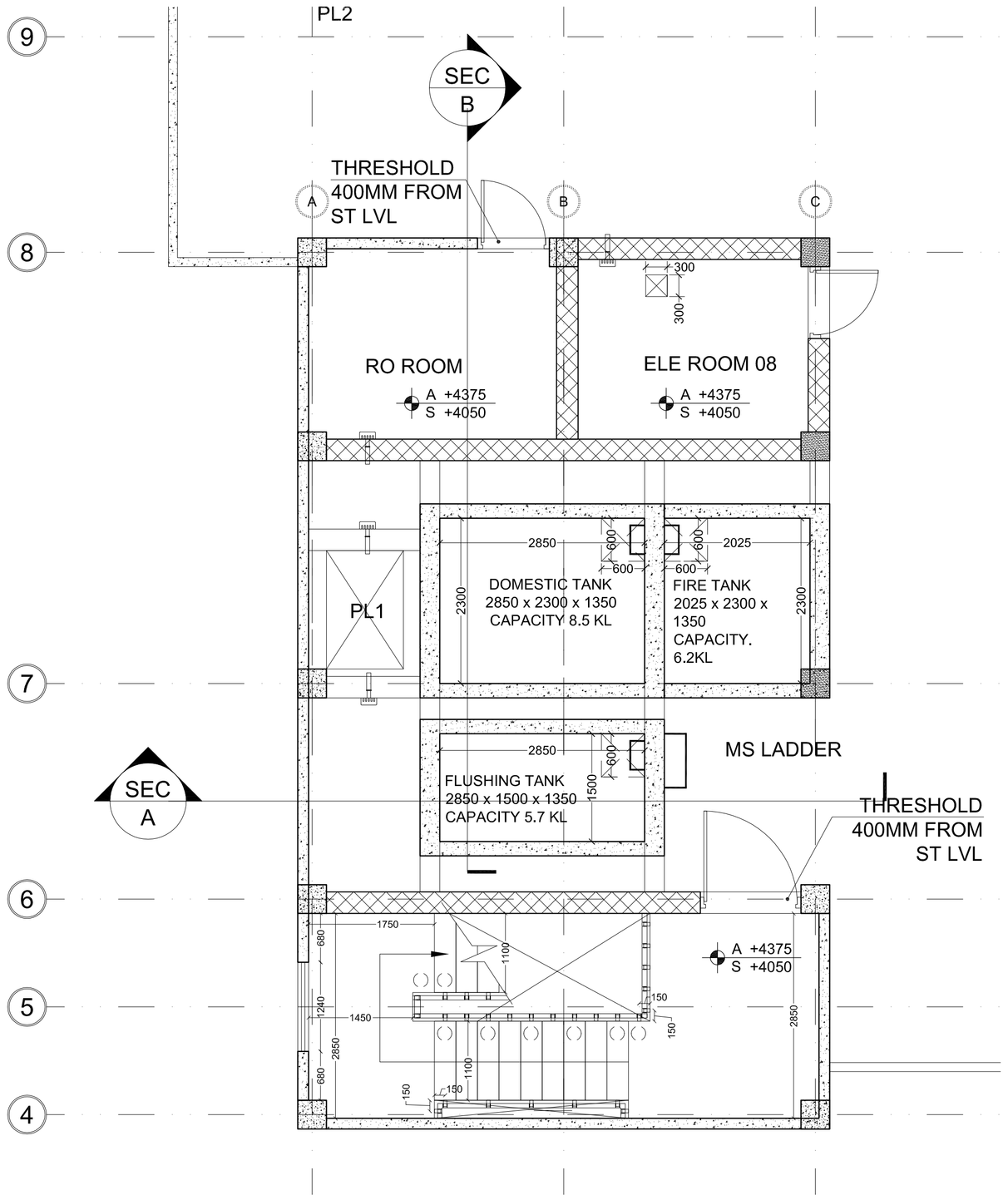
Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

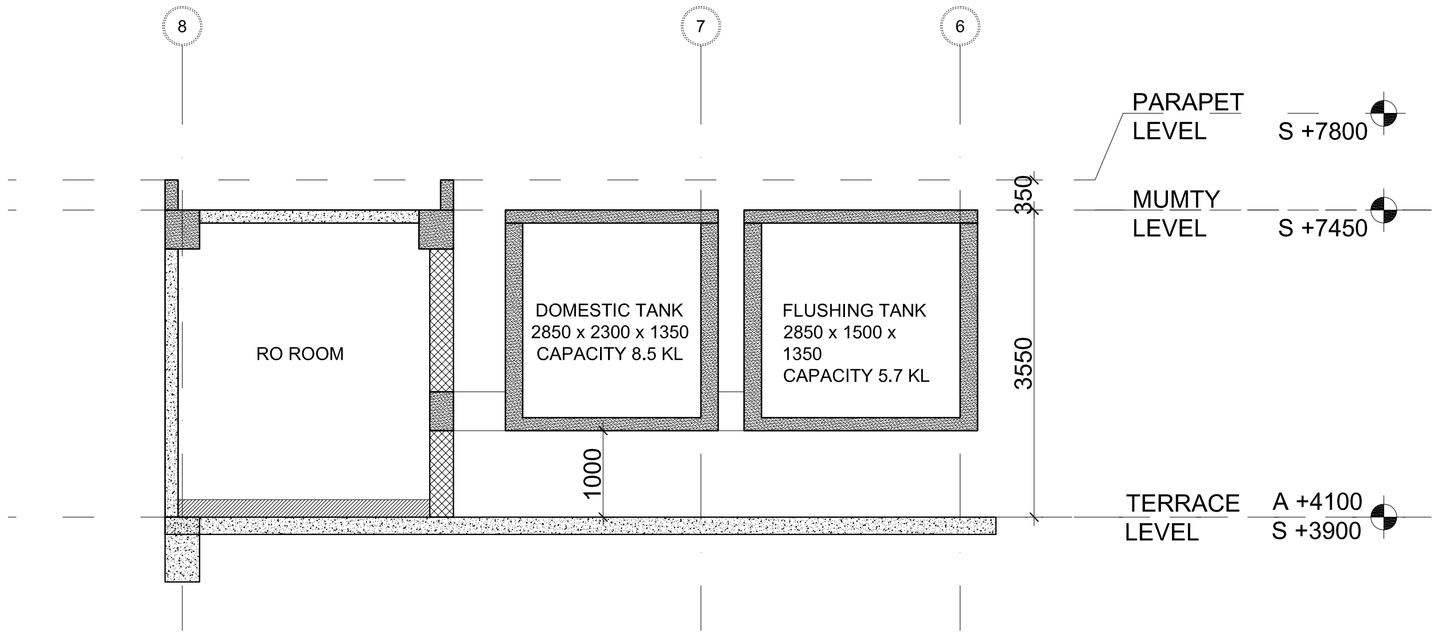
Drawing Title
UGL STAIRCASE DETAILS & SECTION DETAILS

Document Release Type
TENDER

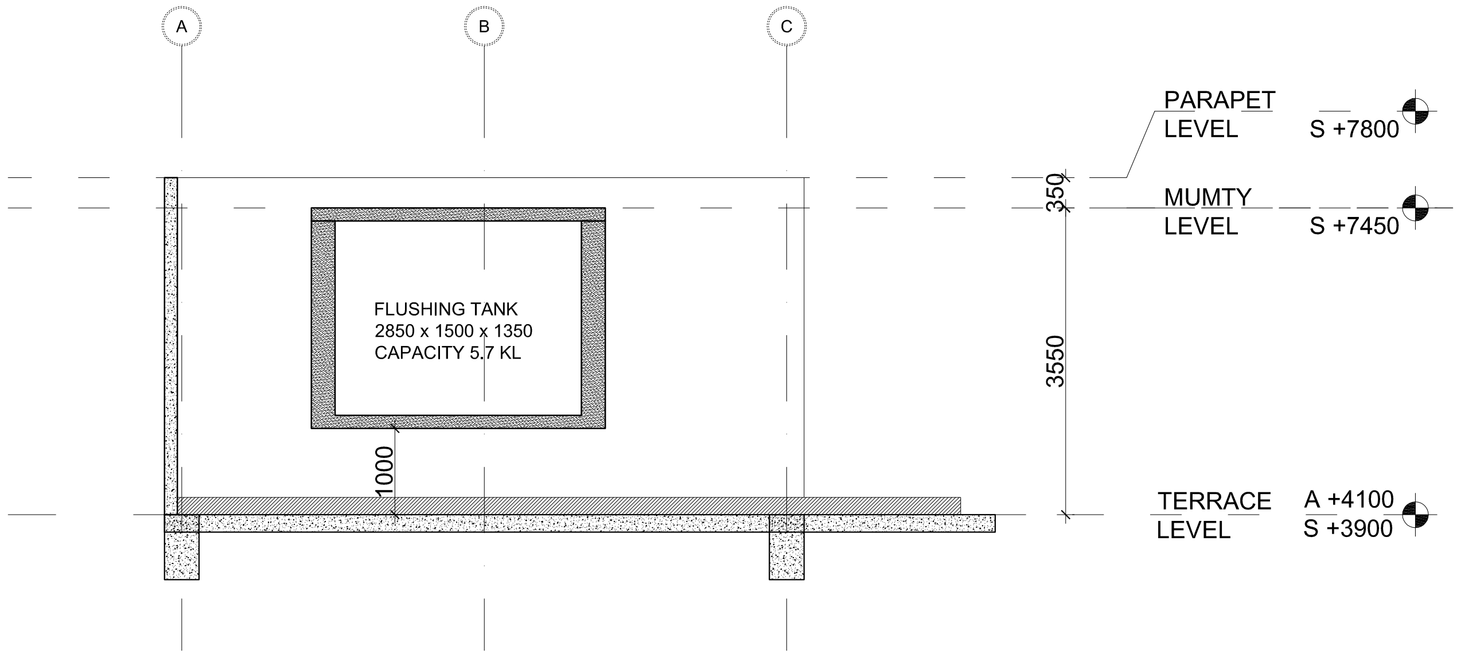
Job No. 2018/07
NORTH N
Scale 1:100 ON A1 SHEET
31 DEC 2018
Drawing No. UGL-AR-701
Drawn by FF
Checked by VB
Revision No. R0
AUTHORITY:



PLAN



SECTION BB



SECTION AA

DATE: 31 DEC 2018

NOTES

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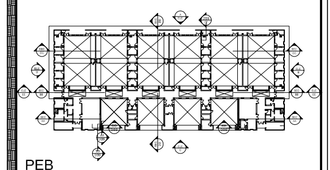
KEY PLAN:



PEB

ISSUES

DATE	REVISION	DESCRIPTION
31/12/2018	R0	TENDER

1, SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus(Jagannath, Yerpedu - Kalahasti Main Road, Tirupati, A.P., Transit Campus(Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P, 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A+13, Plampath Enclave, G.K. 1
New Delhi 110048
Phone: 26443350

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA-201301

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT.LTD., NEW DELHI-110010

ELECTRICAL ENGG CONSULTANTS:
KANSARA GROUNDS ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.S.G CONSULTANTS, NEW DELHI-110030

Architect's Signature | Client's Signature

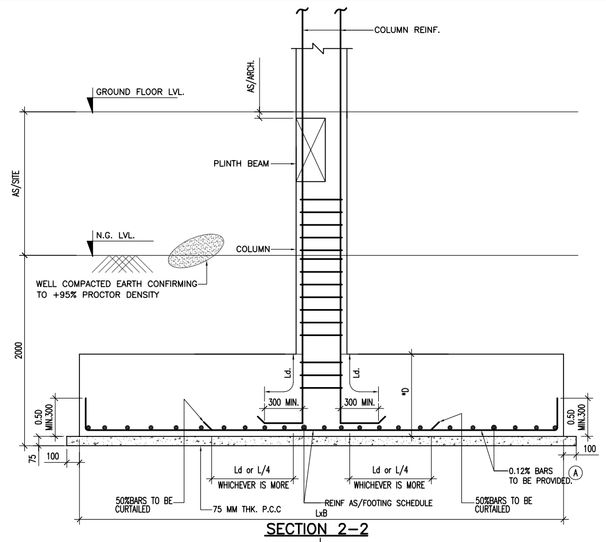
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
PEB TANK DETAILS & SECTION DETAILS

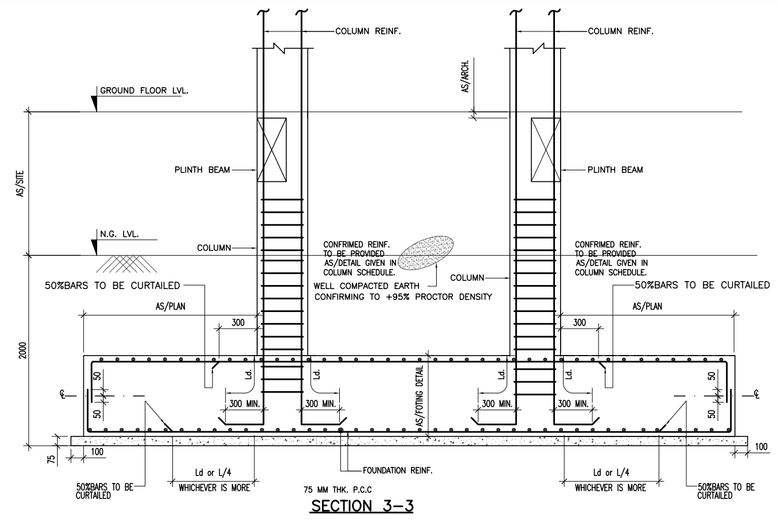
Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:100 ON A1 SHEET	
31 DEC 2018	Drawing No. UGL-AR-751
Drawn by FF	
Checked by VB	Revision No. R0

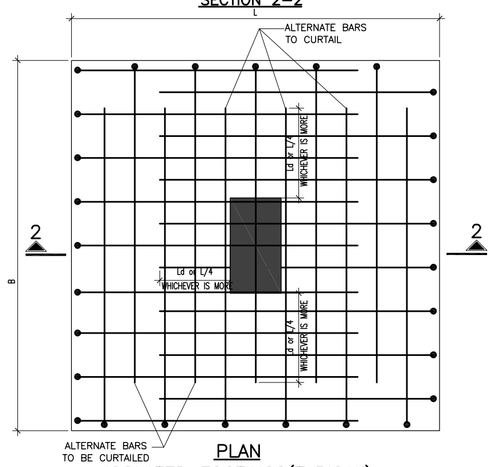
AUTHORITY:



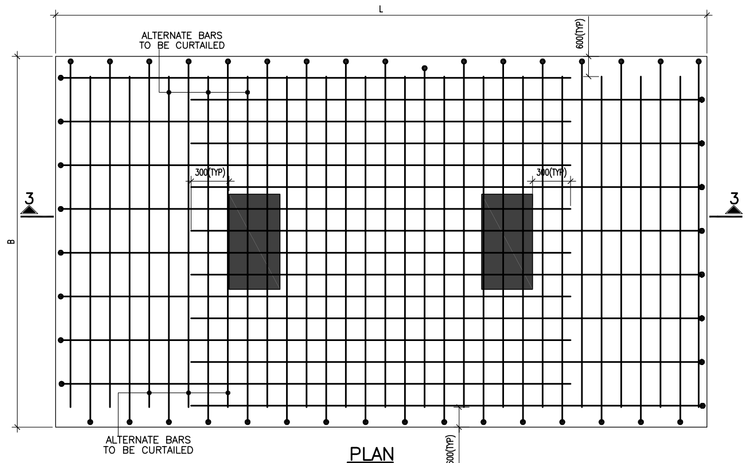
SECTION 2–2



SECTION 3–3



PLAN
ISOLATED FOOTINGS(TYPICAL)



PLAN
COMBINED FOOTINGS (TYPICAL)

ISOLATED FOOTING SCHEDULE

FOOTING NO.	SIZE		DEPTH	REINFORCEMENT
	Length(L)	Breadth(B)	D	
F1	2300	2300	600	⌀10@100c/c
F2	2100	2100	550	⌀10@125c/c
F3	2000	2000	500	⌀10@100c/c
F4	1800	1800	450	⌀10@150c/c
F5	1800	1800	450	⌀10@125c/c
F6	1600	1600	450	⌀10@150c/c

COMBINED FOOTING SCHEDULE

FOOTING NO.	SIZE		DEPTH	BOTTOM REINFORCEMENT		TOP REINFORCEMENT	
	Length(L)	Breadth(B)	D	SHORTER SPAN	LONGER SPAN	SHORTER SPAN	LONGER SPAN
CF1	AS/PLAN	AS/PLAN	450	⌀10@100c/c	⌀10@100c/c	⌀10@150c/c	⌀10@150c/c
CF2	AS/PLAN	AS/PLAN	500	⌀10@100c/c	⌀10@200c/c	⌀10@200c/c	⌀10@150c/c
CF3	AS/PLAN	AS/PLAN	450	⌀12@100c/c	⌀12@100c/c	⌀10@175c/c	⌀10@175c/c
CF4	AS/PLAN	AS/PLAN	500	⌀12@100c/c	⌀12@100c/c	⌀12@100c/c	⌀12@100c/c

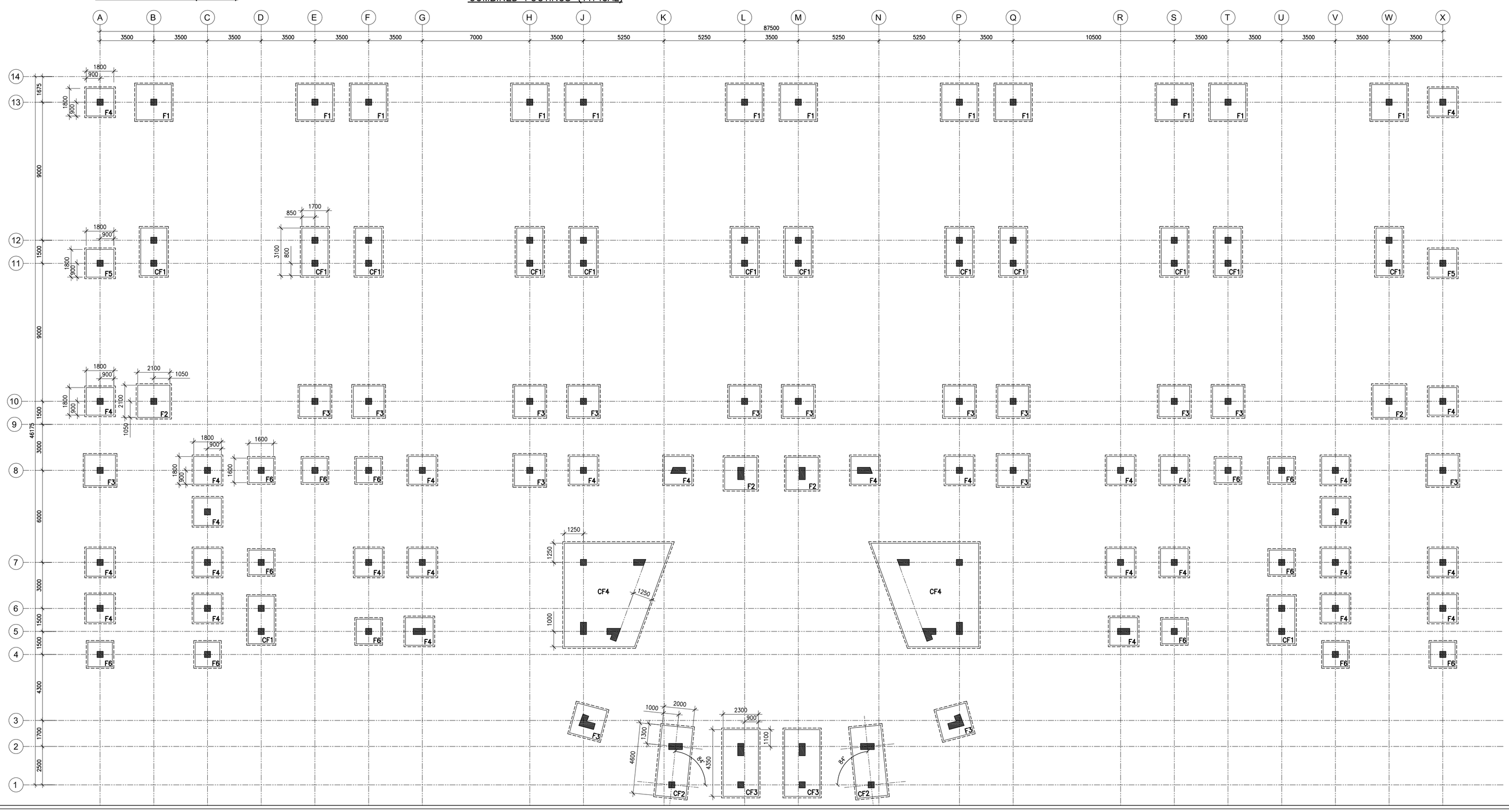
NOTES

1. ALL DIMENSIONS SHALL BE COMPARED WITH THE RELEVANT ARCHITECTURAL DRAWINGS AND DISCREPANCY IF ANY SHALL BE GOT RECONCILED BEFORE EXECUTION AT SITE.
2. FIGURED DIMENSIONS ONLY SHALL BE FOLLOWED.
3. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
4. FOUNDATION BASE SHALL BE P.C.C AS/SPECIFICATION
5. MIX OF CONCRETE SHALL BE:–
   - COLUMN/SHEAR WALL AS PER SHEDULE.
   - PEDESTAL M–30
   - FOOTINGS M–30
   - RETAINING WALL M–30
   - TIE SLAB M–30
6. CLEAR COVER TO ALL REINF. FOR R.C.C MEMBERS SHALL BE AS UNDER:–
   FOUNDATION'S
   BOTTOM 50mm
   TOP/SIDES 50mm
7. REINFORCEMENT SHALL BE IN FORM OF HIGH STRENGTH COLD ROLLED DEFORMED STEEL BARS OF GRADE Fe500ALL CONFORMING TO IS:1786–1985.
8. LAP LENGTH OF STEEL REINFORCING BARS SHALL BE:–

MIX OF CONCRETE	REINF.fe–500 BARS
M–30	45D

'D' IS THE DIA OF REINF. BARS

- IN CASE OF EXTRA EXCAVATION FOUNDATION TO BE LAID ON WELL COMPACTED SOIL HAVING PROCTOR DENSITY OF MORE THAN 95% OR FILL ADDITIONAL EXCAVATED AREA WITH P.C.C AS/SPECIFICATION
- INCASE OF OVERLAPPING OF EXTRA BARS SINGLE LENGTH BAR CAN BE PROVIDED.
- CO–ORDINATE LEVELS WITH ARCH DRG. BEFORE EXECUTION.



ISSUES		
DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus Jagampalli, Yerpedu – Kalahasti Main Road, Tirupati, A.P.
Temporary Campus Ramu Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P., 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-7/1, Pamposh Enclave, G.F., I
New Delhi(110048
Phone : 011–26440050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS , NEW DELHI–110025

MEP CONSULTANTS:
MJ ENGINEERING CONSULTANTS PVT LTD, New Delhi 110019

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

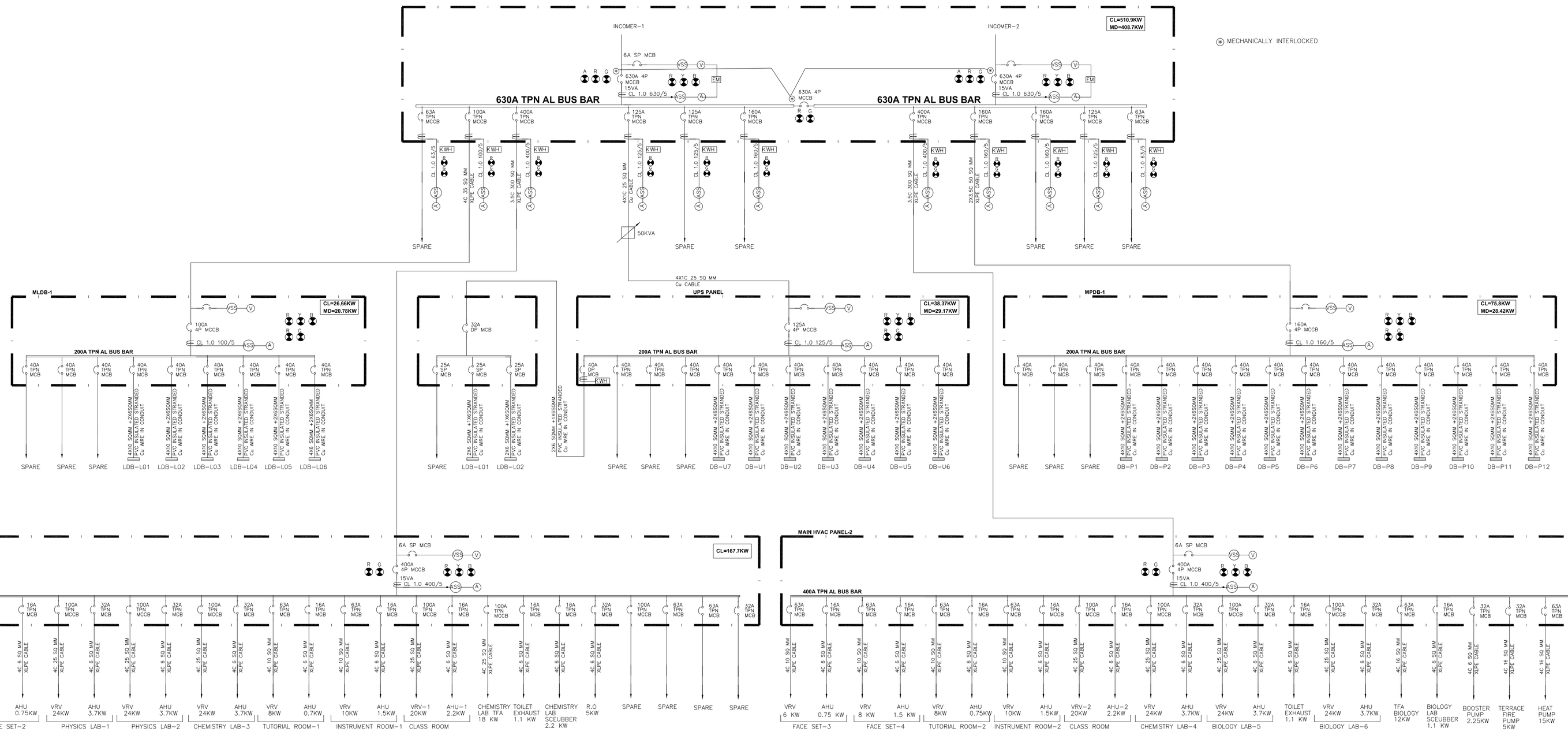
Drawing Title
UGL FOUNDATION PLAN &DETAILS

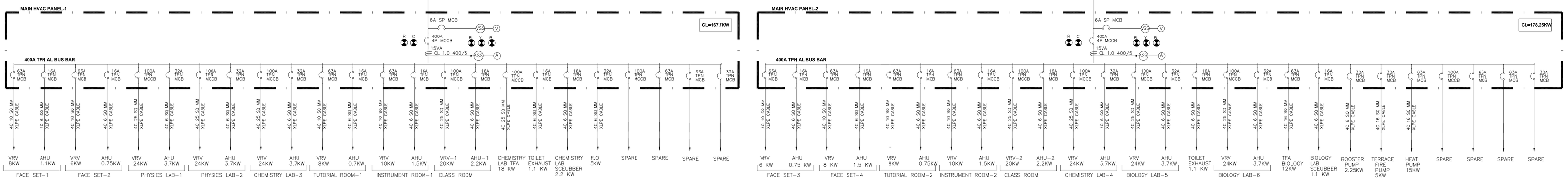
Document Release Type
TENDER

Job No. 2018/07	NORTH
Scale 1:150 ON A1 SHEET	
31- 12- 2018	Drawing No. UGL-ST-151
Drawn by I.HAIDER	
Checked by NP	Revision No. R0

AUTHORITY:

EQUIPMENTS		METERS	
LEGEND			**DIGITAL**
	Draw Out Circuit Breaker /acb	V	Voltmeter
	Current Transformer	A	Ammeter
	Non-Draw Out Circuit Breaker/ Moulded Case Circuit Breaker/mcb	EM	ENERGY ANALYSER
A	Amber lamp for Auto trip	kwh	ENERGY METER
R	Breaker ON		
G	Breaker OFF		
R,Y,B	Phase healthy indicating lamp	(VSS)	Three Way And Off Ammeter Selector Switch
		(VSS)	Three Way & Off Voltmeter Selector Switch





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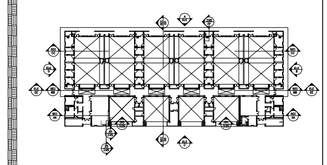
KEY PLAN:



UGL

ISSUES		
DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS & EQUIPMENTS FOR THE APPROVAL FROM THE CAMPUS DESIGNER.

CLIENT:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagarlapalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. I
New Delhi 110 048
Phone: 011-26462260

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA-201301

MECHANICAL ENGG CONSULTANTS:
M.A. ENGINEERING CONSULTANTS PVT.LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
PARWAR KRANEN ASSOCIATES PVT. LTD. NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.K.G CONSULTANTS, NEW DELHI-110030

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL MAIN PANEL - SLD

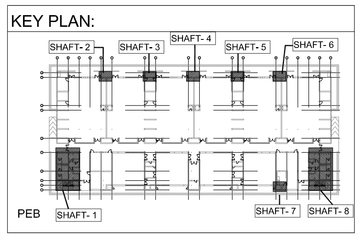
Document Release Type
TENDER

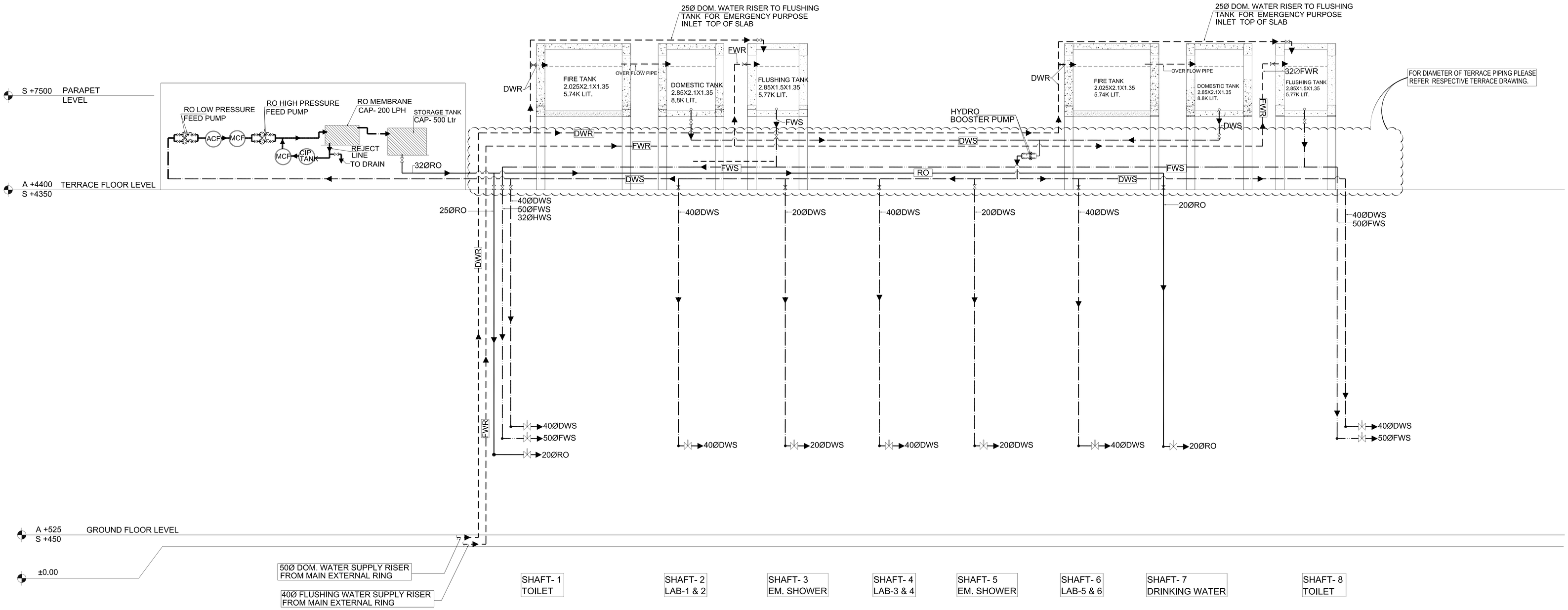
Job No. 2018/07	NORTH
Scale NTS ON A1 SHEET	N
03 JAN 2019	Drawing No. **UGL-EL-001-SLD**
Drawn by C.S.	
Checked by A.R.	Revision No. R0
AUTHORITY:	

PLUMBING NOTES

1. WATER SUPPLY DIAGRAM IS ONLY A SCHEMATIC REPRESENTATION AND IS NOT TO BE SCALED FOR ANY PURPOSES. SIZES INDICATED ON THE DRAWING ARE IN MILLIMETERS.
2. FOR EXACT LOCATIONS OF PIPELINES REFER RELEVANT COORDNATION DRAWINGS.
3. SHOP DRAWING TO BE PREPARED BY THE PLUMBING CONTRACTOR AND SUBMITTED INCORPORATING ALL REQUIRED DETAILS, FABRICATION, SUPPORTS AND CHANGES.
4. CONTRACTOR TO ENSURE CONFORMITY WITH ALL RELEVANT PLUMBING CODES AND AS PER NATIONAL BUILDING CODE OF INDIA (2005).
5. NECESSARY ACCESSORIES, VALVES, PRV'S ETC, SHALL BE INSTALLED FOR PROPER MAINTENANCE AND OPERATIONS AS PER APPROVED LOCATIONS AND REQUIREMENTS.
6. MATERIAL SPECIFICATIONS SHALL BE AS PER DETAILED DRAWINGS/TENDER DOCUMENTS OR AS INSTRUCTED BY THE ENGINEER - IN - CHARGE.
7. FOR DIAMETER OF TERRACE PIPING PLEASE REFER RESPECTIVE TERRACE DRAWING.

KEY PLAN:





DATE: 21 DEC 2018

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LEGEND

SYMBOL	DESCRIPTION
DWR	DOM. WATER RISER
DWS	DOM. WATER SUPPLY LINE
FWR	FLU. WATER RISER
FWS	FLU. WATER SUPPLY LINE
RO	DRINKING WATER SUPPLY LINE
	CONTROL VALVE
	NON RETURN VALVE

ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. HEMCING TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jagarludi, Yerravdu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. I
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA(UP)301

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT LTD, NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
KANKANI ARCHITECTS PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.E.P. CONSULTANTS, NEW DELHI-110048

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

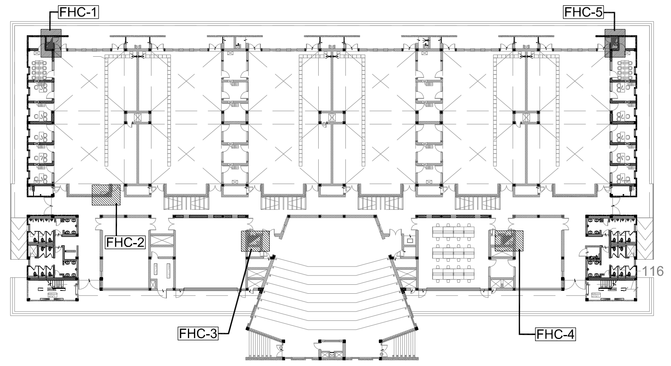
Drawing Title
UGL - PLUMBING & RO & HEAT - SLD

Document Release Type
TENDER

Job No. 2018/07	
Scale NTS ON A0 SHEET	
21 DEC 2018	Drawing No. UGL-PL-SLD-001
Drawn by	Revision No. R0
Checked by	

AUTHORITY:

KEY PLAN:



UGL

S +7500 PARAPET LEVEL

A +4400 TERRACE FLOOR LEVEL
S +4350

A +525 GROUND FLOOR LEVEL
S +450

±0.00

25Ø DOM. WATER RISER TO FLUSHING TANK FOR EMERGENCY PURPOSE INLET TOP OF SLAB

40ØDWR

FIRE TANK
2.025X2.1X1.35
5.74K LIT.

OVER FLOW PIPE

DOMESTIC TANK
2.85X2.1X1.35
8.8K LIT.

32∅FWR

FLUSHING TANK
2.85X1.5X1.35
5.77K LIT.

DWR

FWR

150Ø FIRE

ARV

100Ø FIRE PIPE

150Ø FIRE PIPE

FHC

TERRACE FIRE PUMP
CAP.-450LPM
HEAD -35M

100Ø FIRE
DOWN COMER PIPE

3-WAY FIRE BRIGADE
INLET CONNECTION
AS PER SITE

50Ø DOM. WATER SUPPLY RISER
FROM MAIN EXTERNAL RING

40Ø FLUSHING WATER SUPPLY RISER
FROM MAIN EXTERNAL RING

FHC-01 FHC-02 FHC-03 FHC-04 FHC-05

DATE: 13 DEC 2018

NOTES:

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LEGEND

SYMBOL	DESCRIPTION
DWR	DOM. WATER RISER
FWR	FLU. WATER RISER
F	FIRE LINE
FHC	FIRE HOSE CABINET
ARV	AIR RELEASE VALVE
	CONTROL VALVE
	NON RETURN VALVE

ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jaganadh, Yerravku - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. I
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, MUMBAI/DELHI

MECHANICAL ENGG CONSULTANTS:
ASHWANI KHOSLA & ASSOCIATES PVT. LTD, NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
ASHWANI KHOSLA & ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.E.S. CONSULTANTS, NEW DELHI-110020

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

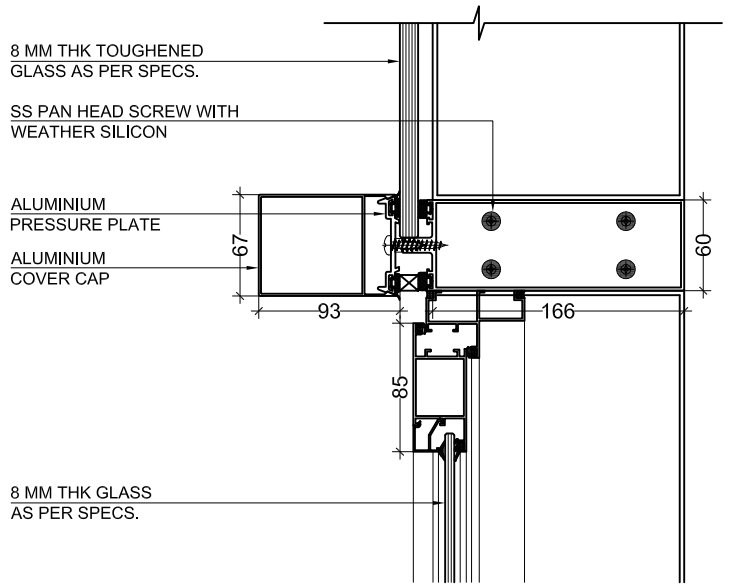
Drawing Title
UGL- FIRE FIGHTING - SLD

Document Release Type
TENDER

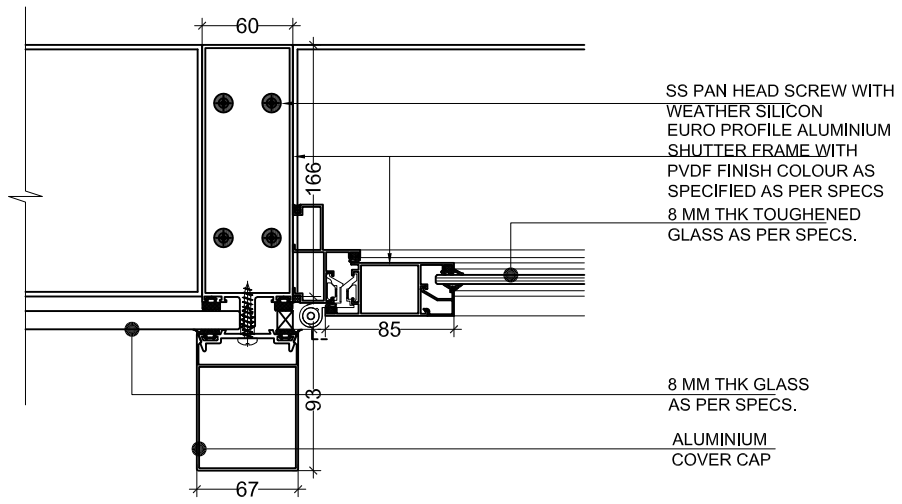
Job No. 2018/07	
Scale NTS ON A0 SHEET	
13 DEC 2018	Drawing No. **UGL-FF-SLD-002**
Drawn by	
Checked by	Revision No. R0

AUTHORITY:

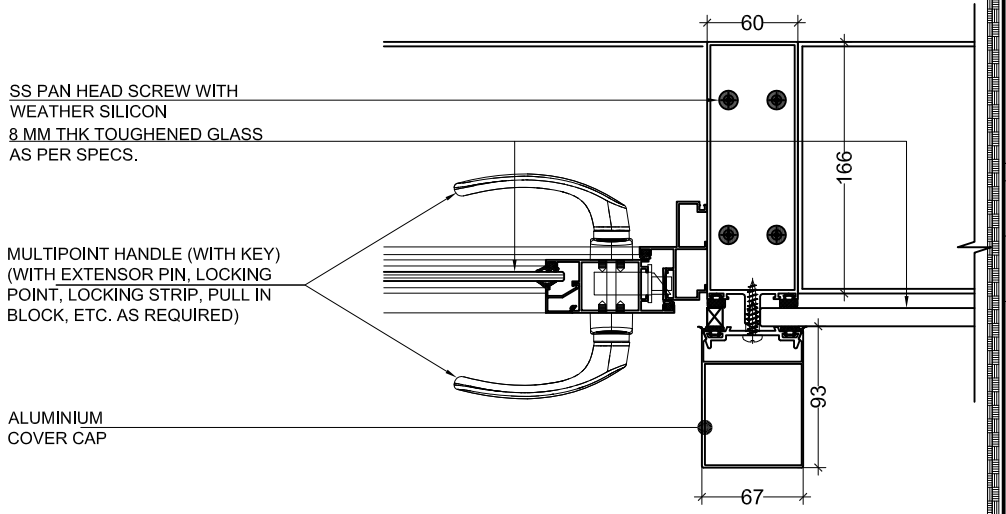
FOR 8MM TOUGHENED GLASS



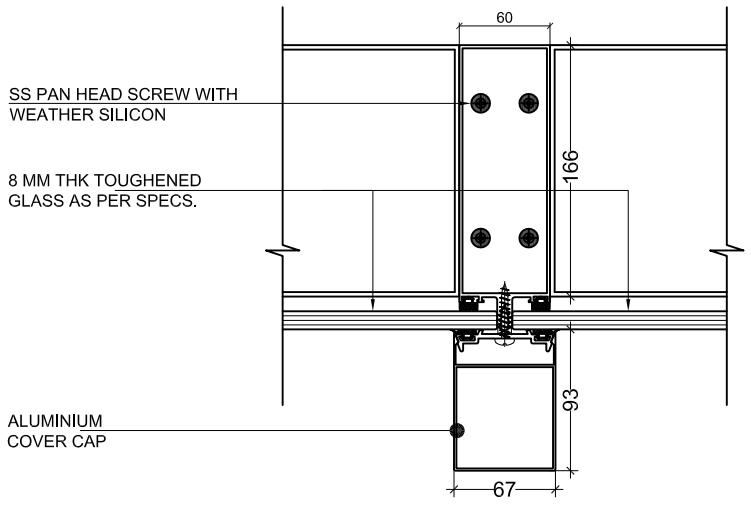
DETAIL-G1
SCALE-1:5



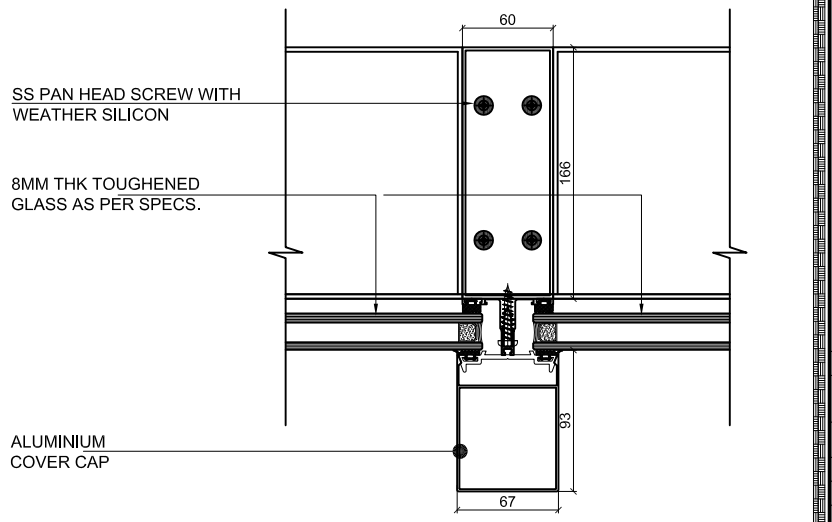
DETAIL-G3
SCALE-1:5



DETAIL-G4
SCALE-1:5

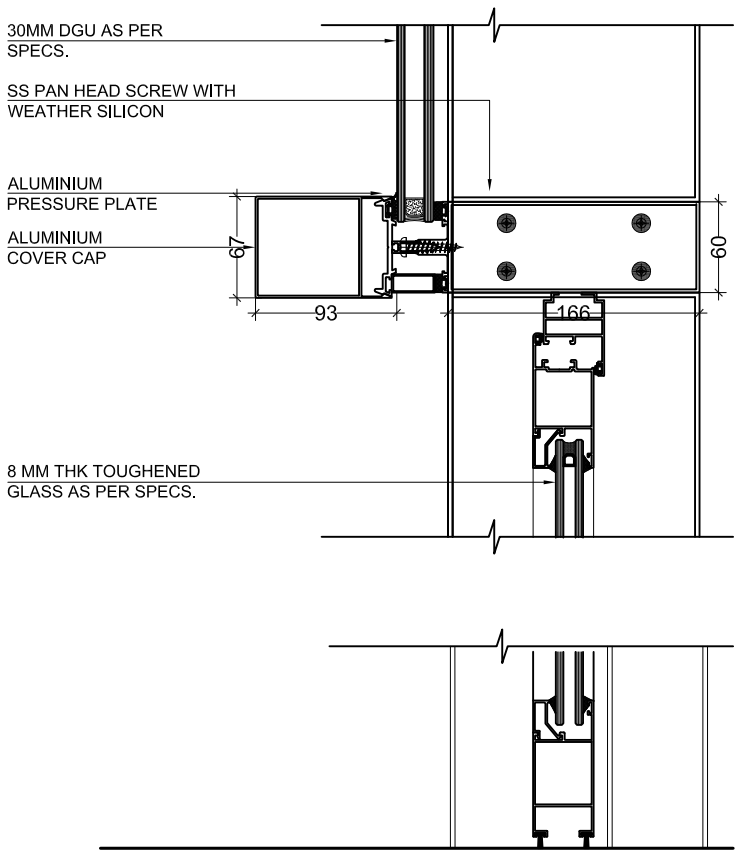


DETAIL-G2
SCALE-1:5

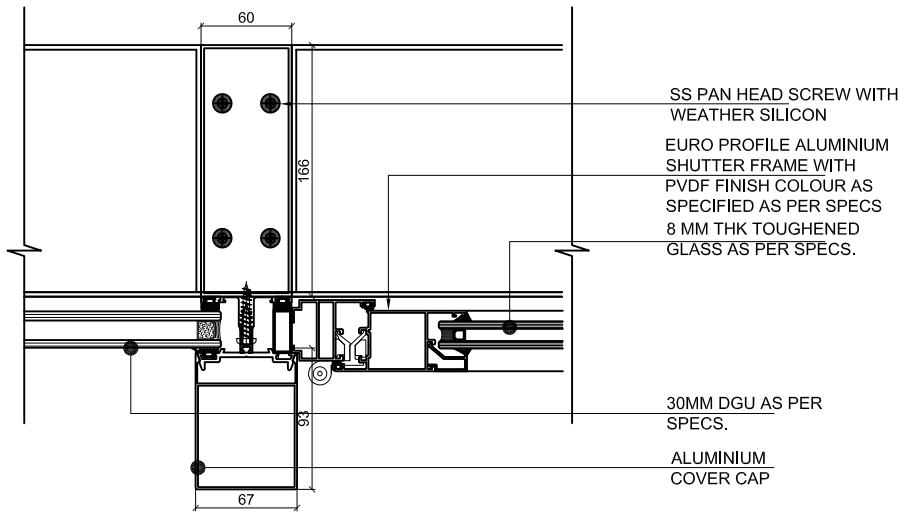


DETAIL-G6
SCALE-1:5

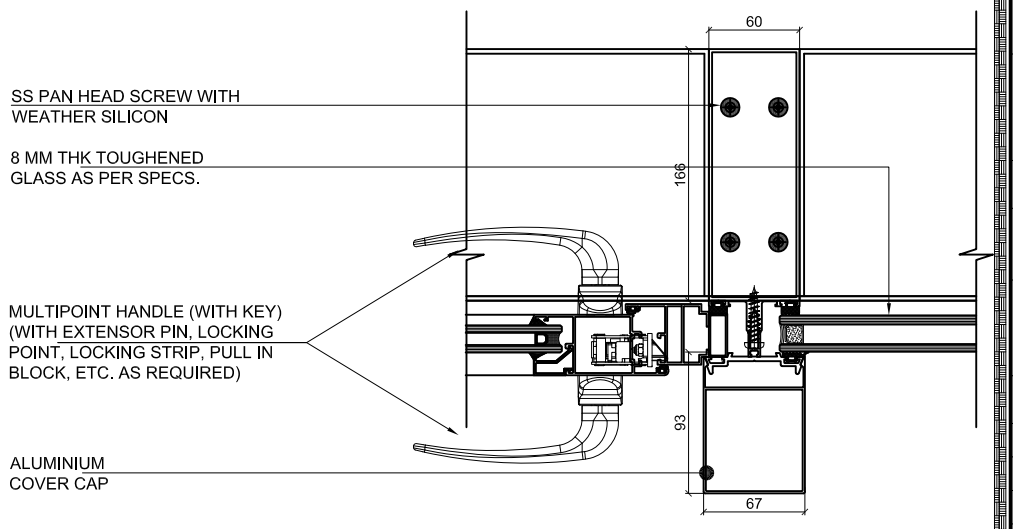
FOR 30MM DGU GLASS



DETAIL-G5
SCALE-1:5



DETAIL-G7
SCALE-1:5



DETAIL-G8
SCALE-1:5

DATE: 04.01.2019

NOTES

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NOTE:

ALL PLANS IN THE DRAWING ARE GENERAL PLANS FOR DETAIL PURPOSES ONLY. PLEASE REFER THE ARCHITECTURAL PLANS AND LAYOUTS FOR INDIVIDUAL BUILDINGS.

REFER WINDOW CONCRETE CILL DETAILS
REFER DOOR THRESHOLD DETAILS

ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jaganpalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

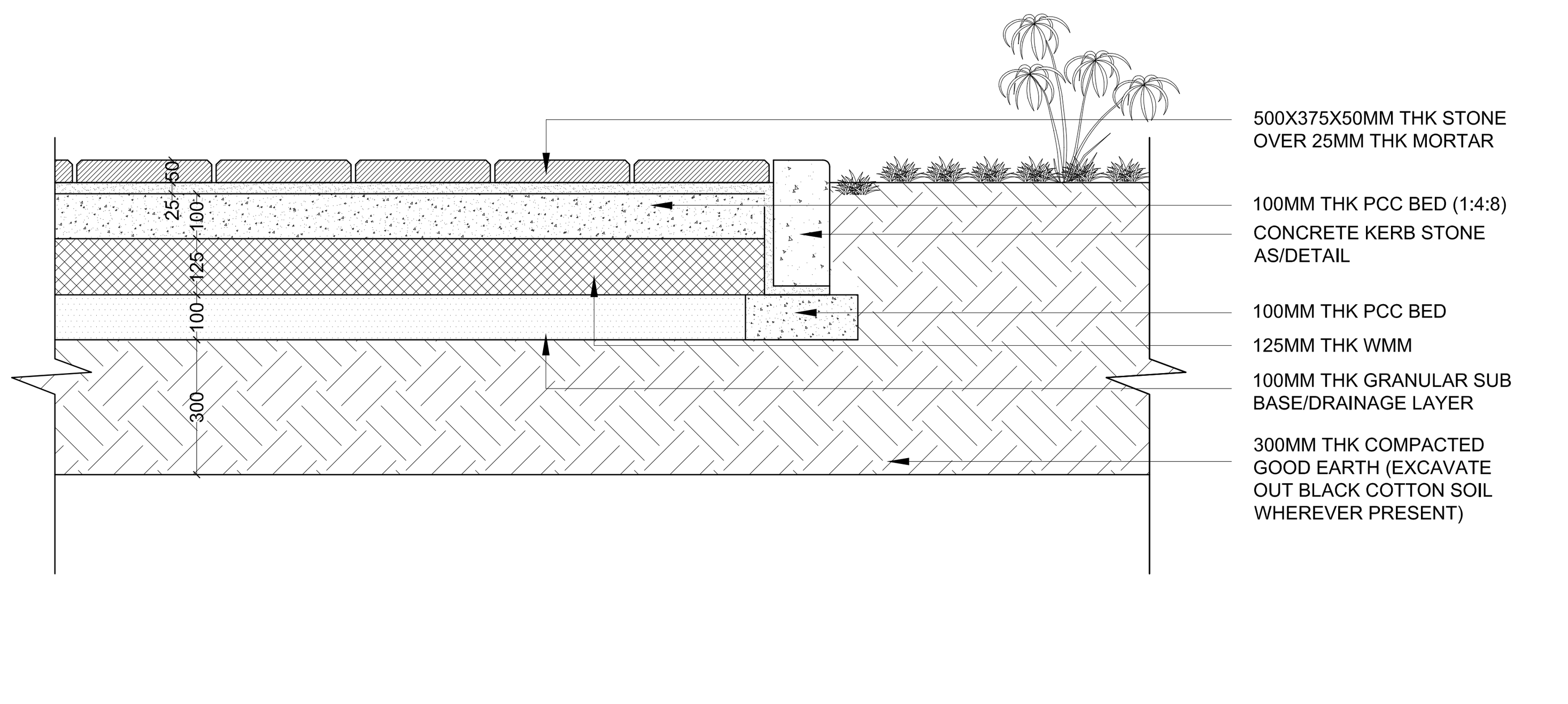
Drawing Title
GLAZING DETAIL FOR SINGLE FLOOR HEIGHT

Document Release Type
TENDER

Scale: AS PER DRAWING	
04.01.2019	Drawing No. TYP-AR-1300
Drawn by: AS	
Checked by: VB	Revision No. R0

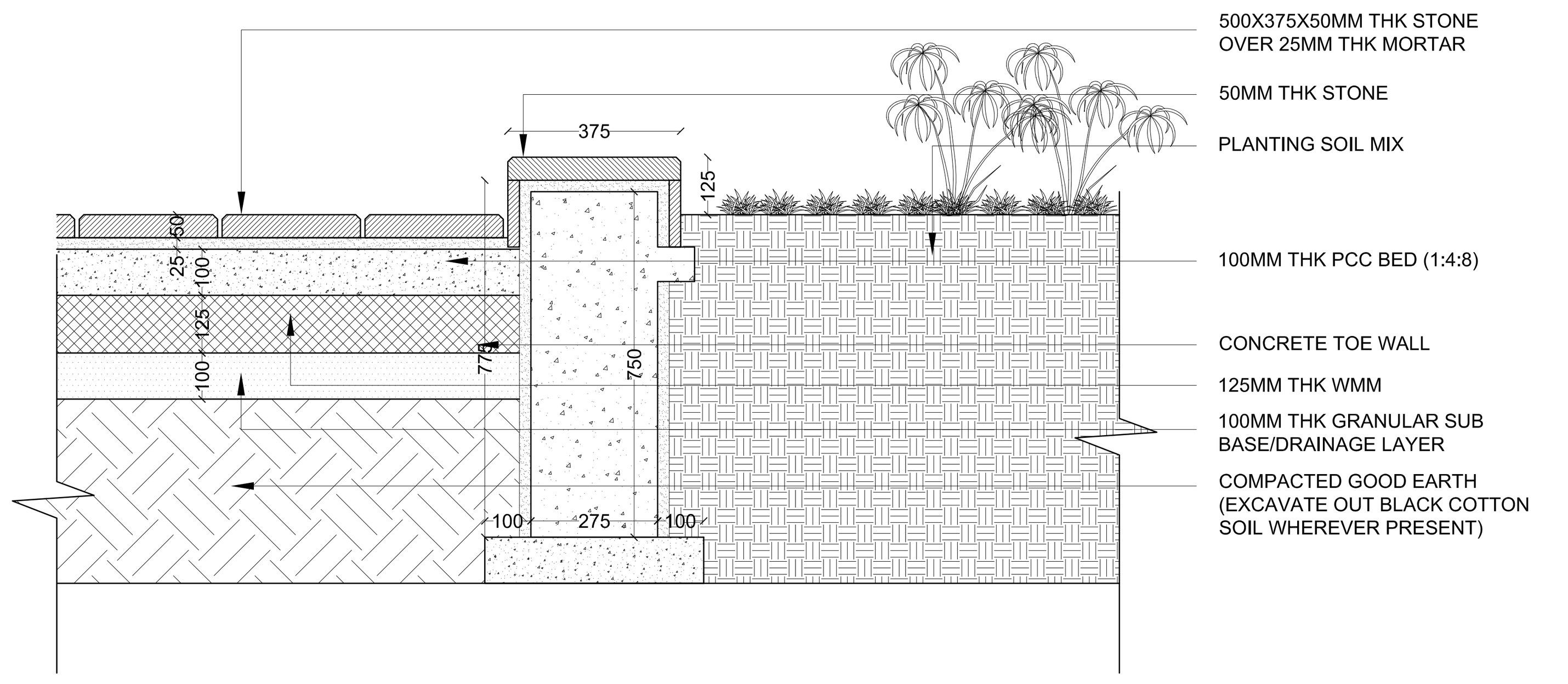
AUTHORITY:

PLAZA PAVING DETAIL WITH 50MM GRANITE



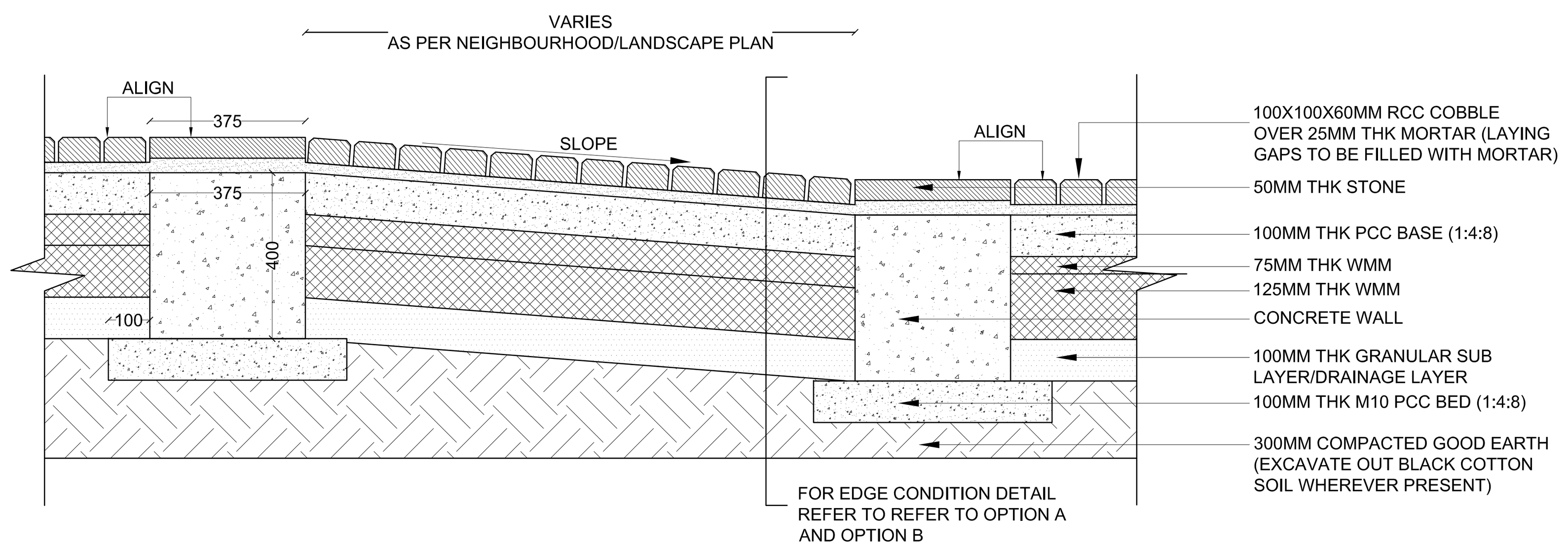
SCALE 1:15

PLAZA PAVING WITH PLANTER BOX DETAIL: IN GRANITE STONE

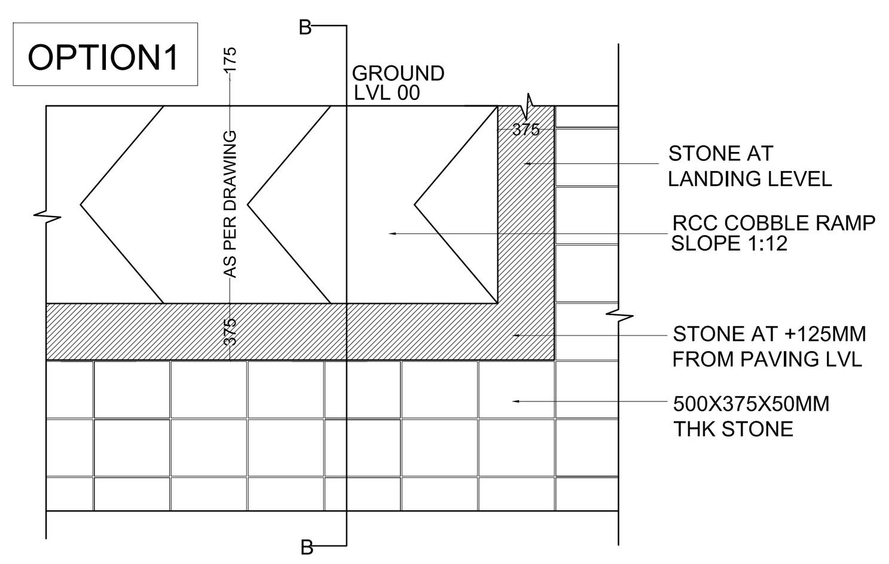


SCALE 1:15

PLAZA RAMP DETAIL: RCC COBBLE WITH EDGE CONDITIONS



OPTION1



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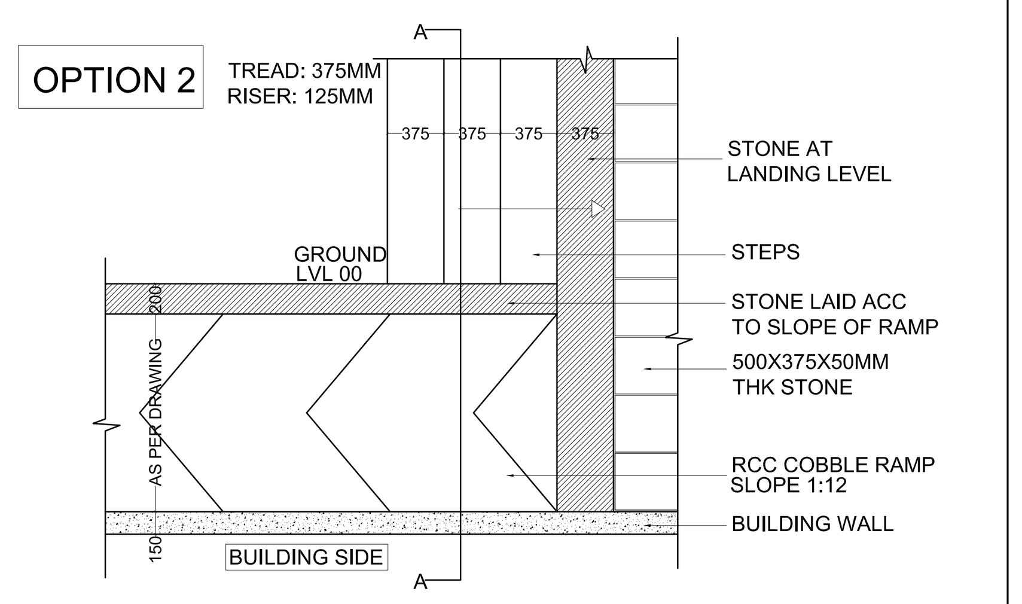
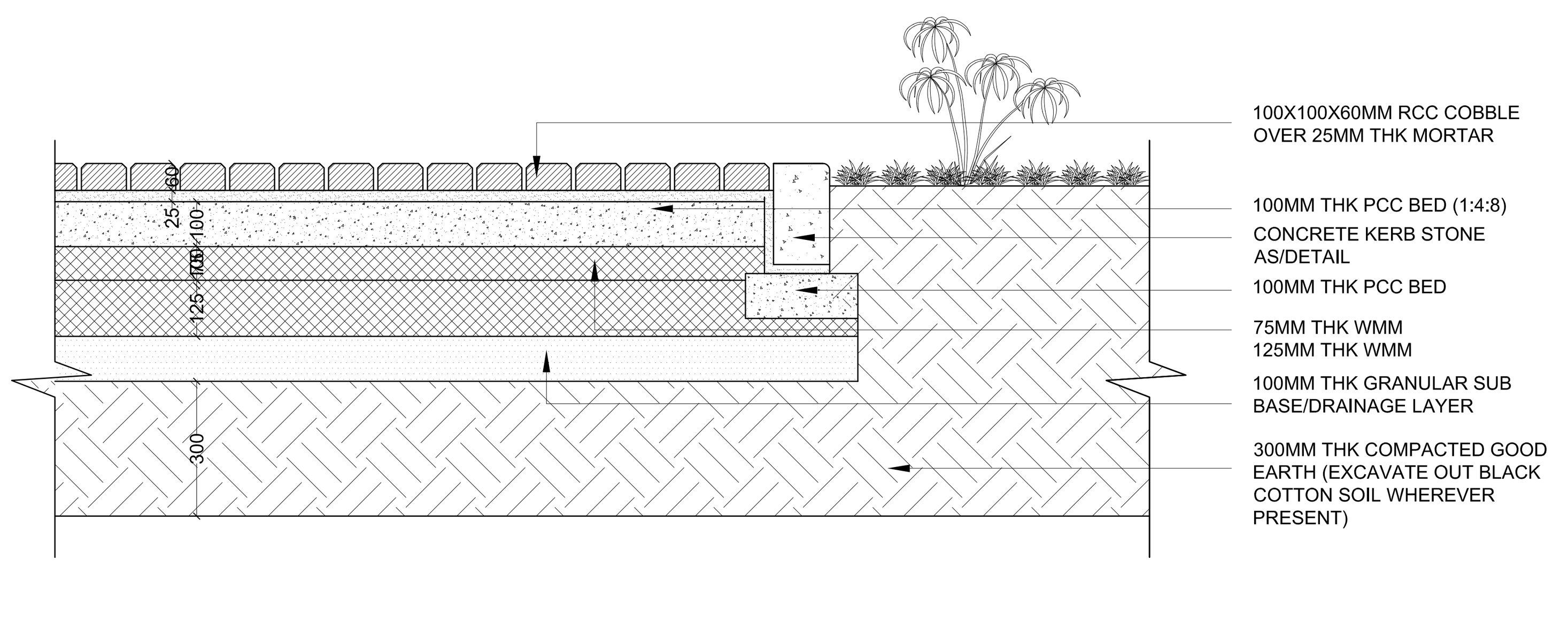
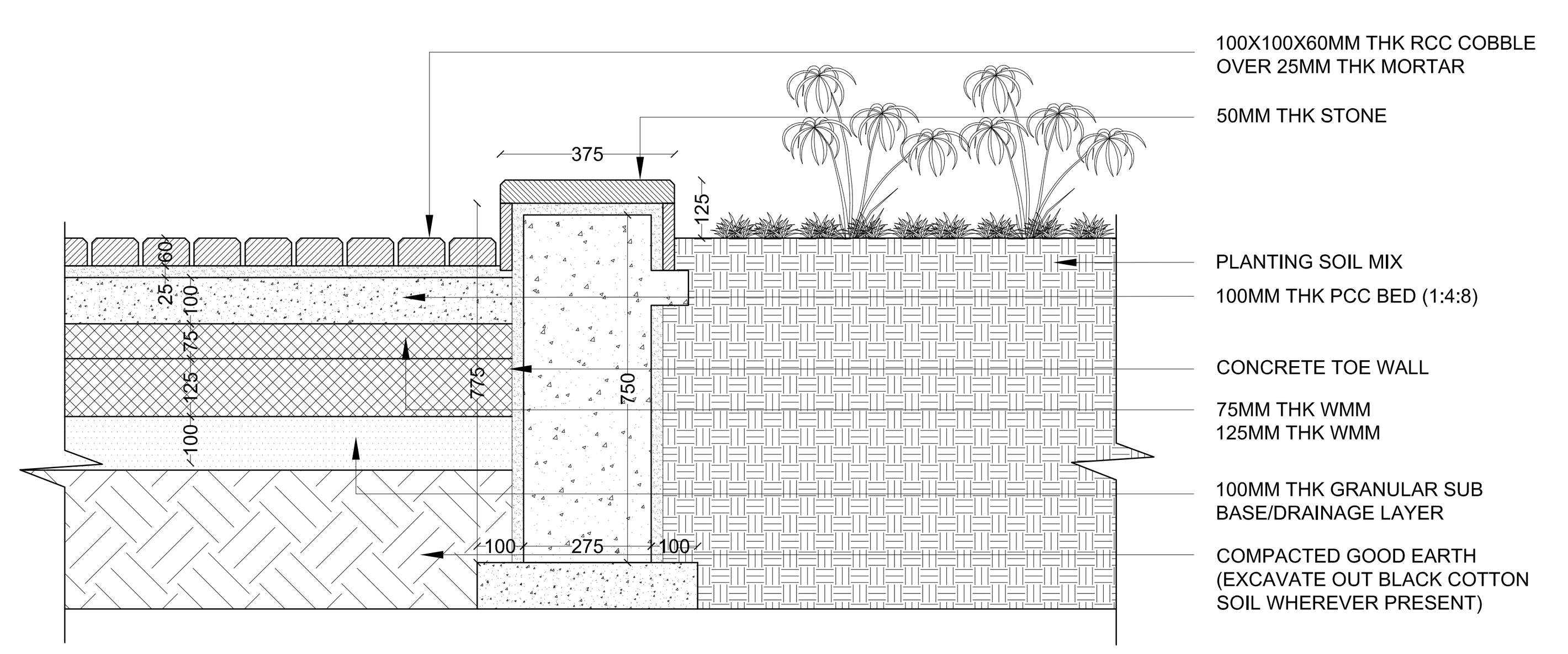


PLAZA PAVING DETAIL WITH 60MM RCC COBBLE



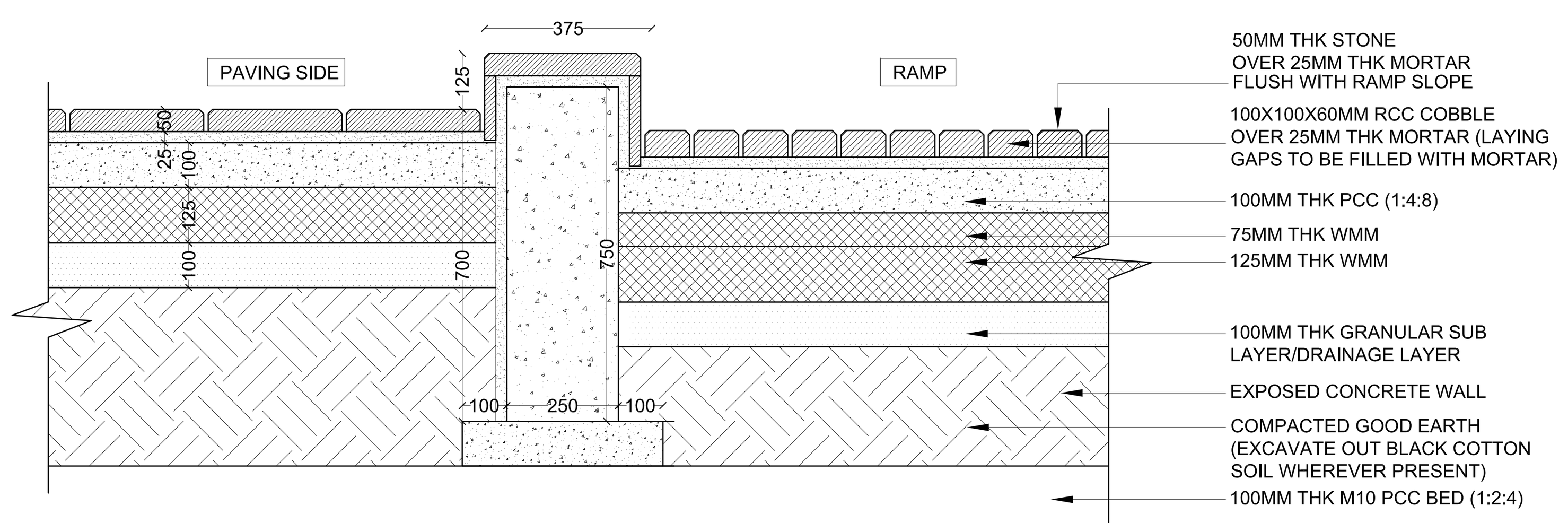
SCALE 1:15

PLAZA PAVING WITH PLANTER BOX DETAIL: IN RCC COBBLE



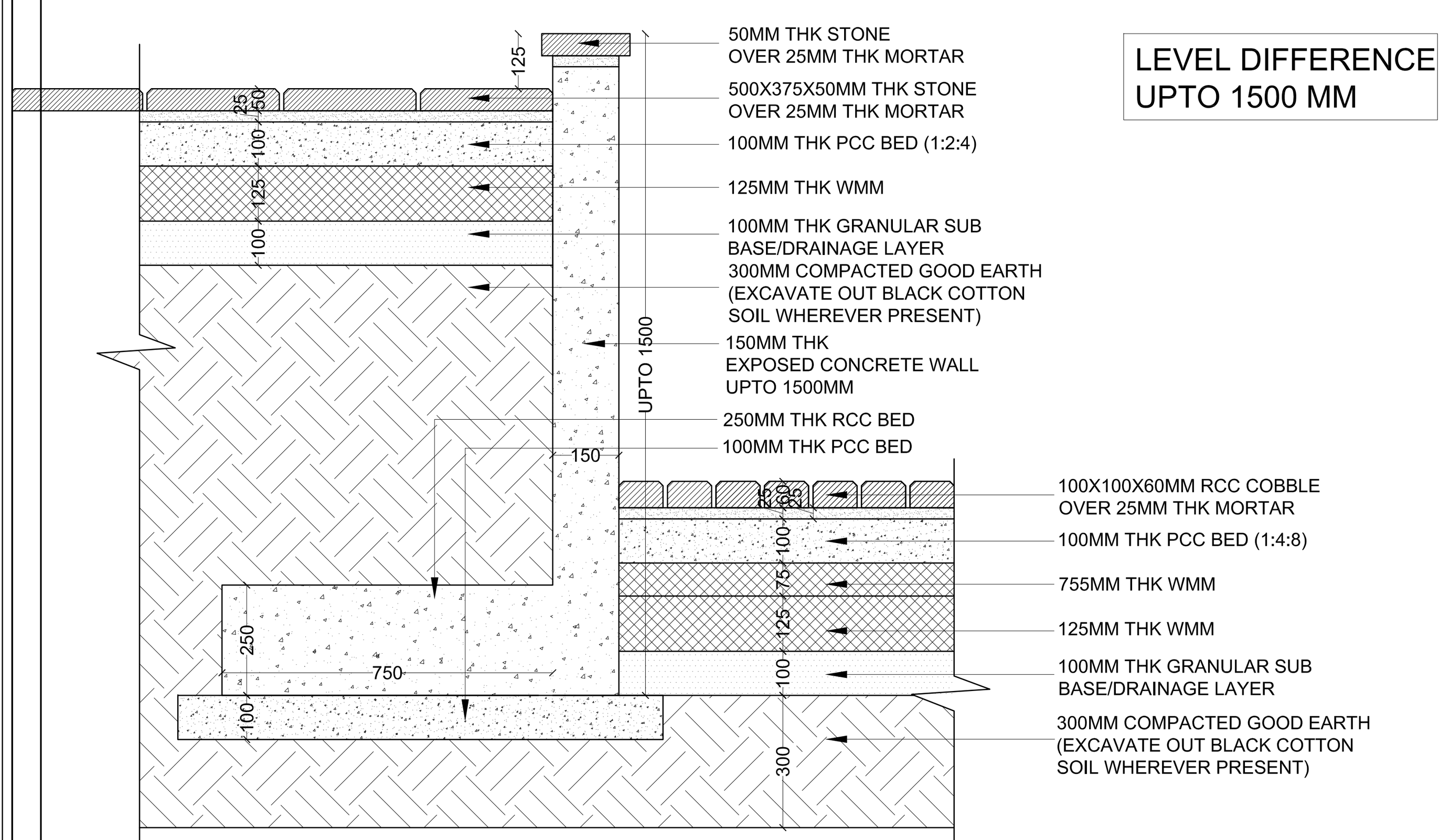
SCALE 1:15

SECTION AA: PAVING ON ONE EDGE, OPEN ENDED ON OTHER EDGE

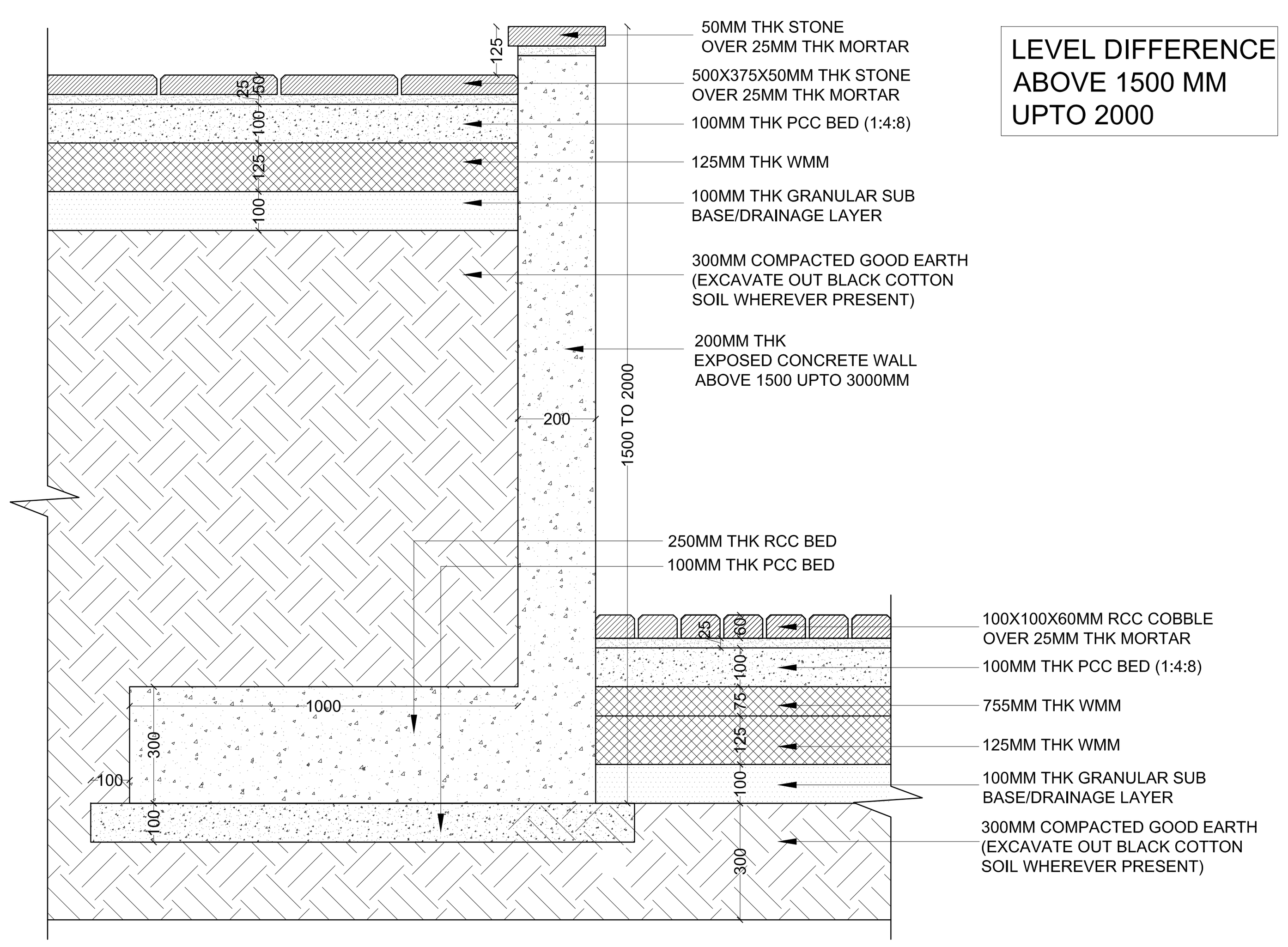


RETAINING WALL DETAILS: IN CASE OF LEVEL DIFFERENCE

LEVEL DIFFERENCE UPTO 1500 MM

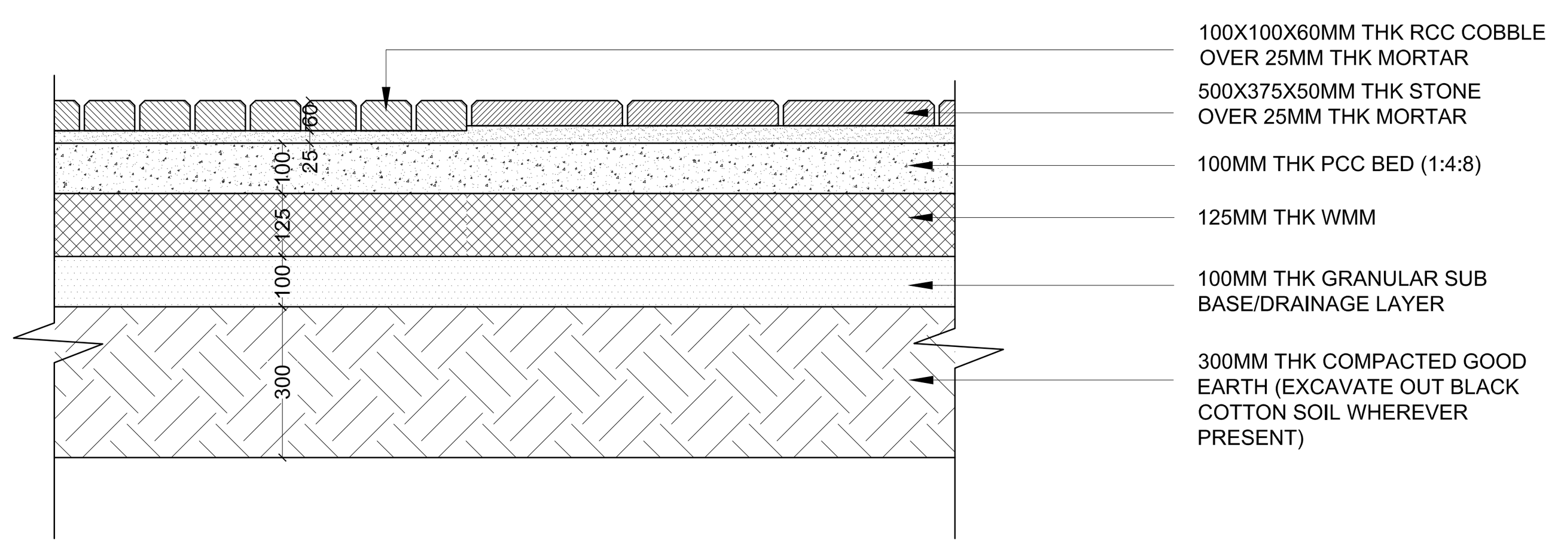


LEVEL DIFFERENCE ABOVE 1500 MM UPTO 2000



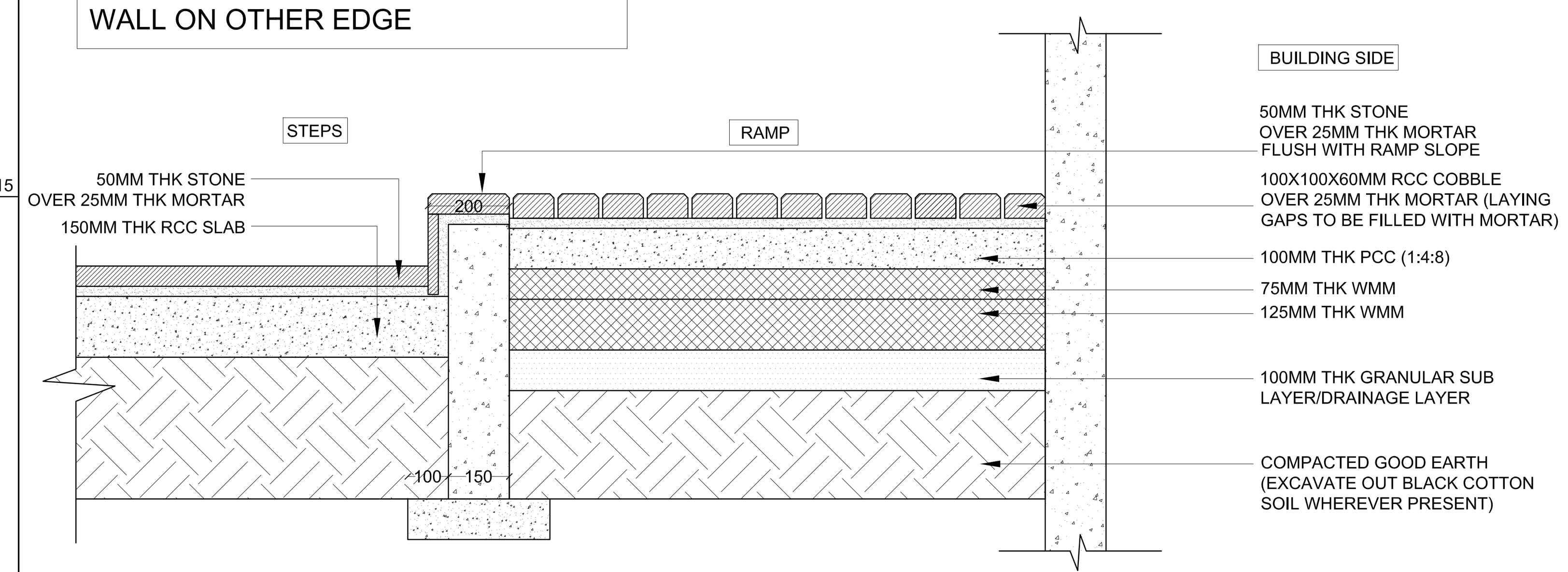
SCALE 1:15

PLAZA PAVING DETAIL: 60MM RCC COBBLE & 50MM STONE JOINING

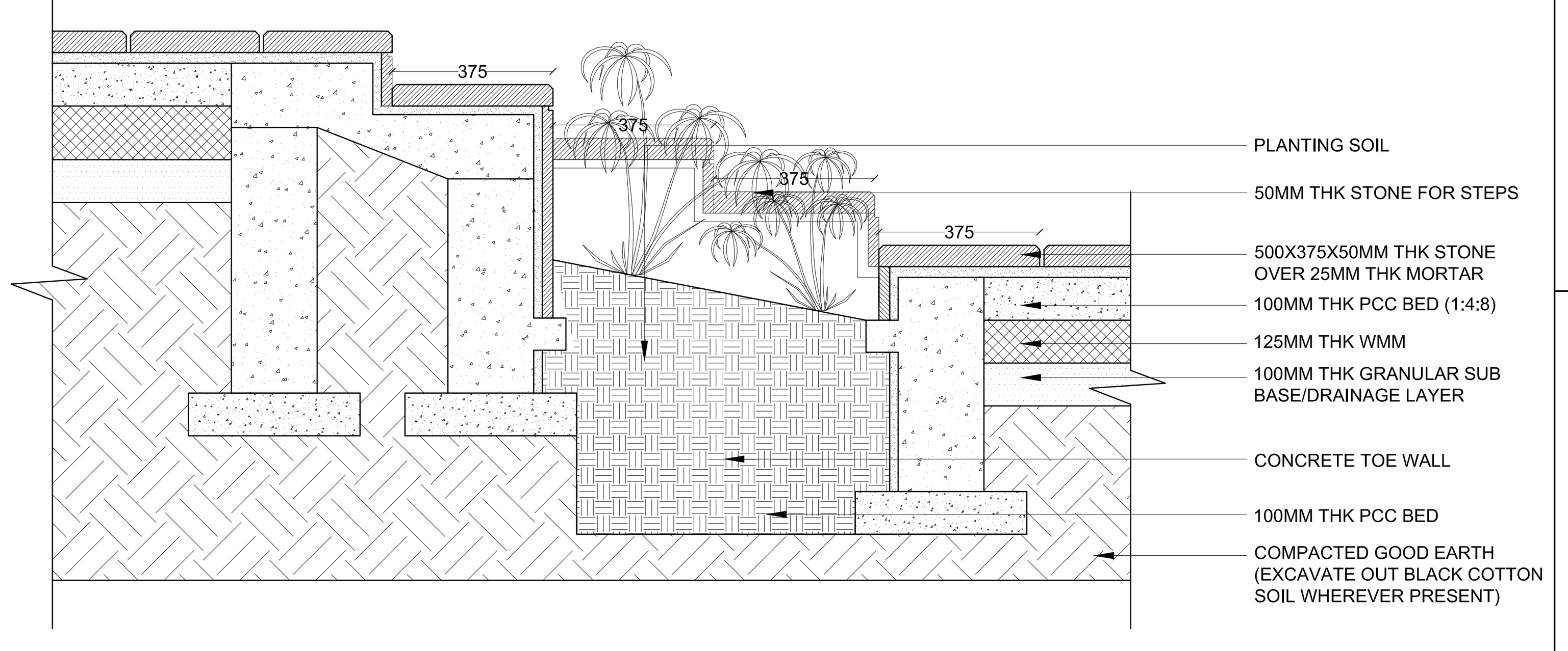


SCALE 1:15

SECTION BB : STEPS ON ONE EDGE, WALL ON OTHER EDGE

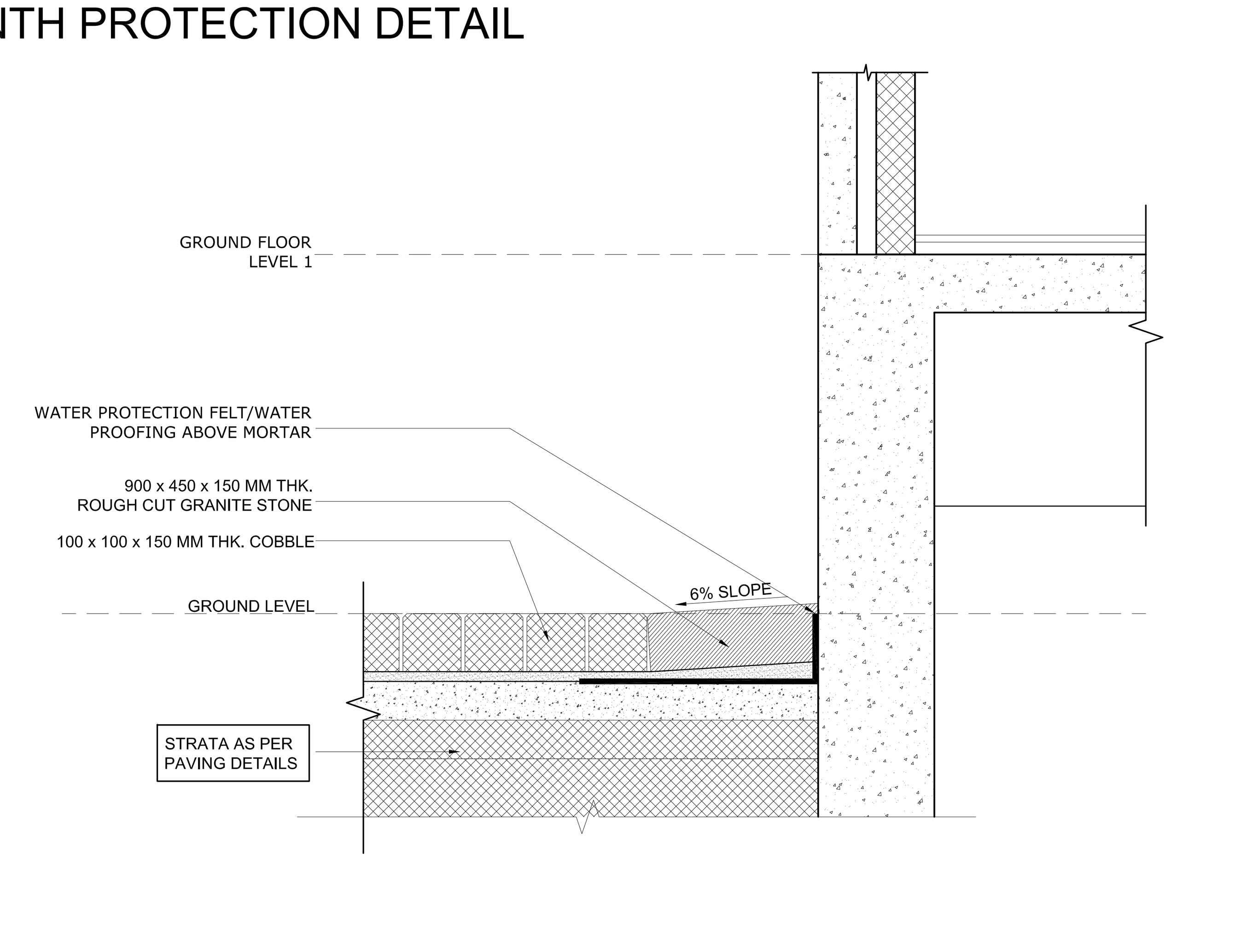


PLAZA STEPS AND PLANTER BOX DETAIL

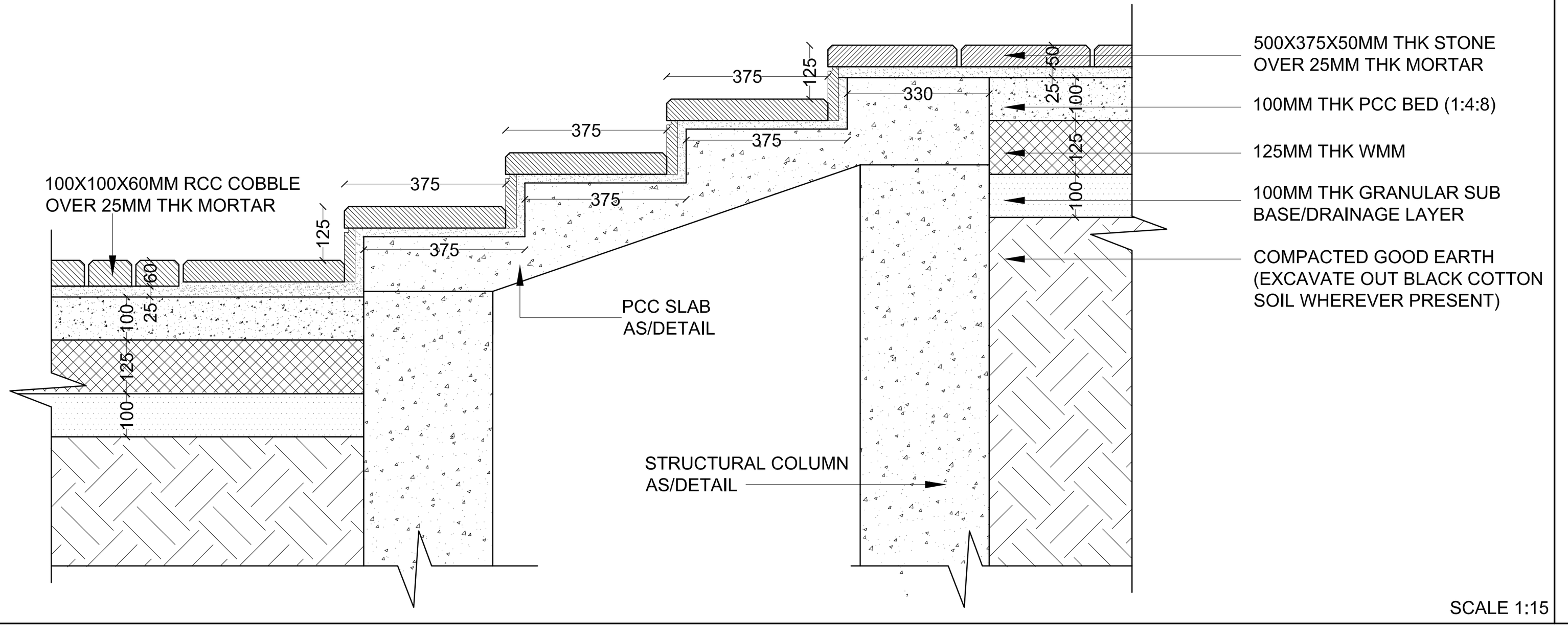


SCALE 1:15

PLINTH PROTECTION DETAIL



PLAZA WITH STEPS DETAIL



SCALE 1:15

SCALE 1:15

DATE: 08 JAN 2019

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ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jaganpalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus: Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P. 517507

ARCHITECTS:
ARCOP ASSOCIATES PVT. LTD.
A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

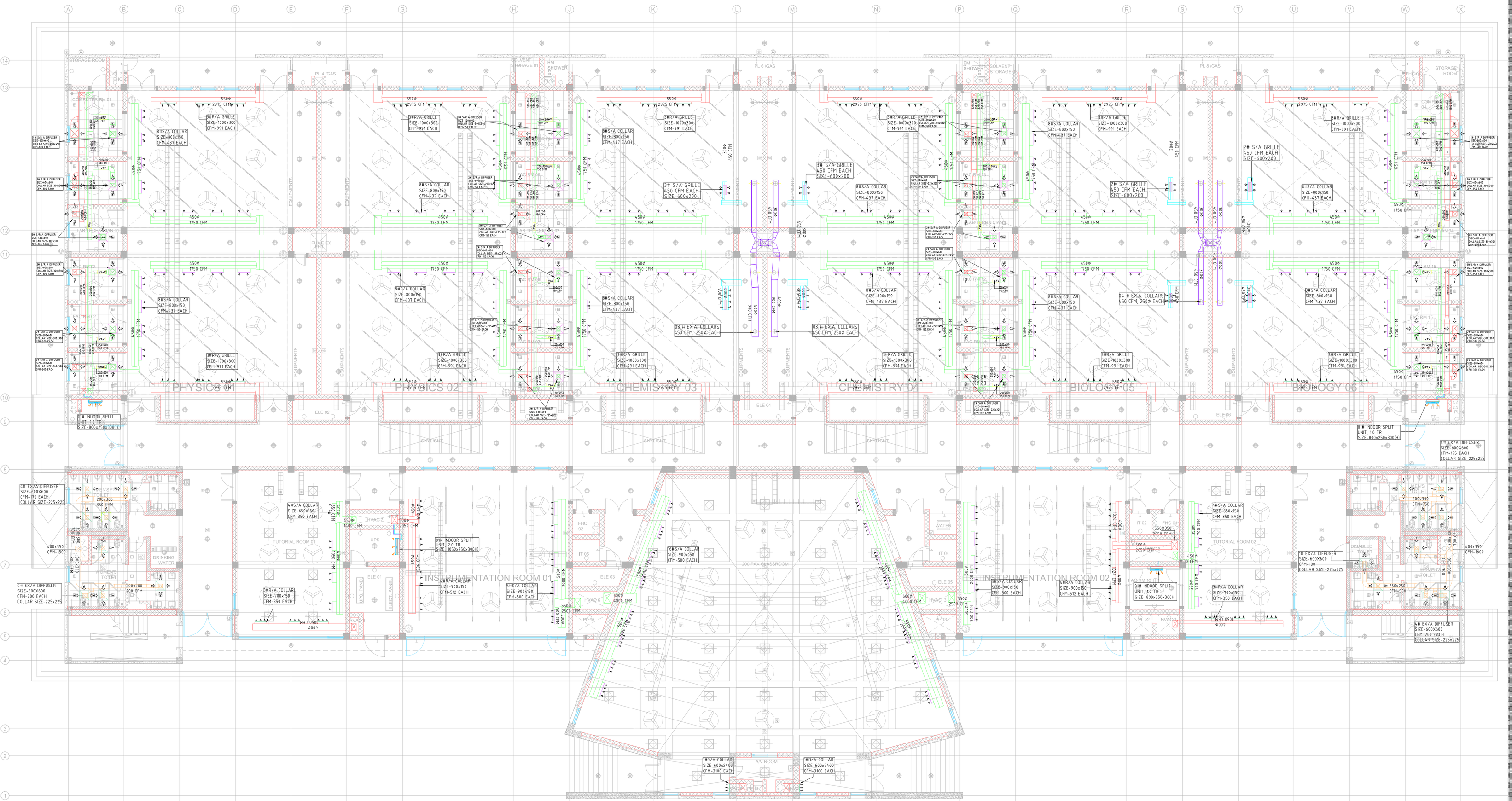
Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

Drawing Title
TYPICAL HARDSCAPE DETAILS

Document Release Type
TENDER

Scale: VARIES ON A1 SHEET
Drawing No.: TYP-AR-913
08 JAN 2019
Drawn by: MP
Checked by: VB
Revision No.: R0
AUTHORITY:



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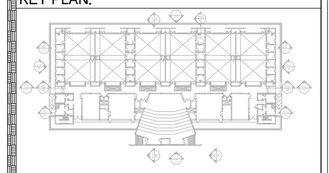
KEY PLAN:



UGL

ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
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Permanent Campus Jaganadh, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
Transit Campus(Sree Rama Engineering College Building, Karakambadi Road, Mangalam, Tirupati, A.P.-517507

ARCHITECTS:
AECOP ASSOCIATES PVT. LTD.
A-43, Phase-II, Okhla, Indl. Area, Okhla, Indl. Area, Phase-I, New Delhi-110020
Phone | 011-26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA-201301

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT.LTD, NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
KANWAR KRISHEN ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
K.K.G CONSULTANTS, NEW DELHI-110030

Architect's Signature | Client's Signature

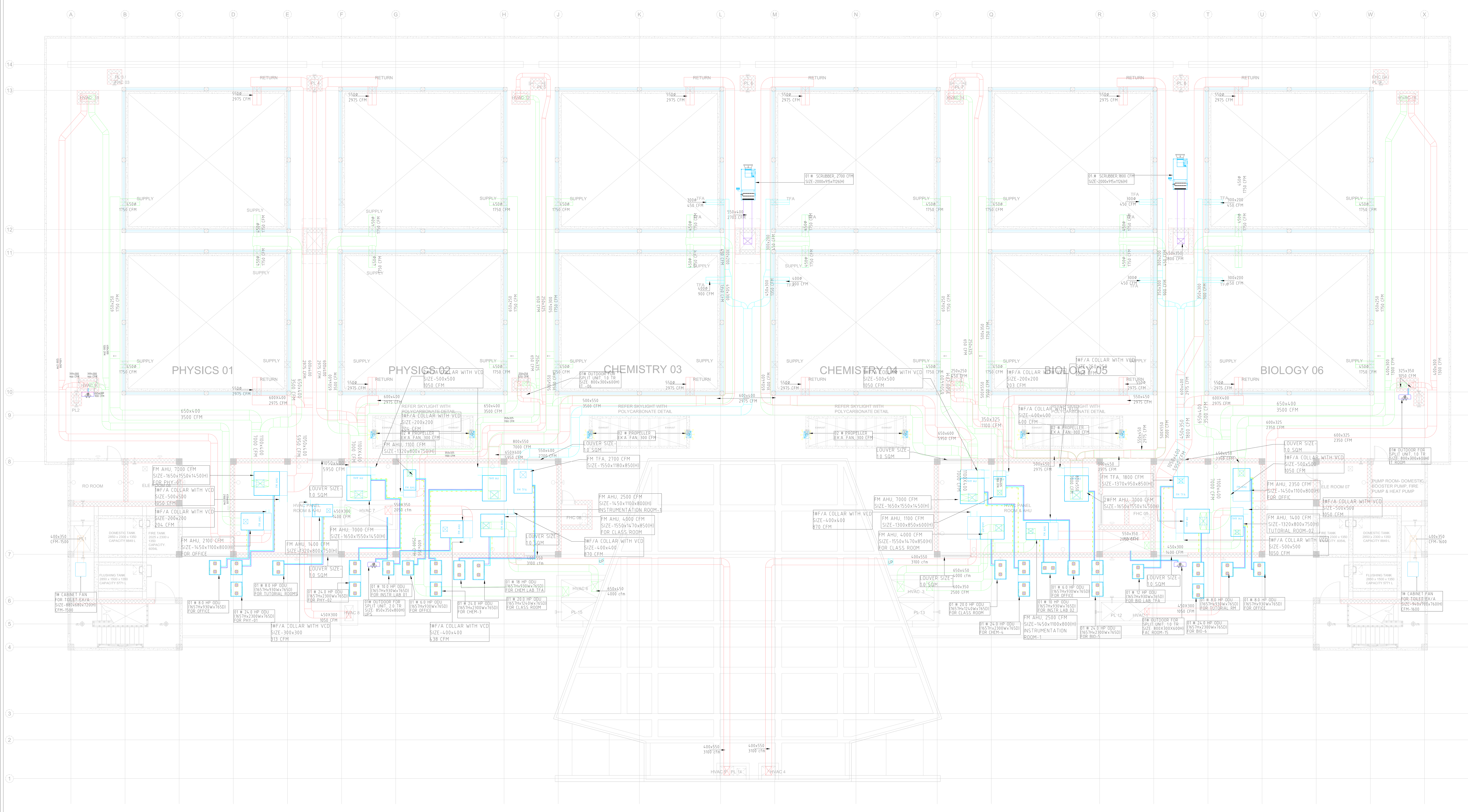
Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL IBMS I/O SUMMARY

Document Release Type
TENDER

Job No. 2018/07	
Scale NTS ON A1 SHEET	
8 JAN 2019	Drawing No. UGL-HVAC-201
Drawn by SACHIN	
Checked by AMIT	Revision No. R0

AUTHORITY:



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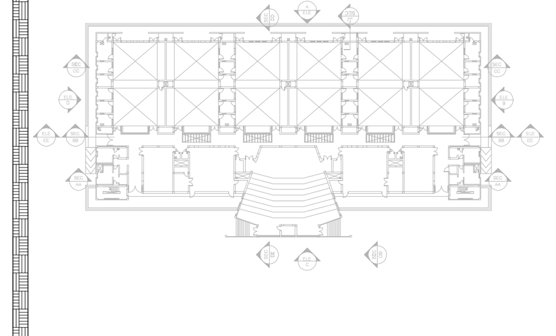
KEY PLAN:



UGL

ISSUES

DATE	REVISION	DESCRIPTION

1. SHUTTERING DRAWING TO BE PROVIDED TO THE CAMPUS DESIGNER FOR APPROVAL.
2. VENDORS TO PROVIDE SHOP DRAWINGS FOR THE APPROVAL FROM THE CAMPUS DESIGNER

CLIENTS:
INDIAN INSTITUTE OF SCIENCE EDUCATION & RESEARCH (IISER) TIRUPATI
Permanent Campus: Jaganpalli, Yerpedu - Kalahasti Main Road, Tirupati, A.P.
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A-15, Pamposh Enclave, G.K. 1
New Delhi 110048
Phone : 011 - 26442050

STRUCTURE CONSULTANTS:
TECHNICAL PROJECTS CONSULTANTS, NOIDA-201301

MECHANICAL ENGG CONSULTANTS:
M.J. ENGINEERING CONSULTANTS PVT LTD., NEW DELHI-110019

ELECTRICAL ENGG CONSULTANTS:
KANWAR KRISHEN ASSOCIATES PVT. LTD, NEW DELHI-110027

PLUMBING & FIRE FIGHTING ENGG CONSULTANTS:
M.K.G CONSULTANTS, NEW DELHI-110030

Architect's Signature | Client's Signature

Job Title
IISER TIRUPATI CAMPUS

Drawing Title
UGL TERRACE FLOOR - HVAC LAYOUT

Document Release Type
TENDER

Job No. 2018/07
Scale 1:125 ON A1 SHEET
Drawn by SACHIN — 8 JAN 2019
Drawing No. UGL-HVAC-202
Checked by AMIT
Revision No. R0

AUTHORITY: