

INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

Notice Inviting Tender (Amended)*

for

Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & Cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay

* The Amendment is on account of incorporation of the response, as appropriate, to Prebid Queries received from various agencies in a meeting held on 06.10.2022.

Bidders are required henceforth to refer the amended Tender Notice and the documents related.

NIT No.: IITB/Dean (IPS)/CACI/H-19/NIT/R1

Dated: 2022 October 31



NIT Invited by

Dean, Infrastructure Planning and Support (IPS)

Indian Institute of Technology Bombay

Powai, Mumbai 400076.

Notice Inviting Tender

Dean (IPS), IITB, on behalf of Director, IITB invites percentage rate composite bid from eligible firms/contractors in two bid system for the following work: -

NIT No.: IITB/Dean (IPS)/CACI/H-19/NIT/R1 dated 31.10.2022

Name of work: Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay.

Estimated cost: For civil components	Rs.73,86,43,489.22/-
For MEP components	Rs.11,53,37,829.19/-
Total	Rs.85,39,81,318.41/-
Total (including 18% GST)	Rs.100,76,97,956.00/-

Earnest Money to be deposited: Rs.1,10,76,980.00/-

Period of Completion: 24 months

Important Dates to Remember**

Date for intimation of inviting tender:	31.10.2022
Last date for submission of all Documents (EMD etc.)	25/11/2022 Up to 15.00 hours
Time and date of opening of Eligibility bid	After 15.30 Hours on 25.11.2022
Time and date of opening of financial bid	Shall be intimated later

For any queries send an Email to Dean (IPS), IITB (dean.ips@iitb.ac.in, with a copy to dean.ips.office@iitb.ac.in and po.ips@iitb.ac.in)

Venue for all events: 1st Floor, Main Office Building, IIT Bombay, Powai, Mumbai 400 076

The bid forms and other details can be obtained from [http:// www.iitb.ac.in/deanpl/tender](http://www.iitb.ac.in/deanpl/tender)

Please note that the entire bidding document to be submitted in total Three (3) Envelopes

- I. EMD in one Envelope**
- II. Part A to C and Eligibility Documents in one Envelope**
- III. Financial Bid (Part D1 & D2) in one Envelope**

Note: Contractors not registered with IITB shall do vendor registration from website portal iitb.ac.in/vrp/

Dean (IPS)
Indian Institute of Technology Bombay

PART-A

TECHNICAL BID

1. PRESS NOTICE: COMPOSITE N.I.T

N.I.T. No.: IITB/Dean(IPS)/CACI/H-19/NIT/R1 dated 31.10.2022

Name of work: Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay.

Composite Estimated Cost: For Civil Components: Rs. 73,86,43,489.22/-

For E&M Components: Rs.11,53,37,829.19/-

Total: Rs.85,39,81,318.41/-

Total (including 18% GST): Rs.100,76,97,956.00/-

The bid forms and other details can be obtained from [http:// www.iitb.ac.in/deanpl/tender](http://www.iitb.ac.in/deanpl/tender)

Earnest Money	Rs.1,10,76,980.00/-
Performance Guarantee	5% of tendered value
Security Deposit	5% of tendered value
Period of Completion	24 months

Dean (IPS)
Indian Institute of Technology Bombay

2. NOTICE INVITING BID

Dean (IPS), IITB (Email:- dean.ips@iitb.ac.in , with a copy to dean.ips.office@iitb.ac.in and po.ips@iitb.ac.in)on behalf of Director, IITB invites percentage rate bids from eligible Contractor as per criteria given further in this document.

NIT No.	NIT No.: IITB/Dean(IPS)/CACI/H-19/NIT/R1 dated 31.10.2022
Name of Work & Location	Construction of Hostel No. 19 Building (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay.
Estimated cost put to tender	Rs. 100,76,97,956.00/-
Earnest Money	Rs.1,10,76,980.00/-
Period of Completion	24 Months

All important dates can be referred from ‘Dates to Remember’ section of this document**

1. Tenders will be considered from eligible contractors who have satisfied eligibility criteria as specified in tender vide documents to be submitted with Envelope-1 of the Tenders subject to producing definite proof (from the appropriate authority which shall be to the satisfaction of the competent authority) of having satisfactorily completed similar works of magnate specified hereinafter.
2. Joint ventures and Special Purpose vehicles are not accepted.
3. Bidders who full fill the following requirements shall be eligible to apply.
 - i. Should have completed the works as mentioned below during the last Seven years ending previous day of last date of submission of tenders.

Three similar works each costing not less than **Rs.40.31 Cr**

OR

Two similar works each costing not less than **Rs.60.46 Cr**

OR

One similar work costing not less than that **Rs.80.62 Cr**
 - ii. One similar work costing not less than **Rs.40.31 Cr** with some Central Government/ Central Autonomous Body/ Central Public Sector Undertaking.
 - iii. **Similar work means:** “RCC Framed Structure having minimum 6 (Six) upper storeys and Height of 24 metre (Above Plinth Level) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & Cable laying, Firefighting system,

Automatic Fire Alarm& PA System, Lifts, Mechanical Ventilation etc. and Site Development Works, all executed under one agreement”.

- iv. 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 tenders.
 - v. **Bidders are advised to Submit copy of Agreement/ final bill or any other relevant document in support of their proposed completed work (s) which conforms to the definition of similar work.**
 - vi. **In case of private works, the same shall be supported by TDS certificate for the work (s) under consideration.**
- 4. Should have average annual financial turnover of **Rs.30.23 Cr** on construction works during last 3 years ending 31st March,2022.
 - 5. Should not have incurred any loss (profit after tax should be positive) in more than two years (out of which one year should be the latest year) during the last five years ending 31st March, 2022.
 - 6. Should have a solvency of **Rs.40.31 Cr.**
 - 7. The bidding capacity of the contractor should be equal to or more than the estimated cost of the work put to Tender. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding Capacity}=[2*A*N]-B$$

Where,

A= Maximum Value of construction works executed in any one Year during the last five years ending with 31st March 2022 taking into account the completed as well as work in progress.

***= where * implies multiplication**

N= Number of years prescribed for completion of works for which bids have been invited

B= Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited

- 8. Quality/safety/schedule/performance evaluation of completed / ongoing works by an Evaluation committee constituted by the Director, IIT Bombay. The bidder should get 60% out of 100 marks. Evaluation will be based on the following parameters:
 - 1. Quality/safety performance based one similar completed work-20 marks
 - 2. Quality/safety performance based one similar ongoing work- 20 marks
 - 3. Schedule performance of the current and past works in last 5 work- 20 marks
 - 4. Manpower with the company and to be deployed at site- 20 marks
 - 5. Equipment, facilities, software, tools, resources etc. available - 20 marks

The bidder shall submit documents/report detailing each of the above signed by the authorized signatory and should be part of the bid.

9. To become eligible for issue of bid, the bidders shall have to furnish and affidavit as Under:
- “I / We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back-to-back basis. Further that, if such a violation comes to the notice of Dean IPS, then I/We shall be debarred for tendering in IITB in future forever. Also, if such violation comes to the notice of Dean IPS before date of start of work, the Dean IPS shall be free to forfeit the entire amount of EMD/Performance guarantee.”*
10. The intending bidder must read the terms and conditions of CPWD-6 carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.
11. Taxes like labour cess and any other taxes shall be factored into the rates quoted by the contractor except Goods and Service tax (GST), which shall be paid separately.
12. Information and Instructions for bidders posted on website shall form part of bid document.
13. The bid document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with the contractor whose bid may be accepted and other necessary documents can be seen on **www. [http:// www.iitb.ac.in/deanpl/tender](http://www.iitb.ac.in/deanpl/tender)**
14. Bid Should be submitted along with original EMD. EMD should be submitted in separate envelope.
15. Certificate of Financial Turn over: At the time of submission of bid, contractor has to Submit Affidavit/Certificate from CA mentioning Financial Turnover of last 5 years and further details if required may be asked from the contractor after opening of eligibility bids. There is no need to submit entire voluminous balance sheet.
16. Contractor must ensure to quote percentage against estimated cost put to tender.
17. The Eligibility bid shall be opened first on due date and time as mentioned above (Refer to the ‘Dates to Remember’** section of this document). The time and date of opening of financial bid of contractors qualifying the eligibility bid shall be communicated to them at a later date.
18. The building is targeted for minimum 3 Star GRIHA rating from TERI. The bidders shall provide all necessary support and required facilities in order to secure this rating. Nothing extra on this account shall be payable.
19. IITB reserves the right to reject any prospective application without assigning any reason and to restrict the list of qualified contractors to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.
20. EMD amount of **Rs.1,10,76,980.00 /-** (**Rupees One Crore Ten Lakh Eight Seventy Six Thousand Nine Hundred Eighty only**) to be submitted along with the tender document by Demand Draft or Pay order drawn in favour of **Registrar** Indian Institute of Technology, Bombay, Payable at Mumbai.
21. It will be obligatory on part of the tenderer to sign the tender document for all the components (Schedule of Quantities conditions, special conditions and Performa Schedules etc.)

22. Information pertaining to any additions, changes, modifications including Record notes of Pre-Bid meeting etc. shall only be uploaded on the official website of IITB and no separate communication shall be made in this regard. Bidders are advised to regularly check website of IITB for further Information/Communication.

Dean (IPS)

Indian Institute of Technology Bombay

3. LIST OF DOCUMENTS TO BE SCANNED AND SUBMITTED BY THE BIDDERS

List of Documents to be submitted within the period of bid submission (All Documents to be submitted)

- i. Earnest money deposit to be submitted in a separate envelope in the form of Demand draft or Pay order only acceptable.
- ii. Certificate of Registration for GST and acknowledgement of up-to-date filled return.
- iii. Letter of transmittal.
- iv. Certified copy of the partnership deed & current address of all the partners of the firm and certified copy of the power of attorney for signing the application/copy of memorandum of Articles of Association duly attested by a Public Notary and certified copy of the power of attorney for signing the application. (If applicable)
Details of One similar Work i.e.: “RCC Framed Structure having minimum 6 (Six) upper storeys, 24 metres (Above Plinth Level) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & Cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation etc and Site Development Works, all executed under one agreement”.
- v. Details of One similar work Costing **Rs.80.62 Cr**
- vi. Details of Two similar work Costing **Rs.60.46 Cr.**
- vii. Details of Three similar work Costing **Rs.40.31 Cr.**
- viii. Details of One similar work Costing **Rs.40.31 Cr** with some Central Government/Central Autonomous Body/Central Public Sector Undertaking.
- ix. Bidding Capacity.
- x. Balance sheet for Last three Financial Year.
- xi. Certificates of Financial Turnover from Chartered Accountant (Form A).
- xii. Bank Solvency Certificate (Form B).
- xiii. Certificates of Work Experience (Form C&D).
- xiv. Structure & Organisation (Form E).
- xv. Affidavit for “Proforma of Affidavit for Non-Black Listing” (Form F).
- xvi. Any other document specified in the public notice.
- xvii. List of work in Hand (with date of start, Stipulated date of completion/ Value of work etc.).
- xviii. List of work executed for last 7 years (with date of start, Stipulated/stipulated actual date of completion/ Value of work etc.).

4. INFORMATION TO THE BIDDERS

1. Percentage rate bids are invited by Dean (IPS), on behalf of Director, IITB in **two bid system** from the eligible contractors as per criteria specified in the bidding document for the work of “Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey’s) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works, at IIT Bombay

1.1. The total estimated cost of the proposed work is **Rs. 100,76,97,956.00/-(including 18% GST)**. The estimate, however, is provided merely as a rough guide.

1.2. Intending bidder is eligible to submit the bid provided the bidder has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude (The value of the items specified under similar work definition only) specified below: -

1.2.1. Criteria of eligibility:

Three similar works each costing not less than **Rs.40.31 Cr**

OR

Two similar works each costing not less than **Rs.60.46 Cr**

OR

One similar work costing not less than **Rs.80.62 Cr** in last seven year sending previous day of last date of submission of bids.

The value of executed works (i.e., value of the items specified under similar work definition only) 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 submission of bid.

Similar work means: “RCC Framed Structure having minimum 6 (Six)upper storeys, 24 metres (Above Plinth Level) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & Cable laying, Firefighting system, Automatic Fire Alarm& PA System, Lifts, Mechanical Ventilation etc and Site Development Works, all executed under one agreement”.

One work of any nature (either part of (i) above or a separate one) costing not less than **Rs.40.31 Cr** with some Central Government/Central Autonomous Body/Central Public Sector Undertaking.

2. Agreement shall be drawn with the successful bidders on prescribed standard form. Bidders shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.
3. The time period for carrying out the work shall be **24 Months** from the date of start as defined in schedule ‘F’ 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 documents.
4. The site for the work is available. Preliminary architectural and structural drawings for the work

are available, however, final working drawings shall be issued after the award of work at an appropriate stage.

5. The bid document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents Standard General Conditions of Contract Form can be seen on website [www.http://www.iitb.ac.in/deanpl/tender_free](http://www.iitb.ac.in/deanpl/tender_free) of cost.
6. Copy of certificate of work experience and other documents as specified in the press notice shall physically submitted in the office of tender open in authority. Financial bid submitted by intending bidders shall be opened only of those bidders, whose documents are found in order.
7. The bid submitted shall become invalid if:
 - i. The bidders are found ineligible.
 - ii. The bidder does not Submit EMD
 - iii. The bidder does not Submit all the documents (including GST registration) as stipulated in the bid document.
8. After opening of the technical bid, the deficiencies found in the bid of each bidder vis -a -vis requirements as per NIT will be communicated to individual bidders by email with a request to furnish required documents within Three days of receipt, failing which it will be presumed that the individual bidder do not have any further documents to furnish and decision on bids will be taken accordingly.
9. The contractor, whose bid is accepted, will be required to furnish **performance guarantee of 5% (Five Percent)** of the bid amount within the period specified in Schedule F. This guarantee shall be in the form of cash (in case guarantee amount is less than Rs.10,000/-) or 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 of any scheduled bank (in case guarantee amount is less than Rs.1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the contractor shall be suspended from being eligible for bidding/award of all future contracts of IITB for a period of one year from the date of commuting such breach.

EMD amount of **Rs.1,10,76,980.00 /-** (**Rupees One Crore Ten Lakh Eight Seventy Six Thousand Nine Hundred Eighty only**) to be submitted along with the tender document by Demand Draft or Pay Order drawn in favour of **Registrar** Indian Institute of Technology Bombay, Payable at Mumbai.

The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/registrations or proof of applying and Programme Chart (Time and Progress using PRIMEVERA) within the period as specified in Schedule F.

10. **Description of work:** Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works, at IIT Bombay. Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their

bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general 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 charge consequent on any misunderstanding or otherwise shall be allowed. The bidders shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. 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 done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

11. The competent authority on behalf of the Director IITB does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.
12. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable to rejection.
13. The competent authority on behalf of Director IITB reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.
14. The contractor shall not be permitted to bid for works in the IITB, in which his near relative is posted a Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer 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 gazette officer in the IITB. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Institute/IITB.
15. No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering IITB of IITB is allowed to work as a contractor for a period of one year after his retirement from IITB, without the previous permission of IITB in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found anytime to be such a person who had not obtained the permission of the Government of India as a foresaid before submission of the bid or engagement in the contractor's service.
16. The bid for the works shall remain open for acceptance for a period of **One- Twenty (120) days** from the date of opening. If any bidders withdraw his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the IITB, then the Government (IITB) shall, without prejudice to any other right or remedy, be at liberty to suspend from being eligible for bidding /award of all future contracts of IITB for a period of one year from the date of committing such breach. Further the bidders shall not be allowed to participate in there tendering process of the work.
17. This notice inviting Bid shall form a part of the contract document. The successful bidders/contractor, on acceptance of his bid by the Accepting Authority shall within 15 days from

the stipulated date of start of the work, sign the contract consisting of:

- i. The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto.
- ii. Standard C.P.W.D. Form7.

18. For composite Bids.

- i. The bidders must associate himself, with agencies of the appropriate class eligible to bid for each of the minor component individually.
- ii. The eligible bidders shall quote rates for all items of major component as well as for all items of minor components of work.
- iii. After acceptance of the bid by competent authority, the Dean (IPS) IITB shall issue letter of award of work on behalf of Director IITB. After the work is awarded, the main contractor will have to enter into one agreement with Dean (IPS).
- iv. Entire work under the scope of composite bid including major and all minor components shall be executed under one agreement.
- v. Security Deposit will be worked out separately for each component corresponding to the estimated cost of the respective component of works.
- vi. The main contractor has to associate agency(s) for minor component(s) conforming to eligibility criteria as defined in the bid document and has to submit detail of such agency(s) to Dean (IPS) within prescribed time. Name of the agency(s) to be associated shall be approved by Dean (IPS).
- vii. 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 Dean (IPS). The new agency/agencies shall also have to satisfy the laid down eligibility criteria. In case, Dean (IPS) 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.
- viii. The main contractor has to enter into agreement with contractor(s) associated by him for execution of minor component(s). Copy of such agreement shall be submitted to Dean (IPS). In case of change of associate contractor, the main contractor has to enter into agreement with the new contractor associated by him.
- ix. Running payment for the major component and minor component shall be made by Dean (IPS) to the main contractor on basis of Quoted Percentage Above or Below on The Estimated Cost of each item shall be worked and paid.
- x. The composite work shall be treated as complete when all the components of the work are complete. The completion certificate of the composite work shall be recorded by Dean (IPS) after record of completion certificate of all other components.
- xi. Final bill of whole work shall be finalized and paid by the Dean (IPS).
- xii. The completion certificate of the work shall be recorded by Dean (IPS).
- xiii. All requirement as per Above NIT.

5. PERCENTAGE RATE TENDER & CONTRACT FOR WORKS

1. **Tender for the work:** Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay.
2. Tender document duly completed in all respects to be submitted to Dean (IPS) office at 1st Floor, Main Office Building, IITB Campus, Powai, Mumbai 400 076 on or before the mentioned date in Dates to remember** section of this document.
3. Last Date & time for submitting EMD and other documents to Dean (IPS) office at 1st Floor, Main Office Building, IITB Campus, Powai, Mumbai 400 076 on or before the mentioned date in Dates to remember** section of this document.
4. Tender to be opened on the mentioned date & time in 'Dates to remember**' section of this document in the office in presence of members who may be present) at Dean IPS office, 1st floor, Main Office Building, IIT Campus, Powai, Mumbai 400 076.

TENDER

I/We have read and examined the notice inviting tender, schedule, A, B, C, D, E & F Specifications applicable, Drawings & Designs, General Conditions of Contract 2020 with amendments up to the last date of submission of tenders, Technical Specifications as per CPWD, clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work "Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works, at IIT Bombay."

I/We hereby tender for the execution of the work specified for the Director IITB within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract of 2020 with amendments up to the last date of submission of tenders and with such materials as are provided for ,by, and in respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for **One Twenty (120 days) from** the date of opening of bid and not to make any modification in its terms and conditions.

Bid security declaration is hereby submitted and the same is uploaded. If I/We, fail to furnish the prescribed performance guarantee within prescribed period, I/We agree that the said Director IITB or his successors representatives, in office shall without prejudice to any other right or remedy, be at liberty to suspend from being eligible for bidding /award of all future contract(s) of IITB for a period of one year from the date of committing such breach. Further, if I/We fail to commence work as specified, I/We agree that Director IITB or the successors representatives in office shall without prejudice to any other right or remedy available in law, be at liberty to Forfeit the said 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 Performance Guarantee or committing such breach as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back-to-back basis. Further that, if such a violation comes to the notice of IITB, then I/We shall be debarred for tendering in IITB in future forever. Also, if such a violation comes to the notice of IITB before date of start of work, Dean (IPS) shall be free to forfeit the entire amount of Performance Guarantee.

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.

Dated:

Signature of Contractor:

Witness:

Address:

Postal Address:

Occupation:

(Blank space to be filled by the Contractor)

Acceptance

The above tender (as modified by you as provided in the letters mentioned here under) is accepted by me for an on behalf of Director IITB for a sum of Rs.

(Rupee.....

.....)

The letters refer red to below shall form part of this contract agreement:

(a)

(b)

(c)

For & on behalf of Signature.....

Dated:

Designation.....

(Blanks to be filled by Dean (IPS))

6. SECTION – I: BRIEF PARTICULARS OF THE WORK

Salient details of the work for which bids are invited are as under:

Indian Institute of Technology (IIT) Bombay is situated in Powai, Mumbai. The campus is fully functional. Following is the brief detail of work under present tender. However, this scope is indicative only and not exhaustive.

Location: The site is located in the campus of IIT Bombay, Powai.

Scope of Work:

1. The estimate is for Construction of HOSTEL No. 19 Building for 1052 students (G+9 Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Site Development Works, at IIT Bombay.
2. The Total Built up area is 30,544 Sqm.
3. The building is designed to achieve a GRIHA rating of minimum 3 Star. Certain construction materials are based on the norms stipulated by GRIHA.
4. Accessibility to the building is proposed considering the specially abled.
5. There are total 6 staircases serving all the floors.
6. There are 6 lifts serving from Ground to Ninth Floor. Lifts are with Machine room.
7. There are 4 toilet blocks in each floor.
8. Lower Ground Floor consists of Underground Tanks, Pump Rooms, Services, and Store Rooms.
9. Open to sky Landscape court yard at Ground Floor.
10. Ground to Ninth floor comprises of 2000 mm wide corridors, dedicated service shafts, Gymnasium, Dining Hall and Cafeteria Area.
11. First floor comprises of single occupancy rooms, and rooms for various services/ staff.
12. Second to Ninth floors comprises of single occupancy rooms, sit outs and space for recreational activities, rooms like TV rooms, Music rooms and computer rooms are the common amenities on alternate floors etc.
13. Terrace floor comprises of Overhead tanks for fire/ flushing and domestic water supply and lift machine room and space allocated to MECHANICAL VENTILATION, Solar Panels etc.
14. Open to sky Terrace- roof of Dining area with provision of sports area for Boys.
15. Internal electrification of the building i/c Distribution cable, Panels, DBs etc.
16. Power distribution system with Rising Main and DBs.
17. Fire-fighting system, Lifts, Sprinkler system, Public Address System and Fire alarm system as per fire NOC, Drinking water Pump Sets.
18. Development works comprises boundary wall, all around interlock Paver blocks road, footpath, storm water drain, central courtyard, RCC drain adjacent to plot and parking.

7. SPECIAL CONDITIONS PERTAINING TO SITE FACILITIES / RESTRICTIONS

1. IIT Bombay is fully residential and fully operational campus. The bidders are advised to take utmost care while executing the work so that minimum/ no disturbances happen to the users. The bidder shall also protect site of work from the unauthorized entry of any persons by erecting necessary barricading as specified for which payment shall be done under relevant item.
2. IIT Bombay campus is situated in densely populated locality of Mumbai with huge flow of traffic in the roads leading to IIT Bombay. The bidders shall fully understand restrictions before participating in the tender. Nothing extra shall be paid on this account. No delay or claims of any kind shall be entertained from the Contractor on this account.
3. Since the campus is fully residential, no concrete plant/ batch mix plant/ ready mix plant shall be allowed inside the IIT campus. Nothing extra shall be paid on this account.
4. Water only for drinking purposes on chargeable basis shall be made available by IIT Bombay at one point near the site. The agency shall be required to lay the grid as per their requirement for which nothing extra shall be paid on this account. Charges @ Rs.6/- per kilo litre or as per prevailing rate from time to time and 70% of sewerage charges shall be payable to IIT. The bidders shall be required to pay water charges at regular interval as desired by IIT. RA bill/ Final bill shall be paid only after proof of up-to-date payment of water charges submitted to the Dean (IPS).
5. Water for construction purposes shall be responsibility of contractor. Bore well will be allowed only after permission from IITB (subjected the quality of water confirms to CPWD specification/applicable BIS Code) and after obtaining all approval from local body/ administration/ competent authority. The contractors shall hand over the borewell in working condition to IIT after completion of work for which nothing extra shall be paid. In case approval for drilling bore well not granted by IITB/ local body/ competent authority, the contractor shall make own arrangement for tanker water for which nothing extra shall be paid.
6. Electricity connection shall be provided by IIT at one point near the site. The contractor shall make is own arrangement for tapping at multiple locations for which nothing extra shall be paid. Charges as per MSEDCL LT II Commercial tariffs. The current rates are at Rs14.11 per unit and Rs.640.00 fixed monthly charges or as per prevailing rate from time to time shall be payable to IIT. Before tendering, he shall visit the site and assess the manner in which he is able to arrange the above facilities. The Dean (IPS) shall in no way be responsible for any delay on this account and no claim, whatsoever, on this account shall be entertained. The bidders shall be required to pay electricity charges at regular interval as desired by IIT. RA bill/ Final bill shall be paid only after proof of up-to-date payment of electricity charges submitted to the Engineer-in-Charge.
7. The Contractor shall abide by the rules /bye laws applicable in respect of water /electricity connection and he shall be solely responsible for any penalty on account of violation of any of the rules / bye laws in this regard. The Contractor shall indemnify the IITB against any claim arising out of pilferage, theft, damage, penalty, non-settlement of bills etc. whatsoever on this account.

8. Space for site office, site store yard and worker rest rooms (including toilets) shall be provided in the vicinity of site free of ground rent. The agency shall be required to establish all such facilities and for which nothing extra shall be paid. It shall be responsibility of agency to transport the material from material stacking yard to site and for which nothing extra shall be paid. In case any building or infrastructure work is required to be executed on the land occupied by the site office/site store/workers rest room/ labour camp, agency shall relocate these shelters for which nothing extra shall be paid.
9. Crèche for the children of labour deployed in the work shall be provided by IITB. The contractor shall compulsorily send children of labour to the crèche. The contractor shall be required to pay @Rs.18,000/- per month to IITB for contribution toward running of crèche. The contractor shall be required to pay contribution at regular interval as desired by IITB irrespective of whether crèche is being used by the children of labour or not. RA bill /Final bill shall be paid only after proof of up-to-date payment of contribution submitted to the Dean (IPS).
10. Public Health Officer of IIT Bombay shall be authorized to check the cleanliness and hygienic of the site & labour huts and suggestion given by him will be binding on agency for which nothing extra shall be paid.
11. The agency shall be required to strictly follow security norms and procedure in terms of entry/ exit passes to all the vehicles/ persons/ materials, issue/ reissue/ surrender of labour passes and other rules and regulations that will be brought in force from time to time by IIT Bombay. Any penalty imposed by IIT Bombay for violating security norms will be immediately paid by the agency for which nothing extra shall be paid.
12. Some trees are required to be replanted & some are to be cut and both shall be paid under relevant item. Approval for the same shall be responsibility of IITB. Agency shall be required to follow the guidelines prescribed by local body for transplanting & cutting and nothing extra shall be paid on this account. Apart from that some trees exist in the vicinity of construction area need to be preserved throughout the time till final handing over. The agency shall take every measure for protection of such trees and nothing extra shall be paid on this account.
13. Space of about 500 Sq. m at the designated place for labour hutment shall be provided within the campus. Whole area of labour hutment shall be cordoned off by erecting GI Sheet of height 3.5 metre for which nothing extra shall be paid. The Bidder Shall be required to construct hutment neatly with proper sanitation including soak pit etc. The bidder shall follow security regulations issued by IITB from Time to time. Nothing extra shall be paid on this account. Bidder shall be required to pay @ Rs.40 (Including applicable GST) per Sq. m per month to IITB toward licence fee for the area being used for labour hutment. After completion of work area shall be handed over in original condition.

8. SECTION – II: GENERAL GUIDELINES FOR BIDDERS

1. GENERAL:

- i. Letter of transmittal and forms for pre-qualification are given in Section – III.
- ii. All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a **“nil” or “no such case”** entry should be made in that column. If any particulars / query is not applicable in case of the bidder, it should be stated as **“not applicable”**. The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the bidder being summarily disqualified. Bids received late will not be entertained.
- iii. The bid should be type written / neatly hand written. The bidder should sign each page of the bid.
- iv. Over writing should be avoided. Correction, if any, should be made by neatly crossing out, initialling, dating and rewriting. Pages of the pre-qualification document are numbered. Additional sheets, if any, added by the contractor, should also be numbered by him. These should be submitted as a package with signed letter of transmittal.
- v. References, information and certificates from the respective clients, certifying suitability, technical know-how or capability of the bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.
- vi. The bidder may furnish any additional information, which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of pre-qualification document unless it is called for by the Employer.

2. DEFINITIONS:

- i. In this document the following words and expressions have the meaning hereby assigned to them.
- ii. **EMPLOYER:** Means the Director IITB, acting through the Dean (IPS).
- iii. **BIDDER:** Means the individual proprietary firm, firm in partnership, limited company private or public or corporation.
- iv. **“Year”** means “Financial Year” unless stated otherwise.

3. METHOD OF APPLICATION:

- i. If the bidder is an individual, the bid shall be signed by him above his full typewritten name with current address.
- ii. If the bidder is a proprietary firm, the bid shall be signed by the proprietor above his full typewritten name and the full name of his firm with its current address.

- iii. If the bidder is a firm in partnership, the bid shall be signed by all the partners of the firm above their full typewritten names and current addresses or alternatively by a partner holding power of attorney for the firm. In the latter case, a certified copy of the power of attorney should accompany the bid. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.
- iv. If the bidder is a limited company or a corporation, the bid shall be signed by a duly authorized person holding power of attorney for signing the bid accompanied by a certified copy of the power of attorney. The bidder should also furnish a copy of this memorandum of Articles of Association duly attested by a public Notary.

4. FINAL DECISION-MAKING AUTHORITY:

The employer (IITB) reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time, without assigning any reason or incurring any liability to the bidders.

5. PARTICULARS PROVISIONAL:

The particulars of the work given in Section-I are provisional. They are liable to change and must be considered only as advance information to assist the bidder.

6. SITE VISIT:

The bidder is advised to visit the site of work, at his own cost, and examine it and its surroundings to himself collect all information that he considers necessary for proper assessment of the prospective assignment. Also, if Architect/Client intend to see the site executed by Bidder of similar Projects then Bidder may make arrangement for the same from his own cost

7. INITIAL CRITERIA FOR ELIGIBILITY FOR QUALIFICATION:

- 1. Bidders who full fill the following requirements shall be eligible to apply
- i. The bidder should have satisfactorily completed the works during the last Seven years ending previous day of last date of submission of tenders. For this purpose, cost of work means gross value of the completed work. This should be certified by an officer not below the rank of Executive Engineer/ Project Manager or equivalent.

Three similar works each costing not less than **Rs.40.31 Cr**

Or

Two similar works each costing not less than **Rs.60.46 Cr**

Or

One similar work costing not less than **Rs.80.62 Cr** (in last seven years ending previous day of last date of submission of bids)

- ii. One similar work costing not less than **Rs.40.31 Cr** with some Central Government/ Central Autonomous Body/ Central Public Sector Undertaking.
- iii. **Similar work means:** “RCC Framed Structure having minimum 6 (Six) upper storeys, 24 metres (Above Plinth Level) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & Cable laying, Firefighting system, Automatic

Fire Alarm& PA System, Lifts, HVAC (Mechanical Ventilation) etc and Site Development Works, all executed under one agreement”.

- iv. 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 tenders.
2. The Bidder should have had average annual financial turnover **Rs.30.23 Cr** on construction work during the last 3 consecutive Years ending 31st March 2022. (Original copy of Audited Balance Sheet to be Submitted). This balance sheet should be duly audited by a Chartered Accountant. Year in which no turnover is shown would also be considered for working out the average.
3. The bidder should not have incurred any loss (profit after tax should be positive) in more than two years (out of which one year should be the latest year) during the last five consecutive years ending 31st March 2022, duly certified and audited by the Chartered Accountant.
4. Bidder should have a solvency of **Rs.40.31 Cr** duly certified by his Bankers (Copy of original solvency to be Submitted).
5. The bidding capacity of the contractor/bidder should be equal to or more than the estimated cost of the work put to Tender. The bidding capacity shall be worked out by the following formula:

Bidding Capacity=[2*A*N]-B

Where,

A= Maximum Value of construction works executed in any one Year during the last five years ending with 31st March 2022 taking into account the completed as well as work in progress.

***= where * implies multiplication**

N= Number of years prescribed for completion of works for which bids have been invited

B= Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited

6. Quality evaluation of completed / ongoing works by an Evaluation committee constituted by Director. The bidder should get 60% out of 100 marks. Evaluation will be based on the following parameters:
 1. One similar completed work-20 marks
 2. One ongoing work- 20 marks
 3. Performance of the work- 20 marks
 4. Manpower- 20 marks
 5. Equipment- 20 marksTotal- 100 marks

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

8. FINANCIAL INFORMATION:

Bidders should furnish the following financial information:

Annual financial statement for the last five years **(in Form “A”)** and solvency certificate **(In Form “B”)**.

9. EXPERIENCE IN WORKS HIGHLIGHTING EXPERIENCE IN SIMILAR WORKS:

Bidder should furnish the following:

List of eligible similar nature of work successfully completed during the last seven years **(In Form “C”)**.

Performance report of works referred in form “C” (In form “D”) signed by officer not below the rank of Executive Engineer /Project Manager or equivalent.

10. ORGANISATION INFORMATION:

Bidder is required to submit information in respect of his organization **(in Form “E”)**.

11. LETTER OF TRANSMITTAL:

The bidder should submit the letter of transmittal attached with documents.

12. OPENING OF PRICE BID:

After evaluation of applications, a list of short-listed agencies will be prepared. Thereafter, the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of qualified bidders or their representatives. The bid shall remain valid for a period of 120 days after the date of opening of eligibility bid.

13. AWARD CRITERIA:

- i The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:
 - a. Amend the scope and value of contract to the bidder.
 - b. Reject any or all the applications without assigning any reason.
- ii. Any effort on the part of the bidder or his agent to exercise influence or to pressure the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

9. SECTION III: INFORMATION REGARDING ELIGIBILITY

LETTER OF TRANSMITTAL

To:

Dean (IPS),

1st floor Main building,

Indian Institute of Technology Bombay (IITB)

Powai, Mumbai – 400 076.

Sub: Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works at IIT Bombay.

Sir,

Having examined the details given in **Notice inviting tender and bid document** for the above work, I/We, hereby submit the relevant information.

1. I / We, hereby certify that all the statements made and information supplied in the enclosed form "A" to "F" accompanying statements are true and correct.
2. I / We, have furnished all information and details necessary for pre-qualification and have no further pertinent information to supply.
3. I / We, submit the requisite certified solvency certificate and authorize the Dean (IPS) to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/We, also authorize Dean (IPS) 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 and capability for having successfully completed the following eligible similar works: -

Name of Work:

Certificate from

Certificate:

It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I / we shall be liable to be debarred, disqualified/ cancellation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures:

Seal of Bidder

Date of Submission

SIGNATURE (S) OF BIDDER(S)

10.FORM 'A' TO 'F'

FORM "A": FINANCIAL INFORMATION

Financial Analysis – Details to be furnished duly supported by figures in balance sheet / Profit and Loss account for the last five years duly certified by the Chartered Accountant as submitted by the Bidder to the Income – Tax IITB (Copies to be attached).

Year	2017-18	2018-19	2019-20	2020-21	2021-22
Gross Annual Turnover on Construction works					
Profit/loss					

SIGNATURE(S) OF BIDDER(S)

Signature of Chartered Accountant with Seal

FORM “B”:

FORM OF BANKER’S CERTIFICATE FROM A SCHEDULED BANK (Not more than three months old)

This is to certify that to the best of our knowledge and information that M/S. /Sh. having marginally noted address, a customer of our bank are / is 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.

Address:

(Signature) For the Bank

NOTE

1. Banker’s certificates should be on letter head of the Bank addressed to tendering authority.
2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM “C”:

**DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED
DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST
DATE OF SUBMISSION OF TENDERS**

Sr. No.	Name of work/ project and Location	Owner or sponsoring organisation	Cost of work	Date of commencement as per contract	Stipulated date of completion as per contract	Actual date of completion	Litigation /Arbitration pending / in progress with details. *	Name and address/ telephones no. of officer to whom reference may be made	Remarks

**Indicate gross Amount Claimed and Amount Awarded by the Arbitrator.*

SIGNATURE (S) OF BIDDER (S)

FORM “D”:
PERFORMANCE REPORT OF WORKS REFERRED IN FORM ‘C’

1. Name of Work / Project and Location:
2. Agreement No.
3. Estimated Cost:
4. Cost of the project done:
 - i. Tendered Cost:
 - ii. Value of work done:
5. Date of start
6. Date of completion
 - i. Stipulated date of completion:
 - ii. Actual date of completion:
7. i. Whether case of levy of compensation for delay has been decided or not: Yes/ No
ii. 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)	Resource fullness	: Outstanding/ Very Good/ Good / Poor
(v)	General behaviour	: Outstanding/ Very Good/ Good/ Poor

Dated:

Executive Engineer or Equivalent

Note: If Name of Work is not clearly defining scope of work as specified in the definition of similar work, bidders are advised to upload copy of Agreement/ final bill or any other relevant document in support of their proposed completed work conforming to the definition of similar work.

FORM “E”:
STRUCTURE AND ORGANISATION

1. Name and address of the bidder:
2. Telephone No./Telex No./Fax No.
3. Legal status of the bidder (Attach copies of original document defining the legal status)
 - i. An individual
 - ii. A proprietary Firm
 - iii. A firm in Partnership
 - iv. A limited company or Corporation
4. Particulars of registration with various Government bodies (Attach Attested Photocopy)

Organisation/ Place of Registration	Registration no.
1.	
2.	
3.	
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 has been convicted by the court of Law? If so, give details.
8. In which field of Civil Engineering Construction and MEP Works the bidder has specialization and interest?
9. Any other information considered necessary, but not included above.

SIGNATURE(S) 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/ IITs/PSUs/Autonomous bodies during the last 7 years of its operations. Further that, if such information comes to the notice of the IITB then I/we shall be debarred for bidding in IITB in future forever. Also, if such information comes to the notice of IITB on any day before date of start of work, Dean (IPS) shall be free to cancel the agreement and to forfeit the entire amount of Performance Guarantee (Scanned copy of this notarized affidavit to be uploaded at the time of submission of bid)

NOTE: Affidavit to be furnished on a ‘Non-Judicial’ stamp paper worth Rs.100/-

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

Signature of Notary with seal

11. Not Applicable -Form of Earnest Money Deposit -Bank Guarantee Bond

WHEREAS, contractor..... (Name of contractor) (hereinafter called "the contractor") has submitted his tender dated..... (Date) for the construction of (name of work) (hereinafter called "the Tender")

KNOW ALL PEOPLE by these presents that we (name of bank) having our registered office at (hereinafter called "the Bank") are bound unto (Name and division of Executive Engineer) (hereinafter called "the Dean(IPS) ") in the sum of Rs. (Rs. in words.....) for which payment well and truly to be made to the said Engineer-in- Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this..... day of 20 THE CONDITIONS of this obligation are:

- (1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender(including extended validity of tender) specified in the Form of Tender;
- (2) If the contractor having been notified of the acceptance of his tender by the Dean(IPS) :
 - (a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required;

OR

- (b) Fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor,

We undertake to pay to the Dean(IPS) either up to the above amount or part thereof upon receipt of his first written demand, without the Dean(IPS) having to substantiate his demand, provided that in his demand the Dean(IPS) will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date*..... after the deadline for submission of

tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in- Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE

SIGNATURE OF THE BANK

SEAL

WITNESS

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 120 days from last date of receipt of tender including extension, if any.

PART-B

MAJOR COMPONENT
(CIVIL AND E&M)

12.PROFOMA OF SCHEDULES
(COMBINED FOR CIVIL AND E&M COMPONENTS)
SCHEDULE “A” to “F”

SCHEDULE “A”

Percentage bid is in Part D1

Schedule of Quantities is in Part D2

SCHEDULE “B”

Schedule of materials to be issued to the Contractor: NIL

SCHEDULE “C”

Tools and Plants to be hired to the Contractor: NIL

SCHEDULE “D”

Extra Schedule for specific requirements/ documents for the work, if any: NIL

SCHEDULE “E”

Reference to General Conditions of Contract:

As per General Conditions of Contract as given along with this document.

Name of Work:

Construction of Hostel No. 19 Building for 1052 students (G+9 upper Storey's) including Finishing works, Water Supply & Sanitary installations, Internal Electrical Installation & cable laying, Firefighting system, Automatic Fire Alarm & PA System, Lifts, Mechanical Ventilation and Development Works, at IIT Bombay.

Estimated Amount:

Rs.85,39,81,318.41/- (Civil Rs.73,86,43,489.22 /- + E&M Rs.11,53,37,829.19 /-)

Rs.100,76,97,956.00/- (With 18% GST)

Earnest Money:

Rs. 1,10,76,980.00/-

Performance Guarantee:

5% of tendered value of Civil & E&M Component

Security Deposit: 5% of tendered value of Civil & E&M Component

SCHEDULE “F”

Office inviting Tender: Dean (IPS)

Definitions:

2(v) Dean (IPS): Dean (IPS), IITB

2(viii) Accepting Authority: Deputy Director (FEA), IITB

2(x) Percentage on cost of materials and labour to cover all overheads and profits:

15%

2(xi) Standard Schedule of Rates: Delhi Schedule Rates (DSR) 2021, updated Dec 2021 for Civil Works

Delhi Schedule Rates (DSR) 2018 for E&M Works

2(xii) Institute: INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

9(ii) Standard Contract Form: Generally, as per CPWD -GCC 2020, CPWD Form 7

CLAUSE 1:

i. Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board or proof of applying thereof from the date of issue of letter of acceptance by IITB:

15 days

ii. Maximum allowable extension beyond the period provided in (i) above:

15 days with late fee @0.1% per day of the Performance Guarantee amount.

CLAUSE 2:

Authority for fixing compensation under Clause 2:

Deputy Director (FEA)

CLAUSE 2A:

Incentive for early completion: Not Applicable

CLAUSE 5:

Number of days from the date of issue of letter of acceptance for reckoning date of start of the work 15 days

Milestones as per the Table given below:			
Sl. No.	Description of Milestones (Physical)	Time allowed in months (from date of start)	Amount to be withheld in case of non-achievement of milestone (% of tendered amount)
1.	• Completion of excavation work	3 months	0.50%
2.	• Completion of work up to plinth level	6 months	1.00%
3.	• Completion of 1 st floor slab • Lift Order	8.5 months	0.50%
4.	• Completion of sample toilet at 1st floor • Completion of sample room at 1st floor	13 Months	0.50%
5.	• Completion of RCC work upto 5 th floor • Lift approval	12 months	0.50%
6.	• Completion of all RCC work including UGT &OHT • Completion of masonry, plaster & flooring work up to 6th floor • Completion of internal plumbing up to 3rd floor • Lift Delivery • Fire Fighting work upto 5 th floor	18 months	1.00%

7.	<ul style="list-style-type: none"> • Completion of masonry, plaster & flooring work • Completion of internal plumbing up to 8rd floor • Completion of Electrical works 	22 months	0.50%
8.	• Completion of all works (Civil & E&M)	24 months	0.50%

AUTHORITY TO DECIDE

Extension of time: Dean (IPS)

Rescheduling of Milestones: Dean (IPS)

Shifting of date of start in case of delay in handing over of site: Dean (IPS)

CLAUSE 6, 6A:

Clause applicable (6 or 6A) 6A (only computerised MB)

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 (As per discretion of E-I-C) Rs. 50 lakhs

Clause 10A

List of testing equipment to be provided by the Contractor at site lab.

- Cube testing machine (with Calibration)
- Silt testing Jar
- Sieve analysis – full set
- Proctor density apparatus
- Levelling instrument

- vi. Oven-1No.
- vii. Cube mould-30 Nos.
- viii. Balance – 7 to 10 kg-1No. and 500gm capacity -1No.
- ix. Vernier Calliper
- x. Measuring cylinder-2Nos.
- xi. Measuring tape 3-meter, 5-meter, 10-meter, 30 meter – 2 each
- xii. Earth Merger
- xiii. Hipot-Testing Kit
- xiv. Multi meter
- xv. Phase sequence Metre
- xvi. R-L-C Metre
- xvii. Earth Merger
- xviii. Clip-on-metre for different rangers

This list is only indicative and not exhaustive. The bidders shall be required to provide any such testing equipment as required as per CPWD specifications/ item nomenclature as and when required on site.

CLAUSE 10B (ii): (Mobilization advance)

Whether clause 10B (ii) shall be applicable: Yes

CLAUSE 10C:

Component of labour expressed as percent of value of work: Not applicable

CLAUSE 10CA:

Whether clause 10CA shall be applicable: Yes

Sr. No.	Materials covered under this clause.	Nearest material (other than cement*, reinforcement bars and structural steel) for which All India Wholesale Price Index is to be followed.	Base price and corresponding period of all the materials covered under clause 10 CA
			Base price (per MT)
1.	Cement (OPC)	Nil	Rs. 5391/-

2.	Reinforcement Bars TMT Fe 500D Primary Producer	Nil	Rs. 57300/-
3.	Structural Steel	Nil	Rs.61750/-
Note: Above base prices are inclusive of applicable GST.			

CLAUSE 10CC:

Clause 10CC to be applicable in contract with stipulated period of completion exceeding the period shown in next column: Applicable

Schedule of component of other materials, Labour, POL etc. for price escalation:

Component of other Materials (Except materials covered under clause 10CA): 40%

Component of labour expressed as percent of total value of work: 25%

Component of P.O.L. expressed as percent of total value of work: Nil

CLAUSE 11:

Specifications to be followed for execution of work: As per CPWD Specifications for Civil and MEP works with up-to-date correction slips (Hereinafter called CPWD specifications also).

CLAUSE 12:

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: Refer below

12.2 & 12.3	Deviation Limit beyond which clauses 12.2, 12.3 & 12.4 of GCC shall apply for E&M Works	30 % (Thirty percent)
12.5	i) Deviation Limit beyond which clauses 12.2, 12.3 & 12.4 of GCC shall apply for substructure up to plinth level ii) Deviation Limit beyond which clauses 12.2, 12.3 & 12.4 of GCC shall apply for super structure.	100 % (One Hundred percent) 30 % (Thirty percent)

CLAUSE 16:

Competent Authority for deciding reduced rates.

Dean (IPS)

CLAUSE 17

Defect liability period: 12 months (From the date of certificate or otherwise of completion of work, or till the final bill has been prepared and passed whichever is earlier)

CLAUSE 18

List of mandatory machinery, tools & plants to be deployed by the contractor at site:-

1. Tower Crane 1 no.
2. Truck 2 nos,
3. Shuttering and props – Quantity as required as per the approved programme.
4. Building hoist 3 nos.
5. Excavator 2 nos.
6. Vibrator 5 nos.
7. Vibration compactor 2 nos.
8. Dewatering pump 4 nos.
9. Cutting & Bending machine 2 Set
10. Total Station - 1 No.
11. Auto Level - 1 nos.
12. DG set – 1 No.

This list is indicative only and not exhaustive. The bidders shall be required to deploy any such T & P as required as per as per work requirement and contract conditions.

Clause 25

Constitution of Dispute Redressal Committee (DRC)

	For total claims
Chairperson	DD (FEA) IITB, Mumbai
Member	Dean (IPS) IITB, Mumbai
Member	One professor from Civil Engineering Dept nominated by Director IITB
Member	One professor from Electrical Engineering Dept nominated by Director IITB

Clause 36 (i)

Requirement of Technical Representative(s) and recovery Rate: -

Sl. No.	Minimum Qualification of Technical Representative	Discipline	Designation (Principal Technical / Technical Representative)	Minimum Experience	Number	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36 (i)	
						Figures (in Rs.)	Words
1	Project Manager with degree in Civil Engineering	Civil	Principle Technical Representative	15 Yrs	1 no.	1,00,000/-	(Rupees One Lakh only) per Month
2	Graduate Engineer	Civil/ Electrical	Senior Technical Representative	12 yrs	2 No.	55,000/-	(Rupees Fifty-five Thousand only) Per Month
3	Graduate Engineer Or Diploma Engineer	Civil	Technical Representative	2 Yrs 5 Yrs	1 Nos.	30,000/-	(Rupees Thirty Thousand only) Per Month
4	Graduate Engineer Or Diploma Engineer	Electrical	MEP	5 Yrs 10 Yrs	1 no.	30,000/-	(Rupees Thirty Thousand only) per month
5	Graduate Engineer	Civil	Project Planning/ Billing Engineer	6 yrs	1 No.	25,000/-	(Rupees Twenty five Thousand only) Per Month
6	Diploma Engineer	QA/ QC	Quality Engineer/ Inspector	2 yrs	1 No.	30,000/-	(Rupees Thirty Thousand only) per month
7	Degree in any discipline with Certificate in Safety	Safety	Safety Cum Labour Officer	NA	1 no.	25,000/-	(Rupees Twenty five Thousand only) per month

Assistant Engineers retired from Government services who are holding Diploma will be treated at par with Graduate Engineers. Diploma holder with minimum 10 year relevant experience with a reputed 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.

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of Bombay

13.ADDITIONAL CONDITIONS

1. GENERAL

- 1.1. The Contractors are advised to inspect and examine the site and its surroundings and satisfy themselves with the nature of site, the means of access to the site, constraints put by local regulations, if any, weather conditions at site, general ground / subsoil conditions etc. or any other circumstances which may affect or influence their tenders. The Contractor shall carry out survey of the work area at his own cost, setting out the layout and fixing of alignment of the building as per architectural and Structural drawings in consultation with the Dean (IPS). Any discrepancy between the architectural drawings and actual layout at site shall be brought to the notice of the Dean (IPS). It shall be responsibility of the Contractor to ensure correct setting out of alignment. Nothing extra shall be payable on this account. No claims, whatsoever, shall be entertained at a later date for any errors found, on plea that the information supplied by the IITB in the tender is insufficient or is at variance with the actual site conditions.
- 1.2. The Contractor shall, if required by him, before submission of the tender, inspect the drawings in the Office of the Dean (IPS). The IITB shall not bear any responsibility for the lack of knowledge and also the consequences, thereof to the Contractor. The information and data shown in the drawings and mentioned in the tender documents have been furnished, in good faith, for general information and guidance only. Dean (IPS), in no case, shall be held responsible for the accuracy thereof and/or interpretations or conclusions drawn there from by the Contractor and all consequences shall be borne by the Contractor. No claim, whatsoever, shall be entertained from the Contractor, if the data or information furnished in tender document is different or in-correct otherwise or actual working drawings are at variance with the drawings available for inspection or attached to the tender documents. It is presumed that the Contractor shall satisfy himself for all possible contingencies, incidental charges, wastages, bottlenecks etc. likely during execution of work and acts of coordination, which may be required between different agencies. Nothing extra shall be payable on this account.
- 1.3. Sub-soil investigation report of work site is available in the office of the Dean IPS). Interested bidders can go through the report if required for their guidance. However, the Bidder is advised to obtain requisite details directly as may be considered necessary by him before quoting rates in the tender. 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 available in the report shall be entertained under any circumstances. The ground water table is a variable condition and the information given in the report is only indicative and it may vary from time to time.
- 1.4. The nomenclature of the item given in the schedule of quantities gives in general the work content but is not exhaustive i.e., does not mention all the incidental works required to be carried out for complete execution of the item of work. The work shall be carried out, all in accordance with true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and/or described in the specifications, provided that the same can be reasonably

inferred. There may be several incidental works, which are not mentioned in the nomenclature of each item but will be necessary to complete the item in all respects. All these incidental works / costs which are not mentioned in item nomenclature but are necessary to complete the item shall be deemed to have been included in the rates quoted by the contractor for various items in the schedule of quantities. No adjustment of rates shall be made for any variation in quantum of incidental works due to variation / change in actual working drawings. Also, no adjustment of rates shall be made due to any change in incidental works or any other deviation in such element of work (which is incidental to the items of work and are necessary to complete such items in all respects) on account of the directions of Dean (IPS). Nothing extra shall be payable on this account.

- 1.5. The contractor(s) shall give to the local body, 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 and charges which may be leviable 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.
- 1.6. The Contractor(s) shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night. In case of any accident of labours/ contractual staff the entire responsibility will rest on the part of the contractor and any compensation under such circumstances, if becomes payable, shall be entirely borne by the contractor.
- 1.7. The work shall generally be carried out in accordance with the latest “CPWD Specifications” with up-to-date correction slips, additional/Particular Specifications, architectural/Structural drawings and as per instructions of Dean (IPS). Any additional item of the work, if taken up subsequently, shall also confirm to the CPWD/other relevant specifications as mentioned above.
- 1.8. 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 scale dimensions.
- 1.9. There be 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
 - iii. Special conditions
 - iv. Additional Conditions
 - v. CPWD Technical Specifications including correction slips issued up to the last date of uploading/submission of tender.
 - vi. General Conditions of Contract for CPWD works including correction slips issued up to the last date of uploading/submission of tender.

- vii. Indian Standards Specifications of B.I.S.
 - viii. Decision of Dean (IPS).
- 1.10. 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.
- 1.11. The works to be undertaken by the contractor shall inter-alia include the following:
- i. Preparation of detailed SHOP drawings and AS BUILT drawings wherever applicable.
 - ii. Obtaining of Statutory permission is in the scope of Architectural consultant appointed by IITB. The agency has to assist in providing AS-BUILT drawing etc.
 - iii. Pre-commissioning tests as per relevant standard specifications, code of practice, Acts and Rules wherever required.
 - iv. Warranty obligation for the equipment's and / or fittings/fixtures supplied by the contractor. Contractor shall provide all the shop drawings or layout drawings for all the co-ordinated services before starting any work or placing any order of any of the services etc. These shop drawings/layout drawings shall be got approved from Dean (IPS) / Architect before implementation and this shall be binding on the contractor. The contractor shall submit material submittals along with material sample for approval of Dean (IPS) / Architect prior to delivery of material at site.
- 1.12. The work shall be carried out in accordance with the approved architectural drawings, structural drawings, services drawings to be issued from time to time, by the Engineer-in-Charge. Before commencement of any item of work the contractor shall correlate all the relevant architectural and structural drawings, nomenclature of items and specifications etc. issued for the work and satisfy himself that the information available from there is complete and unambiguous. The figure and written dimension of the drawings shall be superseding the measurement by scale. The discrepancy, if any, shall be brought to the notice of the Dean (IPS) before execution of the work. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information and no claim whatsoever shall be entertained by the IITB on this account.
- 1.13. Unless otherwise provided in the Schedule of quantities vide Part-D2, the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building and nothing extra shall be payable to him on this account.
- 1.14. The Contractor(s) shall take instructions from the Dean (IPS) regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed. The stacking shall take place as per stacking plan however, if any change is required, the same shall be done with the approval of Dean (IPS).
- 1.15. The Contractor shall bear all incidental charges for cartage, storage and safe custody of materials, if any, issued by IITB as well as to those materials also arranged by the contractor.

- 1.16. Any cement slurry added over base surface (or) for continuation of concreting for better bond is deemed to have been built in the items and nothing extra shall be payable or extra cement considered in consumption on this account.
- 1.17. The contractor shall give performance test of the entire installation(s) as per the specifications in the presence of the Dean (IPS) or his authorized representative before the work is finally accepted and nothing extra what-so-ever shall be payable to the contractor for such test.

1.18. PREVENTION OF NUISANCE AND POLLUTION CONTROL

The contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupiers of adjacent properties and to the public in general and to prevent any damage to such properties from pollutants like smoke, dust, noise. The contractor shall use such methodology and equipment so as to cause minimum environmental pollution of any kind and minimum hindrance to road users and to occupants of the adjacent properties or other services running adjacent/near vicinity. The contractor shall make good at his cost and to the satisfaction of the Dean (IPS), 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. All waste or superfluous materials shall be carried away by the contractor, without any reservation, entirely to the satisfaction of the Dean (IPS).

1.19. SECURITY AND TRAFFIC ARRANGEMENTS

In the event of any restrictions being imposed by the Security agency, CPWD, 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.

- 1.20. No payment shall be made for any damage caused by 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.
- 1.21. 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.
- 1.22. All materials obtained from contractor shall be got checked by the representative of Engineer-in-Charge on receipt of the same at site before use.
- 1.23. The contractor shall be responsible for the watch and ward/guard of the buildings, safety of all fittings and fixtures including all equipment's, services provided by him against pilferage and breakage during the period of Installations and thereafter till the building is physically handed over to the IITB, the Client IITB. No extra payment shall be made on this account and no claim shall be admissible on this account.

- 1.24. 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 / MCGM 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. 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. The clause 30A of the General conditions of contract for CPWD works is not applicable to the tender. All statutory taxes, levies, charges (including 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 shall pay to such authority all the fees that is required to be paid for the execution of work. He shall protect and indemnify the IITB 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 IITB.
- 1.25. 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 the same at his own cost and nothing extra shall be paid.
- 1.26. The Contractor shall make all necessary arrangements for protecting from rains, fog or likewise extreme weather conditions, the work already executed and for carrying out further work, during monsoon including providing and fixing temporary shelters, protections etc. Nothing extra shall be payable on this account and also no claims for hindrance shall be entertained on this account.
- 1.27. 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 notwithstanding 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.
- 1.28. The contractor will take reasonable precautions to prevent his workman and employees from removing and damaging any flora (tree/plant/vegetation) from the project area.

1.29. Setting out

- i. The Contractor shall carry out survey of the work area, at his own cost, setting out the layout of buildings/ roads/ services in consultation with the Engineer -in-Charge & proceed further. Any discrepancy between 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., Nothing extra shall be payable on this account.

- ii. The Contractor shall establish, maintain and assume responsibility for grades, lines, levels and benchmarks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions etc. 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.
 - iii. If at any time, any error appears due to grades, lines, levels and benchmarks 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. Nothing extra shall be payable on this account.
 - iv. The Contractor shall protect and maintain temporary/ permanent benchmarks at the site of work throughout the execution of work. These benchmarks shall be got checked by the Dean (IPS) 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.
 - v. The approval by the Dean (IPS) , 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.
 - vi. 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 entire satisfaction of the Engineer - in-Charge.
 - vii. The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work (including marking of reference points, Centre lines of buildings), construction and maintenance of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, barricading, signage, labour safety, labour welfare and labour training measures, preparatory works, working during monsoon, working at all depths, height and location etc. and any other incidental works required to complete this work. Nothing extra shall be payable on this account.
- 1.30. A site laboratory with the minimum equipment's as specified in CPWD specifications/in this agreement shall be established, made functional and maintained within one month from the award of work as per clause 10A of schedule A to F without any extra cost to the IITB. In case of non-compliance / delay in compliance in this, a recovery @ Rs. 500/- per day will be imposed which will be recovered from the immediate next R/A Bill of the Contractor.

1.31. TOOLS AND PLANTS

The bidder should have own constructions equipment required for the proper and timely execution of the work. Nothing extra shall be paid on this account. No tools and plants

including any special T&P etc. shall be supplied by the IITB 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.

1.32. SCAFFOLDING

Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the Contractor. It shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. It shall be designed to take all incidental loads. 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.

- 1.33. 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 to 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 by contractor 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 workshop for this work, shall be exclusively used in the construction of this work and they shall not be shifted/ removed from site without the permission of the Engineer-in- Charge.
- 1.34. The Contractor shall maintain all the work in good condition till the completion of entire work. The Contractor shall be responsible for and shall make good, all damages and repairs, rendered necessary due to fire, rain, traffic, floods or any other causes. The Engineer-in-Charge shall not be responsible for any claims for injuries to person/workmen or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the Contractor or of any other of his representatives, in his employment during the execution of the work. The compensation, if any, shall be paid directly to the IITB/ authority / persons concerned, by the Contractor at his own cost.

1.35. ROYALTY

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 boulders, metals, all sizes stone aggregates, brick aggregates, coarse and fine sand, murum, earth, river sand, gravels and bajri 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.

1.36. PRESERVATION AND CONSERVATION MEASURES

- i. Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services, if any, encountered in the course of the execution of work shall be protected against the damage by the contractor at his own expense. In case the same are to be removed and diverted, expenditure incurred in doing so shall be payable to the contractor. The contractor shall work out the cost, get the same approved by Dean (IPS) before taking up actual execution. 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.
- ii. 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 work men 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.

1.37. RESPONSIBILITY

- i. He shall protect and indemnify IITB 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.
- ii. The Contractor shall assume all liability, financial or otherwise in connection with this contract and shall protect and indemnify the IITB from any and all damages and claims that may arise on any account. The Contractor shall indemnify the IITB 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 IITB in all respect from such actions, costs and expenses. Nothing extra shall be payable on this account.
- iii. The entire work up to the plinth level, as required for obtaining approval of the plinth from the local authority, shall be completed by the Contractor at the same time. Work above plinth shall be allowed to be carried out only after obtaining plinth approval from the local body. No delay shall be allowed on this ground and also no claim whatsoever on account of any delay in approval at plinth level by the local body shall be entertained from the Contractor. Nothing extra shall be payable on this account.
- iv. On completion of work, the contractor shall submit required sets of “as built” drawings to the Dean (IPS) furnishing requisite information for obtaining various service connections.

1.38. CO-OPERATION WITH OTHER CONTRACTORS/SPECIALIZED AGENCIES/ ASSOCIATE CONTRACTORS

- i. The Contractor shall take all precautions to abide by the environmental related restrictions imposed by any statutory body having jurisdiction in the area as well as prevent any pollution of streams, ravines, river bed and waterways. All waste or superfluous materials shall be transported by the Contractor, entirely to the satisfaction of the Engineer- in-Charge and disposed at designated places only. No claim what so ever on account of site constraints mentioned above or any other site constraints, lack of public transport, inadequate availability of skilled, semi-skilled or unskilled workers in the near vicinity, non-availability of construction machinery spare parts and any other constraints not specifically stated here, shall be entertained from the Contractor. Therefore, the Tenderers are advised to visit site and get first-hand information of site constraints. Accordingly, they should quote their tenders. Nothing extra shall be payable on this account.
- ii. 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 indemnify IITB against any claim(s) arising out of such disputes. The Contractor shall:
 - a) Allow use of scaffolding, toilets, sheds etc.
 - b) Properly co-ordinate their work with the work of other Contractors.
 - c) Provide control lines and benchmarks to his associate Contractors and the other Contractors.
 - d) Provide electricity and water at mutually agreed rates.
 - e) Provide hoist and crane facilities for lifting material at mutually agreed rates.
 - f) Co-ordinate with other Contractors for leaving inserts, making chases, alignment of services etc. at site.
 - g) Adjust work schedule and site activities in consultation with the Engineer-in-Charge and other Contractors to suit the overall schedule completion.
 - h) Resolve the disputes with other Contractors/ associate contractors amicably and the Dean (IPS) shall not be made intermediary or arbitrator.
- iii. The work should be planned in a systematic manner so as to ensure proper co-ordination of various disciplines viz. sanitary & water supply, drainage, rain water harvesting, electrical, firefighting & fire alarm system, information technology, communication & electronics and any other services.

1.39. SUPERVISION OF WORK

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 Mumbai 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 Dean (IPS) 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. Principle Technical representative of the Contractor having minimum experience in similar nature of work as mentioned in the clause 36 of the General Conditions of the Contract, shall always be available at the site during the actual execution of the work.

1.40. SPECIALIZED AGENCIES

- i. The contractor has to engage one of the approved agencies as mentioned in the list of specialized work. The main contractor shall not change the specialized agency. However, if the change is warranted, he may do so, with permission of Engineer-in-charge. Nothing extra shall be payable on this account.
- ii. It shall be the responsibility of main contractor to sort out any dispute / litigation with the Specialized Agencies without any time & cost overrun to IITB. 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. 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 whatsoever, of any kind, shall be entertained from the Contractor on account of delay attributable to the selection/rejection of the Specialized Agencies or any dispute amongst them.

1.41. QUALITY ASSURANCE & TESTING OF MATERIALS

- i. All material to be used in the work shall bear ISI certification mark unless otherwise the make is specified in the SOQ, list of approved makes and other conditions / specifications, appended with this tender document. In case ISI mark materials or the materials mentioned in the tender documents are not available, the material to be used shall conform to CPWD specifications applicable to this tender and / or national / international codes as approved by Dean (IPS). In such cases, the Engineer-in-charge shall satisfy himself about the quality of such materials and give his approval in writing. Only articles classified, as first quality by the manufacturers / suppliers shall be used in the work, unless otherwise specified. All materials not having ISI mark, if allowed to be used in the work by Dean (IPS), shall be tested as per relevant specifications, as approved by the Dean (IPS). In all cases of use of ISI marked materials, proper proof of procurement of materials from authentic manufacturers shall be provided by the Contractor to the entire satisfaction of Engineer in charge. The mass procurement of material should be done only after approval of IITB in writing.
- ii. The Contractor shall make available, on request from IITB, the copies of challan, cash memos, receipts and other certificates, if any, vouchers towards the quantity and quality of various materials procured for the work and the same shall be kept in record. The Contractor shall also provide information and necessary documentation on the name of the manufacturer, manufacturer's product identification, manufacturer's instructions, warning, date of manufacturing and test certificates (from manufacturers for the product

for each consignment delivered at site), shelf life, if any etc., for the IITB to ensure that the material have been procured from the approved source and is of the approved quality, as directed by the Dean (IPS) . Wherever specified, day-to-day account of receipt of such material shall be maintained at site of work and shall be regulated by the IITB.

- iii. Inspection of Electrical items at Manufacturers works by consultant and client's representative will have to be arranged by contractors if it is intended by Engineer in charge.
- iv. The contractor has to establish field laboratory at site including all necessary equipment for field tests as given in Schedule 'F'. All the relevant and applicable standards and specifications shall be made available by the contractor at his cost in the field laboratory. The contractor shall designate one of his technical representatives as Quality Assurance Engineer, who shall be responsible for carrying out all mandatory filed/ laboratory tests. The contractor shall also provide adequate supporting staff at his cost for carrying out field tests, packaging & forwarding of samples for outside laboratory tests and for maintaining test records. All the registers of tests carried out at site or in outside laboratories shall be maintained by the contractor. The test register shall be issued to the contractor by the Dean (IPS). All the entries in the test register will be made by the designated engineer of the contractor and same shall be regularly reviewed by the Dean (IPS) or his authorized representatives at site.
- v. The Contractor shall submit, immediately after the 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 Dean (IPS). All the materials to be used in the work 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 Dean (IPS).
- vi. 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 contractor regarding non availability of the specified brand and also subject to independent verification by the Dean (IPS). In exceptional cases, where such approval is required, the decision of Dean (IPS) 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 Dean (IPS).
- vii. All materials whether obtained from Govt. stores or otherwise shall be got checked by the Dean (IPS) or his authorized supervisory staff on receipt of the same at site before use.
- viii. 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.

- ix. 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.
- x. Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to byelaws and municipal body / corporation where CPWD Specifications are not available. The contractor should engage licensed plumbers for the work and get the materials (fixtures/fittings) tested by the Municipal Body/Corporation authorities wherever required at his own cost.
- xi. The testing charges shall be borne by the IITB unless otherwise specified in the particular specifications for the respective items of the contract agreement. However, the IITB shall bear the testing charges only when the samples satisfy the parameters specified and conform to the requirements of the relevant specifications. If the results show that the samples do not satisfy the relevant specified parameters and / or requirements of the relevant specifications, the testing charges shall be borne by the Contractor.

1.42. PROGRAM CHART:

- i. The Contractor shall prepare an integrated program chart within fifteen days of issue of award letter including civil as well as E & M activities for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfilment of the program within the stipulated period and submit the same for approval of the Dean(IPS) These shall be submitted by the contractor through electronic media besides forwarding hard copies of the same. The integrated program chart so submitted should not have any discrepancy with the physical milestones attached in the contract agreement. The program chart should include the following: -
- ii. Descriptive note explaining sequence of various activities.
- iii. Construction Program prepared on PRIMAVERA Software, which will indicate resources in financial terms, manpower and specialized equipment for every important stage.
- iv. Program for procurement of materials by the contractor.
- v. Program for arranging and deployment of manpower both skilled and unskilled so as to achieve targeted progress.
- vi. 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.
- vii. In case of noncompliance/delay in compliance in this, a penalty @ Rs. 500/- per day will be imposed which will be recovered from the immediate next R/A Bill of the

Contractor.

- viii. If at any time, it appears to the Dean (IPS) that the actual progress of work does not conform to the approved program referred above, the contractor shall produce a revised program showing the modifications to the approved program by additional inputs to ensure completion of the work within the stipulated time.
- ix. The submission for approval by the Dean (IPS) of such program or the furnishing of such particulars shall not relieve the contractor of any of his 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.
- x. Apart from the above integrated program chart, the contractor shall be required to submit fortnightly progress report of the work in a computerized form on 1st and 16th of every month. The progress report shall contain the following, apart from whatever else may be required as specified above:
- xi. Construction schedule of the various components of the work through a bar chart for the next two fortnights (or as may be specified), showing the micro- milestone/milestones, targeted tasks (including material and labour requirement) 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 fortnightly progress report.
- xii. Progress chart of the various components of the work that are planned and achieved, for the fortnight as well as cumulative up to the fortnight under reckoning, with reason for deviations, if any in a tabular format.
- xiii. Plant and machinery statement, indicating those deployed in the work
- xiv. In case of non-compliance / delay in compliance in submission of fortnightly, a penalty @ Rs. 1000/- per fortnightly report will be imposed which will be recovered from the immediate next R/A Bill of the Contractor.
- xv. IITB 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 & electric supply shall be made by the Contractor for 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.

1.43. CLEANLINESS OF SITE

- i. The Contractor shall not stack building material/malba/muck on the land or road of the institute or on the land owned by the others, as the case may be. So the muck, rubbish etc. shall be removed periodically as directed by the Dean (IPS), from the site of work to the approved dumping grounds as per the local bye laws and regulations of the concerned authorities and all necessary permissions in this regard from the local bodies

shall be obtained by the Contractor. Nothing extra shall be payable on this account. In case, the Contractor is found stacking the building material/malba as stated above, the Contractor shall be liable to pay the stacking charges/penalty as may be levied by the local body or any other authority and also to face penal action as per the rules, regulations and bye-laws of such body or authority. The Engineer –in-Charge shall be at liberty to recover, such sums due but not paid to the concerned authorities on the above accounts, from any sums due to the Contractor including amount of the Security Deposit and performance guarantee in respect of this contract agreement.

- ii. The contractor shall take instructions from the Dean (IPS) regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed.
- iii. The Contractor shall take all care to prevent any water- logging at site. The waste water, slush etc. shall not be allowed to be collected at site. For discharge into public drainage system, necessary permission shall be obtained from relevant 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.

1.44. INSPECTION OF WORK

Officers of IIT Bombay or authorised personnel of IITB 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.

- i. 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.
- ii. Entrance and area surrounding to be kept cleaned.
- iii. Display layout plan key plan, Building drawings including plans, elevations and sections.
- iv. Up to date displays of Bar chart, CPM and PERT etc.
- v. Keep details of quantities executed, balance quantities, deviations, possible Extra item, substituted Item etc.
- vi. Keep plastic / cloth mounted one sets of building drawings.
- vii. Set of Helmets and safety shoes for exclusive use for officers/dignitaries visiting at site.

1.45. FINAL TESTING OF THE INSTALLATION

The Contractor shall demonstrate trouble free functioning of all the Civil and E & M installations and services. The Dean (IPS) 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 Dean(IPS). Nothing extra shall be payable on this account.

1.46. DEFECT LIABILITY PERIOD (REFUND OF SECURITY DEPOSIT)

The clause 17 of the General Conditions of Contract CPWD works shall be applied. The defect liability / maintenance period shall start after the date of issue of completion certificate. Besides observing other formalities prescribed in the General Conditions of the Contract, for release of security deposit, the contractor shall have to produce a certificate stating that no defects are pending for rectification from the Dean (IPS), IIT Bombay or any other authorized person of the IIT Bombay.

1.47. DEALING WITH INCONSISTENT RATES

- i. The Contractors shall quote same rates for the identical items which may inadvertently appear in more than one place. If different rates are quoted by the tenderers for such identical items, the same shall be rationalized by considering the lowest quoted rate for such items, for evaluation and acceptance of tender.
- ii. Wherever any reference to any Indian Standards occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued thereto or revisions thereof, if any, up to the date of receipt of tenders.
- iii. Unless otherwise specified in the schedule of quantities, the rates for all items of work shall be considered, as inclusive of pumping out or bailing out water, if required throughout the construction period for which no extra payment shall be made. This shall also include water encountered from any sources such as rains, floods, sub soil water table being high and/or due to any other cause whatsoever.
- iv. The rates for all items of work, shall unless clearly specified otherwise, include cost of all operations and all inputs of labour, material, T & P, scaffolding, wastages, watch and ward, other inputs, all incidental charges, all taxes, cess, VAT, duties, levies etc. required for execution of the work.
- v. Unless otherwise provided in the Schedule of Quantities, the rates quoted by the Contractor for the various items shall be inclusive of carrying out the works at and / or up to all heights, lifts, leads and depths.
- vi. Unless otherwise specified in the Schedule of Quantities, the rates quoted by the Contractor for the various items shall be inclusive of carrying out the work in curvilinear portions of the building in plan and elevation as per the architectural drawings. Nothing extra shall be payable on this account.

1.48. INSURANCE POLICIES

- i. 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 Dean (IPS) proper Contractor All Risk Insurance Policy for an amount 1.25 times the contract amount for this work, with Dean (IPS) as the first beneficiary. The insurance shall be obtained in joint names of Dean (IPS) and the Contractor (who shall be second beneficiary). Also, he shall indemnify the IITB

from any liability during the execution of the work. Further, he shall obtain and submit to the Dean (IPS), a third party insurance policy for maximum Rs.10 lakh for each accident, with the Dean (IPS) as the first beneficiary. The insurance shall be obtained in joint names of Dean (IPS) and the Contractor (who shall be second beneficiary).

- ii. 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. Without prejudice to any of its obligations and responsibilities specified above, the Contractor shall within 10 days from the date of letter of acceptance of the tender and thereafter at the end of each quarter submit a report to the IITB giving details of the Insurance Policies along with Certificate of these insurance policies being valid, along with documentary evidences as required by the Dean(IPS). 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.

1.49. FACILITIES FOR THE IITB

The Contractor shall provide, construct and maintain at all times during execution and till completion of the work, a temporary site office with adequate electrical light fittings, A.C., fans, electric/ power points, switches etc at his cost for exclusive use of the Dean (IPS) and his authorized representatives. Area of such office shall be approximately 160 sqm and shall have required partitions, doors, windows, locking arrangement etc. with a conference hall for 20 persons with conference table, chairs etc. all as per direction of Dean (IPS). Adequate toilet facilities connected to a temporary septic tank /soak pit, drinking water with water purifier & cooler etc. shall also be provided in the site office. All the water and electricity charges for the site office shall be borne by the contractor. The contractor shall also provide services of an office boy at his cost in the site office for assisting the site representatives of the Dean (IPS) in day to day work. The contractor shall maintain the site office and its surroundings in a neat and clean condition for the entire duration of the construction. After completion of the work, site office shall be dismantled by the contractor and all the dismantled materials shall be taken away at his cost. The Contractor shall provide at his cost two latest desk top computers, broadband connection and laser printers along with the service of a computer operator at the disposal of Engineer-in- charge. The computer shall be provided with PRIMAVERA, MS office, AUTOCADD & appropriate OS. The computer operator shall be fully conversant with MS-word, Excel, Power-point, PRIMAVERA & AUTOCADD. Nothing extra shall be paid on this account.

- 1.50. The Contractor shall at all reasonable times provide access to the Dean (IPS) or his authorized representative to the workshops, factories or other places where materials are stored, for inspection and/or collection of samples. Nothing extra shall be payable on this account.

1.51. PREPARATION OF MOCKUPS AND SAMPLE UNITS

The contractor shall prepare & display mock-ups in actual position of each and every item

and obtain approval of Dean (IPS) before execution en masse. The mock up shall be preserved for the purpose of reference till completion of the item represented by the mock up. Similarly, the contractor shall prepare two sample toilet blocks comprising of all finishes and fittings included in the scope of this contract. Approval of Dean (IPS) shall be obtained before taking up finishing works en masse. The work executed in approved mock ups / sample units in actual position forming part of the main work shall be measured and paid to the contractor under the respective items of the contract. However, any mock-up/sample not approved shall not be measured and paid. Also, the contractor shall have to dismantle and remove the same from the site of work at his cost. However, those mock-up/ samples not prepared in actual position and not forming the part of main work shall not be paid.

1.52. Standard operating procedure for GRIHA during construction

It is envisaged to obtain minimum 3-star GRIHA rating from TERI for building to be constructed under this contract. The contractor shall strictly adhere to the following conditions as part of his contractual obligation. Rate quoted by the agency deemed to be inclusive of expenditure on this account and nothing extra shall be paid for these compliances.

1. Barricading of existing retained trees shall be provided with brick foundation single layer, bamboo/bar supports & covered with transparent green cloth. Nothing extra shall be paid on this account.
2. Sedimentation & erosion control system shall be provided by Construction of temporary sedimentation tank at the lowest level of site. (Dimensions- 2m X 2m X 0.6m) along with wire mesh filter at the outlet. Once the sediments in Water settle down, the water can be pumped into the city storm-water drains. Nothing extra shall be paid on this account.
3. TOP SOIL PROTECTION: Top soil to be tested by accredited laboratory of ICAR – Indian Council of Agricultural Research. Parameters to be checked in test are for primary plant nutrients {Organic Carbon (%), Alkaline KMnO₄ Nitrogen (%), Olsen Phosphorus (Kg/ha), Ammonia Acetate Potassium(mg/g)} and pH. Top soil up to 20cm in depth to be removed from the areas proposed for the buildings, roads, paved areas and external services. The top soil should be stockpiled to a height of 40cm and reapplied during plantation of the proposed vegetation. Nothing extra shall be paid on this account
4. Provide minimum level of sanitation/safety facilities for construction workers: The agency shall ensure compliance with the NBC (latest revision) safety norms for providing the necessary safety equipment and measures for construction workers. Provisions for drinking water, healthy and clean living conditions and sanitation facilities shall be provided for the workers. Nothing extra shall be paid on this account.
5. Barricading of complete site shall be done as per item in BOQ.
6. Spraying of water on loose soil at site shall be done by the agency at regular interval. Nothing extra shall be paid on this account.
7. Wheel washing facility for outgoing vehicles- Gravel bed where truck types will be washed before exit from site. Nothing extra shall be paid on this account.

8. Efficient water use during construction: Use waste jute bags to cover columns and beams during curing. Nothing extra shall be paid on this account.
9. Percolation test: A percolation test needs to be carried out to ascertain the recharging rate of water and to know the ground water table at site. Nothing extra shall be paid on this account.
10. Storage & segregation of - recyclable waste generated at site: A separate storage area (weather proof shed) to be maintained at site for the following materials:
Steel/Aluminium/Metals- Should be sent to recyclers
RMC- should be used for back filing
Concrete debris-should be used for back filing Blocks-should be used for back filing
Glass-Should be sent to recyclers Wood-Should be sent to recyclers
Cement bags/Plastics-Should be sent to recyclers
11. Water meters needs to be provided for the following:-
Municipal Inlet
Bore Well inlet
STP Outlets
Treated water Flushing
Treated water Landscaping
12. Firefighting system: It should be CFC free and Halon free.
13. Energy meter for the following :-
Main Source (from Electricity supply company)
Alternate source DG
Internal lighting
External lighting
Air Conditioning
Solar PV system
Any major loads, if any.
14. **Automatic controls for 100% of outdoor lightings** : Automatic switches (Timer) for 100% of outdoor lights.
15. Luminous efficacy of 100% of lamps used in outdoor lighting to meet the lamp luminous efficacy table shown.
16. Lighting levels in tabular format for all indoor spaces along vis-à-vis the lighting levels required by NBC 2005 (BIS 2005).
17. HVAC SYSTEM:

The efficiencies of the air conditioning system should be as under (mandatory):-

o Split ACs- IS 1391 – part 2(table 5.3)

Refrigeration system should be CFC free. (mandatory).

Insulation proposed in the building is CFC & HCFC free. (mandatory)

Fresh air calculations for all spaces (conditioned & non-conditioned areas) as per NBC Part 8 section-3 or as per ASHARE 62-4 ventilation std. (mandatory)

18. NO SMOKING:

No smoking signages to be installed in the project building at various places/common areas. Penalty clause to be included in the signages.

14.PARTICULAR SPECIFICATION FOR CIVIL COMPONENTS

1.1 Particular Specifications for Earthwork

1. Earthwork in excavation, in general, shall be carried out as per the CPWD Specifications.
2. The earthwork in excavation, wherever required, shall be carried out in slushy position. Rates for earthwork shall include cost of the element for working in or under water / liquid mud including pumping of water / liquid mud. Nothing extra shall be payable on this account. Therefore, the Contractor shall quote his rates after studying the site conditions.

1.2 Particular Specifications for De-watering

1. De-watering shall be carried out by suitable means with adequate stand-by arrangements of pumps etc. and it shall be ensured that its disposal is carried out as per the regulations of the local bodies. The agencies are, therefore, advised to inspect and acquaint themselves of the site and location of disposal point(s) of water / slush and satisfy themselves as regards method of pumping and disposal required to be adopted. Any default or failure on the part of the Contractor to acquaint himself with the aforesaid aspect of work shall not absolve him from his responsibility for the execution / performance of this contract. Also, all permissions in this regard, to be taken from local authorities, shall be obtained by the Contractor. Nothing extra shall be payable on these accounts.
2. In trenches where surface water is likely to get into cut / trench during monsoons, a ring bund of puddle clay or by any other means shall be formed outside, to the required height, and maintained by the Contractor. Also, suitable steps shall be taken by the Contractor to prevent back flow of pumped water into the trench. Nothing extra shall be payable on this account.
3. The cost of de watering or working under water and / or liquid mud for execution of all the items for the work is deemed to be included in quoted rates of the respective items and shall not be measured separately for payment. Nothing extra shall be payable for de watering in this work, irrespective of whether specified or not, in the item descriptions or in the specifications / conditions in this contract agreement.
4. This shall also include water encountered from any sources such as rains, floods, sub soil water table being high and/or due to any other cause whatsoever.

1.3 Particular Specifications for Block Work

1. **Pre-cast cement concrete solid block**
 - 1.1. The work shall be carried out as per the CPWD specifications.
2. **AAC block masonry**
 - 2.1. The work in general shall be carried out as per the CPWD specifications. The AAC blocks shall conform to Grade I of IS: 2185 (Part 3)–1984 and shall be procured from the approved manufactures only.
 - 2.2. The material received at site shall be fully cured and shall have attained the required strength before delivery to the site. The material shall be free of cracks.

- 2.3. The AAC blocks shall be supplied in the required sizes as approved by the Dean(IPS).
- 2.4. The samples of AAC blocks (each sample consisting of 6 specimen) shall be collected randomly from the lot procured and tested for various parameters specified below. One sample shall be tested for every 100 cum or part thereof. However, minimum one sample shall be tested from each lot received at site if the quantity procured in the lot is less than 100 cum. If required, Dean(IPS) or his authorized representative shall inspect the factory during production of the material for this work and also collect samples (of materials used for making AAC blocks) from the factory itself. The contractor shall consider this contingency also while placing the order with one of the approved manufacturer. Nothing extra shall be paid on this account.
- 2.5. AAC blocks shall be got tested for following parameters from any accredited laboratory approved by the Dean(IPS):
- 2.5.1. Compressive strength
 - 2.5.2. Oven Dry Density
 - 2.5.3. Thermal conductivity
 - 2.5.4. Drying shrinkage
 - 2.5.5. Dimensional Tolerances
- 2.6. The AAC blocks shall meet following parameters:
- 2.6.1. Compressive strength shall not be less than 4 N/sq. mm.
 - 2.6.2. Oven Dry Density shall not be more than 650 kg/cum.
 - 2.6.3. Thermal conductivity shall not be more than 0.24 W / m.k
 - 2.6.4. Drying shrinkage shall not be more than 0.05%
 - 2.6.5. Dimensional Tolerances in the size shall not be more than \pm 5mm for length and
 - 2.6.6. \pm 3mm for height and width.
- 2.7. AAC masonry work shall be executed as per the specifications and instructions of the Engineer- in-Charge.
- 2.8. The scope of work also includes chasing the AAC block masonry work for embedding pipes, laying conduits etc. and also making good the same by filling cement mortar 1:4 (1 cement : 4 coarse sand) for which nothing extra shall be payable. The chasing shall, however, be carried out using machine cutters in a workman like manner , so as not to disturb the joints in the masonry and without any cracks being developed in the AAC blocks and the masonry. Such defective work shall be replaced free of cost by the contractor.
- 2.9. Mode of measurement shall be same as of brick masonry work of CPWD Specifications.

1.4 Particular Specifications for Concrete and RCC Works

1. The work in general shall be carried out as per the CPWD specifications.
2. Before taking up the RCC (wall / box) work for external façade as mentioned in the structural drawings of the respective buildings, the contractor shall submit a method statement for carrying out shuttering and RCC work, for approval of Dean(IPS). The work for this portion shall be executed only after approval of method statement, after taking into consideration the observations of Dean(IPS), if any.
3. In case, expansion strip is required to be provided as per the structural requirement in any of the buildings, the contractor shall follow the scheme provided by Dean(IPS) including keeping the shuttering in position for extended period. Nothing extra shall be paid on this account.
4. Construction joints in RCC shall be provided only at places as per approved structural drawings. It shall not in any manner structurally or functionally affect the structure. If, any additional construction joint is required to be provided, it shall be done with approval of the Dean(IPS).
5. The Centering, shuttering, strutting etc., required for the construction joint in RCC shall be provided as per the CPWD Specifications.

1.7 Particular specifications for wood work, factory made doors and wooden fire resistant door (FRD) frames and shutters

1. General

- 1.1 The work in general shall be carried out as per the CPWD specifications.
- 1.2 The glue / wooden adhesive to be used for this sub-head shall be PVAc based adhesive, of approved make (Fevicol of Pidilite Industries Ltd. or Korlok of National).

2. Wood work

- 2.1. The work in general shall be carried out as per the CPWD specifications.
- 2.2. The wood shall be selected best quality second-class teak wood.
- 2.3. The work shall be carried out in accordance with the architectural drawings issued by the IITB. The architectural drawings shall at all times be properly correlated and architectural requirements have to be fully satisfied.
- 2.4. All the wood used for the manufacturing of the door shutters including the door frames, internal & external lipping, beading for fixing glazing etc. shall be seasoned as per the requirements of the CPWD Specifications.
- 2.5. All the screws used for woodwork shall be fully threaded, counter sunk stainless steel screws, grade 304 and they shall be suitably concealed or plugged.

3. Factory made doors

The work shall be carried out as per the CPWD specifications.

4. Decorative high pressure laminate

- 4.1. The work in general shall be carried out as per CPWD specifications.
- 4.2. The contractor shall procure and submit to the Dean(IPS), samples of laminate for approval. After approval of the samples, the contractor shall prepare a mock up for approval. The material shall be procured and the mass work taken up only after the approval of themock up by the Dean(IPS).
- 4.3. Each type of laminate shall be obtained from only one of the approved manufacturers as specified and in one lot. Adequate spare quantity shall be ordered to cover for any damaged sheet and for replacement by the Contractor till the completion of the work.
- 4.4. The Contractor shall ensure that the edges of the laminates do not come out or chip / peel off during cutting and fixing of the laminates. Defective work on this account shall not be accepted and shall be redone by the contractor at his own cost.

5. Wooden Fire Resistant Door (FRD) frames and shutters

- 5.1. The fire resistant flush doors along with the frames shall be procured as a set from one of the approved manufacturers and shall be as per the specifications, as per description of the item and the approval of the Dean(IPS). The door shutters shall be entirely symmetrical on both faces. The complete door assembly shall have the required stability and shall satisfy performance required for integrity & insulation as per BS 476: Part 20 & 22 applicable for 2 hours fire rating. Besides, it shall conform to all the requirements for Flush door shutters as per the relevant IS codes and CPWD Specifications.
- 5.2. The gap between the shutter and frame, between shutters in case of double leaf shutter should not be more than 2mm. Similar care shall be taken for making rebates for fixing hinges and other hard wares. The workmanship required is of superior class for achieving the desired results.
- 5.3. Graphite based Intumescent strip seal of required size as per manufacturer's specifications shall be provided and fixed in the grooves on the door shutters all around the periphery excepton the bottom to prevent penetration of smoke and fire. The shutters shall not be worked upon at site to prevent damage to the intumescent strip. In case of double leaf shutters, Intumescent strips, of required size as per manufacturer's specifications shall be fixed in the rebate portion of meeting styles of each leaf of the shutter.
- 5.4. All the FRD shutters shall be provided with 2nd class teak wood external lipping all around the shutter as per manufacturer's specifications. The grooves of required size and shape shall be made in the external wooden lipping for fixing intumescent seal. All the external visiblesurfaces of lipping will be finished with 3 coats of melamine polish.

- 5.5. The hinges to be used for fixing the door shutters shall be fire rated stainless steel ball bearing hinges of grade 304 fixed with stain steel screws of grade 304. While testing for fire resistance, the whole assembly shall be tested along with the door shutter, door frame, beadings, hinges, etc.
- 5.6. All the shutters shall be treated for anti-termite treatment, against woodborer, fungus, pests etc. Therefore, it shall be provided with the preservative treatment based on Boron & Fluoride and as per CPWD Specifications. Nothing extra shall be payable on this account.
- 5.7. The calcium silicate boards to be used for manufacturing fire rated door shutters shall be from one of the approved brands. It shall be non-combustible and shall conform to BS 476 part 4 and to class 1 of BS476 part 7 for surface spread of flame.
- 5.8. The contractor shall submit manufacturer's test certificate for specified fire rating for integrity and insulation criteria, required as per the item nomenclature and the specifications. The Contractor shall also co-ordinate and facilitate with the office of the Fire Officer for obtaining clearance for the FRD shutters along with frames including getting the required site visits conducted by such authorities with a view to obtain Fire NOC. The Contractor shall also be responsible for liaising work required, if any, in this regard. Statutory charges / fees etc. required to be paid to the concerned authorities in this connection shall only be paid by the IITB or shall be reimbursable to the Contractor on production of proof of actual payment by him.
- 5.9. Destructive Testing for fire resistance of the door shutter along with door frame shall be done in a laboratory approved by Dean(IPS) . The complete door assembly should be able to resist thermal stresses and should not fail on account of shrinkage, cracking or distortion or any other reason, during testing for the duration for which it is fire rated. The cost of sample of door shutter along with the frame (including cost of laminates, beadings, intumescent strips, hinges, screws etc. but excluding painting, polishing etc.), packaging, sealing and transportation of sample to the approved laboratory etc., shall be borne by the Contractor. At least one finished sample (door shutter fixed to the door frame with hinges etc.) for two- hour fire rating shall be tested.
- 5.10. The sample shall be randomly chosen by the Dean(IPS) , from the lot (of shutter along with frame) procured and brought to the site of work for fixing. If the shutter fails to satisfy the test requirements, the entire lot shall be rejected and replaced by the Contractor at his own cost. Nothing extra shall be payable on this account and no delay shall be accepted on this account.
- 5.11. Testing charges shall be borne by the IITB provided that the door assembly fulfils the requirements of relevant specifications. If the door assembly fails to fulfil the requirements, testing charges shall be borne by the Contractor.

- 5.12. Measurement - For the purpose of payment, the area shall be measured from outer frame to outer frame above the finished floor level excluding the portion embedded inside floors, wall cladding. The door frame shall not be measured separately for payment. No deduction shall be made for making vision panel, if any.

6. Metal Fire Resistant Door (FRD) frames and shutters

- 6.1. The fire resistant metal flush doors along with the frames shall be procured as a set from one of the approved manufacturers and shall be as per the specifications, as per description of the item and the approval of the Dean(IPS) . The metal door shutters shall be entirely symmetrical on both faces. The complete door assembly shall have the required stability and shall satisfy performance required for both stability & integrity as per BS 476: Part 20 & 22 and IS 3614 Part -2 applicable for 2 hours fire rating. Besides, it shall conform to all the requirements of fire rated flush door shutters as per the relevant IS codes and CPWD Specifications.
- 6.2. The gap between the shutter and frame, between shutters in case of double leaf shutter should not be more than 3mm. Similar care shall be taken for making rebates for fixing hinges and other hardware. The workmanship required is of superior class for achieving the desired results.
- 6.3. The hinges to be used for fixing the door shutters shall be fire rated stainless steel ball bearing hinges of grade 304 fixed with stainless steel screws. While testing for fire resistance, the whole assembly shall be tested along with the door shutter, door frame, beadings, hinges, vision panels etc.
- 6.4. Honey comb paper or fire metal ceramic wool of 96 kg/M³ should be used for manufacturing the metal fire doors. The wool or honey comb paper shall be snugly fit in the internal frame work of the door shutter.
- 6.5. The contractor shall submit through the proposed manufacturer prior test certificates for the specified 2 hours fire rating for stability and integrity criteria for both single leaf and double leaf doors required as per the item nomenclature and the specifications. The test certificates shall clearly show that doors have been tested with vision panels and approved hardware to establish the technical credentials of the proposed manufacturer. The Contractor shall also co- ordinate and facilitate with the office of the Fire Officer for obtaining clearance for the FRD shutters along with frames including getting the required site visits conducted by such authorities with a view to obtain Fire NOC. The Contractor shall also be responsible for liaising work required, if any, in this regard. Statutory charges / fees etc. required to be paid to the concerned authorities in this connection shall only be paid by the IITB or shall be reimbursable to the Contractor on production of proof of actual payment by him.
- 6.6. Destructive Testing for fire resistance of the door shutter along with door frame shall be done in a laboratory approved by Dean(IPS) . The complete door

assembly should be able to resist thermal stresses and should not fail on account of shrinkage, cracking or distortion or any other reason, during testing for the duration for which it is fire rated. The cost of sample of door shutter along with the frame (including cost of intumescent strips, hinges, screws etc. but excluding painting, polishing etc.), packaging, sealing and transportation of sample to the approved laboratory etc., shall be borne by the Contractor. At least one finished sample (door shutter fixed to the door frame with hinges etc.) for two-hour fire rating shall be tested.

- 6.7. The sample shall be randomly chosen by the Dean(IPS) , from the lot (of shutter along with frame ,vision panels and the proposed hardware) procured and brought to the site of work for fixing. If the shutter fails to satisfy the test requirements, the entire lot shall be rejected and replaced by the Contractor at his own cost. Nothing extra shall be payable on this account and no delay shall be accepted on this account.
- 6.8. Testing charges shall be borne by the IITB provided that the door assembly fulfils the requirements of relevant specifications. If the door assembly fails to fulfil the requirements, testing charges shall be borne by the Contractor.
- 6.9. Measurement - For the purpose of payment, the area shall be measured from outer frame to outer frame above the finished floor level excluding the portion embedded inside floors, wall cladding. The door frame shall not be measured separately for payment. No deduction shall be made for making vision panel, if any.
- 6.10. All door frames and shutters shall be finished with polyurethane aliphatic grade paint of approval colour. The door leaf and frame shall have passed minimum 250 hours of Salt Spray Test.

1.6 Particular specifications for door hardware and fittings

1. General

- 1.1 The work in general shall be carried out as per CPWD specifications.
- 1.2 The contractor shall procure and submit samples of various hardware's and fittings for approval, of the Dean(IPS) . The material shall be procured and the mass work shall be taken up only after the approval of the samples by the Dean(IPS) .
- 1.3 All the hardware and fittings shall be supplied with the required spindles, pivots, stud, connecting bolts, screws, grub screws, nuts, bolts, connecting pin / bolt (including stainless steel washers / shims, PVC washers, PVC buffers etc.) and of the material as per the manufacturer's specifications. Their cost is deemed to be included in the cost of the hardware and fittings to be supplied and these accessories shall not be measured separately for payment. If any of the

accessories get damaged during fixing of the hardware and fittings, additional numbers as required shall be supplied by the Contractor at his own cost.

- 1.4 The size for the hardware and fittings shall be as specified in the item description in the schedule of quantities and the particular specifications. Wherever the size is not mentioned in the item nomenclature and particular specifications, it shall be as per the manufacturer's specifications or as directed by the Dean(IPS) . The shape has been specified as per the model number mentioned in the manufacturer's product catalogue / information.
- 1.5 If the model number for an item is changed or modified or the item itself is changed /modified, during execution and / or during the defect liability period / guarantee period, the decision of the Dean(IPS) as to the equivalence of the item provided in the schedule of quantities shall be final and binding on the Contractor and no claim of any kind shall be entertained from the Contractor on this account. Nothing extra shall be payable on this account.
- 1.6 The Contractor shall be permitted to supply items superior than the item in the schedule of quantities, but only with specific written approval of the Dean(IPS) , provided they are aesthetically similar and nothing extra shall be payable on this account. That the product proposed to be supplied by the Contractor is superior than that provided in the schedule of quantities / product supplied, shall be the sole discretion of the Dean(IPS) and his decision shall be final and binding on the Contractor and no claim of any kind shall be entertained from the Contractor on this account.
- 1.7 The entire supply for each type of hardware and fittings shall be made, preferably, in one lot to keep variations in finishes to the minimum.
- 1.8 Three samples from each lot of each hardware shall be tested for conformity to the required grade. Samples shall be supplied by the agency free of cost. Testing charges shall be borne by the IITB provided that the hardware fulfils the requirements of its grade. If the hardware fails to fulfil the requirements, testing charges shall be borne by the Contractor.

2 Handles

- 2.1 All the Door handles shall be of the same type (model and finish) and make unless specifically permitted in writing by the Dean(IPS) .
- 2.2 The handles shall be of stainless steel grade as specified under item description.
- 2.3 The handles shall be supplied in required finish as directed by Dean(IPS) for which nothing extra shall be paid.

3 Mortise latch, mortise dead bolt, mortise latch cum lock, lock with keys, escutcheon

- 3.1 The mortise latch, mortise dead bolt, mortise latch cum lock, lock with keys and escutcheon shall be of approved same make.

- 3.2 The locks and accessories shall be supplied as per item description.
- 3.3 The strike plate and for end plate shall be brush finish stainless steel of grade SS 304. Nothing extra shall be payable for supplying stainless steel grade SS 316 instead of SS 304 specified.
- 3.4 The cylinder escutcheons (key hole covers) shall be of stainless steel grade SS 304. These shall be supplied along with the key cylinder lock and shall not be measured separately for payment. Nothing extra shall be payable for supplying stainless steel grade SS 316 instead of SS 304 specified.
- 3.5 The lock shall be supplied with a set of three keys.

4 Concealed / flush tower bolts

The concealed / flush tower bolts shall be made out of SS grade, size and shape as specified, as per the item description and as per the approved samples.

5 Door stopper

- 5.1 The fittings shall be made out of stainless steel of Grade as specified.
- 5.2 The required screws, bolts, spindles etc. of stainless steel grade SS 304 as per the manufacturer's specifications, shall be supplied along with the fittings and their cost is deemed to be included in the cost of the fitting itself.
- 5.3 The fittings shall be of size, shape and finish as specified in the item description in the schedule of quantities and as per the approved samples.

6 Floor spring : The floor spring of approved make shall conform to the following parameters:

S. No.	Attributes	Range
6.1	Mechanism	As per manufacturer's specifications
6.2	Maximum door width	≤1100 mm
6.3	Maximum door weight	Minimum 120 kg
6.4	Spring strength (EN)	1 - 4
6.5	back check	Mechanical
6.6	Closing speed	Two Independent Speed Adjustment Valves - (175□ – 15□) and (15□- 0□)
6.7	Hold open Function feature	At 90□
6.8	Internal components of floor	Stainless steel precision manufactured

	Spring	
6.9	Cover plate	Stainless steel SS grade 304, secured to the floor spring body using stainlesssteel screws of SS 304 grade.
6.10	Non handed	Should be suitable for single and double action doors

7 Surface door closer : The surface door closer of approved make shall conform to the following parameters:

7.1 Surface door closer -

S. No.	Attributes	Range
7.1.1	Mechanism	As per manufacturer's specifications
7.1.2	Maximum door width	1100 mm
7.1.3	Closing force as per EN	2 – 4
7.1.4	Non-handed	Feature needed
7.1.5	Two Independent Speed Adjustment for variable closing and latching speed	Two Independent Speed Adjustments, (180° – 15°) and speed (15° - 0°).

7.2 Surface door closer -

S. No.	Attributes	Range
7.2.1	Mechanism	As per manufacturer's specifications
7.2.2	Maximum door width	1100 mm
7.2.3	Closing force as per EN	3 – 4
7.2.4	Non-handed	Feature needed

7.2.5	Two Independent Speed Adjustment for variable closing and latching speed	Two Independent Speed Adjustments, (180° – 15°) and speed (15°- 0°).
7.2.6	Suitability for fire door	Feature needed

1.7 Particular Specifications for pressed galvanized steel door frame

The work in general shall be carried out as per the CPWD Specifications for pressed steel doorframe and relevant IS code.

1.8 Particular Specifications for hot dipping galvanizing work

1. work shall be carried out as per item nomenclature and relevant IS code.
2. Rates quoted by the bidder also includes cutting of required sections, transporting to factory, complete procedure for galvanization, transporting to site and installation.
3. Three random sample of each section shall be tested for required coating and samples shall be supplied free of cost by the agency. Testing shall be done as per relevant IS code in the lab approved by Dean(IPS) .

1.9 Particular Specifications for Stainless Steel Works

1. Stainless steel work

- 1.1. The work under this sub-head in general shall be carried out as per the CPWD Specifications.

2. Stainless steel cladding

- 2.1. The scope of the work includes preparation of the shop drawings (based on the architectural drawings), fabrication, supply, installation and protection of the stainless steel work till completion and handing over of the work.
- 2.2. Based on the samples approved by the Dean(IPS) , the contractor shall prepare mock up (one no.) at site of work, for approval of quality of workmanship. If the quality of the workmanship and the material is as per the required standards and approved by the Dean (IPS), the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.
- 2.3. One test (three specimens) for each lot shall be conducted for the stainless steel sheet in the approved laboratory. Therefore, the material shall preferably be procured in one lot from one manufacturer. If the test fails, the entire lot of material shall be rejected and shall be replaced by the Contractor at his own cost. The cost of the sample shall be borne by the Contractor.

- 2.4. The finished surface shall be free of any defects like dents, waviness, scratches, stains etc. and shall have uniform finish as directed by Dean(IPS) . Any defective work shall be rejected and redone by the contractor at his own cost. The finished surface shall therefore be protected using protective tape which shall be removed at the time of completion of the work. The surface shall then be suitably cleaned using non abrasive approved cleaner for the material. Nothing extra shall be payable on this account.

1.10 Particular Specifications for Flooring & Dado / Cladding

1 General (applicable for all kinds of flooring and dado / cladding works under this sub-head):

- 1.1 The work under this sub-head in general shall be carried out as per the CPWD Specifications, as per the architectural drawings and as per the direction of Dean(IPS).
- 1.2 The Dean(IPS) or his representative may, if required, visit the source of supply of the various stones to assess the quality as well as availability of the material in the required quantities. The IITB shall bear the cost of such visits of the officers of the IITB.
- 1.3 Based on the samples approved by the Dean(IPS) for various flooring and dado / cladding materials as specified hereinafter, the contractor shall prepare mock up(s) at site of work as specified under relevant flooring and dado / cladding items, for approval of quality of workmanship and material specified. If the quality of the workmanship and the material is as per the required standards and approved by the Engineer-in- Charge, the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor as directed by the Dean(IPS) and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.
- 1.4 The stones / tiles shall be transported to site well packed in boxes or otherwise. These shall be handled carefully to prevent any damage. The various types of stones and tiles, procured shall be free of any surface defect or any edge damage. The damaged stones and tiles shall not be allowed to be used in the work. So, the contractor shall procure additional quantity of the stone and tiles to cover such contingencies. However, nothing extra shall be payable on this account.
- 1.5 For the enclosures with circular or curved profile, only the actual area of the flooring shall be measured for payment and nothing extra shall be payable for labour, material, wastages and any other incidental charges.
- 1.6 For the skirting in the enclosures with curvilinear profiles, the tiles / stones shall be cut to the required size and the shape to match the profile and/ or the joints as per the architectural drawings. Similarly, the skirting shall be fixed

in a manner as to flush or project from the finished face of the wall as per the architectural drawings and as directed by the Engineer – in- Charge. Any chasing of the C.C masonry blocks required for such fixing is deemed to be included in the cost of masonry. Nothing extra shall be payable on this account.

- 1.7 For flooring work, the joints between the different types of flooring shall be located as per the architectural drawings and the measurement shall be done as per item description. Also, the Contractor shall maintain the uniform level of the finished flooring of the different types unless specifically mentioned on the architectural drawings. Nothing extra shall be payable on these accounts.
- 1.8 All the flooring works specified under this sub-head shall be adequately protected by a layer of plaster of paris which shall be laid over a 400 micron PVC film. The protective layer shall be maintained throughout the execution of works and removed just before handing over of the site for which nothing extra shall be payable.
- 1.9 At the time of handing over, flooring & dado / cladding shall be free of any scratches, stain etc. The flooring & dado / cladding shall be properly cleaned before handing over. However, abrasive cleaners shall not be used to clean the marks and other scratches.

2 Kota stone work

- 2.1 The Contractor shall procure and submit the samples of the kota stone for flooring as well as risers and treads in the staircase, for the approval of the Dean(IPS) prior to the execution of the item.
- 2.2 Mock up (one no.) shall be prepared for staircase (tread as well as riser).
- 2.3 All the Kota stones shall have uniform colour and shade. So, the entire quantity shall be obtained, preferably, in one lot from one location (in one quarry) to keep variation to the minimum. The Contractor shall also sort, segregate and use the stone slabs, according to colour, shade, etc. at any one location to keep variation in the colour, shade etc. in stones used to the minimum. Any stone slab with a variation, not acceptable to the Engineer-in- Charge, shall not be used in the work and shall be removed and replaced by the Contractor at his own cost. Nothing extra shall be payable on these accounts. Also, no claim of any kind shall be entertained from the Contractor on this account.
- 2.4 The exposed cut edges of the Kota Stone slab in risers and treads along its width (sides of the risers and treads of the steps i.e. along the shorter dimensions of the kota stone slab for the risers and treads) shall be polished in a workmanlike manner. The top exposed edge of the kota stone skirting shall also be polished in a workmanlike manner. Nothing extra shall be payable on this account.
- 2.5 Nosing / edge moulding shall be provided to the front edge of the Kota stone slab treads along its length i.e. along the longer dimensions of the kota stone

slab, as per the architectural drawings. The payment of the same shall be made separately under relevant item.

3 Granite stone work

- 3.1 The Contractor shall procure and submit the samples of different types of granite stones, for the approval of the Dean(IPS) prior to the execution of the item.
- 3.2 The mock up (one each) shall be prepared in staircase, amphitheatre, stilt of academic block, dining area, etc.
- 3.3 The entire supply for each type of granite stone slab shall be procured from one location (in one quarry), and supplied preferably, in one lot to keep variations to the minimum. The Contractor shall also segregate and sort the slabs according to colour, shade, texture and size of grains etc. to keep variation(s) in stones used at any one location to the minimum. Any slab with variation in the colour, shade, texture and size of grains etc., not acceptable to the Dean(IPS) , shall not be used in the work and shall be removed and replaced by the Contractor. Nothing extra shall be payable on these accounts. Also no claim of any kind shall be entertained from the Contractor on this account.
- 3.4 Granite stone slabs shall be pre polished (mirror polished) or given any other surface treatment as specified in the item nomenclature, as per the Architectural drawings and as directed by the Dean(IPS) .
- 3.5 Machine polishing and cutting to required size shall be done with water (as lubricant) only. Sawing shall also be done preferably with water as lubricant but as a special case, the Dean(IPS) may permit, at his discretion, oil or kerosene as lubricant subject to all kerosene or oil in the body and surface of tiles / slabs being thoroughly dried in ovens. Tiles / slabs with stains or patches due to the use of oil or otherwise, either before or after installation, shall be rejected and shall be replaced by the Contractor at his own cost. Nothing extra shall be payable on this account.
- 3.6 The stone work may be required to be carried out in patterns, design and / or in combination with granite stones of different colour and shade with or without borders and in combination of different stone slabs / tiles for which nothing extra shall be payable. The stones shall be provided in sizes and shapes as per the architectural drawings and wastages and incidental costs, if any, shall be deemed to be covered in the cost of the relevant items. Nothing extra shall be payable on this account.
- 3.7 For the flooring portions curved in plan, the stone slabs (at the edge) shall be cut to the required profile and shape as per the architectural drawings. Nothing extra shall be payable on this account and any consequent wastages and incidental charges on such accounts shall be deemed to be included in the cost

of such items. For the purpose of payment, the actual area of granite stone shall be measured separately as specified under the relevant items.

- 3.8 The granite slabs used for providing and fixing in the sills, soffits and jambs of doors, windows, ventilators and similar locations shall be in single piece unless otherwise directed by the Dean(IPS) . Wherever stone slab other than in single piece is allowed to be fixed, the joints shall be provided as per the architectural drawings and as per the directions of the Dean(IPS) . In the cabin areas, the joints in sills shall preferably be provided in linewith the partition wall. Depending on the number of joints, as far as possible, the stone slabs shall be procured and fixed in slabs of equal lengths as per the architectural drawings and as directed by Dean(IPS) .
- 3.9 The specifications for dressing, laying, curing, finishing, measurements, rate etc. for the granitestone flooring shall be same as that of works for the Marble flooring, skirting and risers ofsteps under Flooring Sub Head of the CPWD Specifications. The wall lining / veneer work with granite stone shall be as per the CPWD Specifications for Marble work Sub Head.

4 Vitrified and ceramic tiles work

- 4.1 The contractor shall procure and submit the samples of approved make, shade and thicknessof different types of vitrified and ceramic tiles, for the approval of the Dean(IPS) prior to the execution of the item.
- 4.2 The mock up (one each) shall be prepared for flooring and dado, for vitrified tiles etc.
- 4.3 The entire supply for each type of tiles shall be procured from one manufacturer / authorized dealer, preferably, in one lot to keep variations to the minimum.
- 4.4 The tiling work may be required to be carried out in patterns, design and / or in combination with tiles of different colour and shade and in combination of different stone slabs / tiles for which nothing extra shall be payable. The tiles shall be provided as per the architectural drawings and wastages and incidental costs, if any, shall be deemed to be covered in the cost of the relevant items. Nothing extra shall be payable on this account.
- 4.5 For the flooring portions curved in plan, the tiles (at the edge) shall be cut to the required profile and shape as per the architectural drawings. Nothing extra shall be payable on this account and any consequent wastages and incidental charges on such accounts shall be deemed to be included in the cost of such items.
- 4.6 The Contractor shall obtain and submit to the IITB the manufacturer's test certificate for compliance of various parameters for the material as per the manufacturer's specifications, with each lot of material received at site.
- 4.7 The flooring and dado / cladding should be set out such that the perimeter/ corner tiles are in excess of half a tile so that the edge panels on both the sides

are of equal sizes, as far as possible. The tiles shall be cut to required size and shape in a workman like manner but with all precautions, as per the manufacturer's specifications.

- 4.8 For dado / cladding / skirting work, the tiles shall be chamfered at the meeting edges on the corners in a manner that butt edges are not visible. It shall be ensured that the edges shall be ground / filed to chamfer the edges so that the glazing layer at the edges of the tiles is not chipped off otherwise the work shall be rejected and redone by the Contractor at his own cost.

5 PVC sports flooring

- 5.1 The Contractor shall procure and submit the samples of approved make, shade and thickness of PVC sports flooring material along with accessories and adhesives proposed to be used as per the manufacturer's recommendations, for the approval of the Dean(IPS) prior to execution of the item.
- 5.2 Once the material is approved, the entire material for PVC sports flooring shall be procured from one of the approved manufacturer / authorized dealer preferably, in one lot to keep variations to the minimum. The contractor shall also procure various accessories and adhesive required for satisfactory installation of PVC sports flooring.
- 5.3 The work shall be carried out as per the architectural drawings, as per site conditions and as per the directions of the Engineer-in- Charge. The work shall be carried out in design and pattern including in combination with PVC sheets / tiles of different colours and shade in linearas well as curvilinear portions of the building, as per the architectural drawings. The joints shall be kept as minimum as possible.
- 5.4 The work shall be carried out as per the manufacturer's specifications. The work shall be got executed through an experienced agency executing similar works.
- 5.5 Before fixing the PVC sports flooring, it shall be ensured that the sub floor on which the PVC sports flooring is being laid is smooth, flat, hard & free from moisture, grease, etc. In case of uneven sub floor, the same shall be levelled by self-levelling compound at no extra cost to the IITB. The PVC sports flooring shall have perfect level after laying and no undulations from the sub-base shall be visible (reflected) on the surface. Also, there shall not be any air bubbles or delamination of the flooring, otherwise the work shall be rejected and redone by the Contractor at his own cost.
- 5.6 Care shall also be taken to ensure that sub floor is dry at the time of installation.
- 5.7 The composite thickness of the PVC flooring sheet shall be as per item description.

- 5.8 All the joints shall be sealed by hot welding as recommended by the manufacturer to make the floor seamless and safe.
- 5.9 The Contractor shall obtain and submit to the IITB the manufacturer's test certificate for compliance of various parameters for the material as per relevant EN standards, with each lot of material received at site.
- 5.10 For the purpose of measurement, the actual area of PVC sports flooring including skirting provided and fixed in position shall be considered.

6 Crazy ceramic (china mosaic) tile flooring

- 6.1 The materials to be used shall be broken glazed ceramic tile pieces. These shall be obtained from broken glazed tiles of uniform thickness and of approved shade and manufacture and conforming to I.S. 13753. The tile pieces shall be hard, sound, dense and glossy in texture. These shall be of required colour and shade and free from stains, cracks, decay and weathering.
- 6.2 The work shall be carried out as per the architectural drawings in design (geometric, abstract etc.) and in linear and / or curvilinear pattern and in combination with tile pieces of different colour and shade.
- 6.3 Before laying tile flooring on RCC slabs / PCC base, the laitance shall be removed and the surface shall be roughened. A coat of cement slurry @ 2.2 kg of cement per sqm shall be applied over the base surface for bonding between RCC slab / PCC and mortar bedding of tile flooring. Nothing extra shall be payable on this account.
- 6.4 Pieces of ceramic glazed shall be brought to required size & shape to achieve the required design/ pattern. The shade of the tiles shall also be selected depending upon the pattern/ design. Tiles shall be thoroughly cleaned and soaked in water before fixing. Cement grout of desired consistency admixed with approved water-proofing compound and synthetic polyester fibre shall be spread over the mortar bedding when the mortar is still plastic. Pieces of glazed tile shall be pressed piece by piece in the required pattern in the cement float. The fixing shall be done by keeping the joints between the pieces as thin as possible but not exceeding 5mm. The work shall be carried out to correct level and slopes and compacted by striking the surface with hand thappies and straight screed tamper. The grout shall cream up to the surface. The junctions of the flooring and the parapet wall shall be rounded and the flooring shall be extended up to the wall for 15cm or as specified. After the flooring has been laid or the day's fixing work is completed, surplus cement grout that may have come out of the joints on compacting shall be cleaned off. The flooring laid shall be kept moist and allowed to mature undisturbed for 10 days to allow the bedding and flooring to set properly.
- 6.5 Once the floor has set, it shall be carefully washed clean and dried. When dry, the floor shall be covered with oil free dry saw dust which shall be removed only after the construction work is completed.

- 6.6 The Contractor shall ensure that the China Mosaic work provides waterproofing treatment and shall not allow penetration of water. The guarantee for the water proofing work at the terrace shall also include restoration of the China Mosaic work after rectification, if any to the integral cement based waterproofing treatment to the terrace. Nothing extra shall be payable on this account.
- 6.7 For the purpose of payment, actual area of the China Mosaic tile work shall be measured in sqm correct to two decimal places. No deduction shall be made for joint width between the adjacent tile pieces.

1.11 Particular Specifications – Roofing (False ceiling)

1 General (applicable for all kinds of roofing works under this sub-head):

- 1.1 The work in general shall be carried out as per the CPWD specifications, as per the manufacturer's specifications, as per architectural drawings and as per directions of Engineer- in-Charge.
- 1.2 Various false ceiling shall be done in different levels in linear and curvilinear pattern in plan and elevation and in combination with other types of false ceiling as specified in schedule of quantities, as per the architectural drawings. However, payment shall be made under respective items.
- 1.3 The tiles and the suspension system shall be as specified in the item nomenclature. The contractor shall procure and submit the samples of tiles and grid system of approved make, for the approval of the Dean(IPS) prior to execution of the item.
- 1.4 The Contractor shall prepare the mock-up at site for approval of material and quality of workmanship by the Dean(IPS) . Only after the approval of Mock-up, the Contractor shall start the mass work. If the quality of the workmanship and the material is as per the required standards and approved by the Engineer-in- Charge, the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor as directed by the Dean(IPS) and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.
- 1.5 Once the material and mock up are approved, the entire material (tiles as well as grid system) shall be procured from the approved manufacturer or its authorized dealer.
- 1.6 The installation shall be got done through an experienced installer, executing similar works.
- 1.7 The material shall be transported to site well packed. The ceiling material procured shall be free of any surface defect, edge damage and any other such defects. The contractor shall ensure careful handling and storage and prevent any rough handling, rolling of cartons or dropping cartons to prevent any edge damage or breakage. The defective / damaged material shall not be allowed to be used in the work. So, the contractor shall procure additional quantity of

material to cover such contingencies. However, nothing extra shall be payable on this account.

- 1.8 Adequate care shall be taken before installation as well as afterwards till completion of the work. It shall be protected from rains, excessive humidity, chemical fumes, vibrations, dust etc. Any tile with edge damaged or crack etc. shall not be allowed to be used in the work and shall be replaced by the contractor at his own cost. Similarly, adequate care shall be taken by the contractor while placing or removing and handling the tiles so as not to cause any damage. The ceiling shall be cleaned as per manufacturer's specifications. Abrasive cleaners shall not be used to clean the marks.
- 1.9 The Contractor shall obtain and submit to the IITB the manufacturer's test certificate /report for compliance of the material to the relevant standards along with each lot of material supplied for the work.
- 1.10 The suspension system for various types of false ceiling shall be as per manufacturer's specifications. The false ceiling tiles shall be fixed on to coordinated suspension ceiling system with supporting grids system that fully integrates with the ceiling tiles as per manufacturer's specifications. It shall be ensured that the suspension system shall be suitable to take all designed dead, imposed and all incidental loads efficiently and shall not sag. The true line and levels for false ceiling work shall be maintained.
- 1.11 The luminaries, air grills / diffusers, signages etc. shall be as far as possible independently supported to avoid any over loading of the ceiling system which may result in excessive deflection or twisting of grids. Any strengthening of grid system by providing additional hangers, fasteners, runners, cross tees etc. or providing additional bracing may be carried out as required for any specific locations or for specific purpose for which nothing extra shall be payable.
- 1.12 The rate for the item of various false ceiling system shall include cost of all inputs of labour, materials, wastage if any, T&P, scaffolding, staging or any other temporary enabling structure /services etc. and all other incidental charges including making necessary cut outs for A.C diffusers, Light fittings, grills, Fire detection, alarm, sprinklers devices and fittings etc. No deduction in the area shall be made for openings nor anything extra shall be payable for making the openings. Also nothing extra shall be payable on account of any wastage in materials. Also nothing extra shall be payable on account of any strengthening of the supporting suspension system for the false ceiling, around the openings in the false ceiling by using additional hangers, fasteners, runners, cross tees, cross channels, etc. However, for the purpose of payment only the actual area of the false ceiling shall be measured in sqm.

2 Gypsum board false ceiling

The work in general shall be carried out as per CPWD specifications, as per the manufacturer's specifications, as per architectural drawings and as per directions of Dean(IPS) .

1.12 Particular Specifications – Finishing

1. General (applicable for all items under this sub-head)

- 1.1. The work shall in general be carried out as per the CPWD specifications and the manufacturer's specifications (where CPWD specifications are not available).
- 1.2. The theoretical consumptions of the various materials like plaster, primer, paint, etc. shall be as per the CPWD specifications and the various coefficients specified herein. Wherever coefficients are not mentioned in CPWD specifications, the same shall be as specified under relevant items. Nothing extra shall be payable on account of actual consumption exceeding the theoretical consumption. However, in exceptional cases, if the actual consumption is lesser than the theoretical consumption, cost adjustment shall be made for lesser consumption of material at the prevailing market rate.

2. Ready Mixed Cement Plaster

- 2.1 The quantity of plaster required as per the theoretical consumption including wastages, if any, shall be procured from one of the approved manufacturer or his authorized dealers.
- 2.2 The plaster shall be obtained in packing (40 Kg or 50 Kg, as per manufacturer) as far as possible.
- 2.3 The name of the manufacturer, manufacturer's product identification, manufacturer's mixing instructions, warnings and instructions for handling and application, date of manufacturing and shelf life shall be clearly and legibly mentioned on the labels of each bag. These details shall be kept in record. The material shall be consumed in the order of material brought to site, first come first consume basis. The Contractor shall obtain and submit to the IITB the manufacturer's test certificate for compliance of various parameters for the material as per the manufacturer's specifications, with each lot of material received at site.
- 2.4 The method of storage of material shall be same as applicable for cement specifications. The material older than 6 months from the date of manufacturing shall not be allowed to be used in the work.
- 2.5 **Surface preparation** - The base surface shall be cured properly prior to the application of plaster. It shall be cleaned thoroughly, with no loose particles or dust. The surface shall be structurally sound, clean and free from dirt, oil, grease, efflorescence or any other contaminant that could impair the natural bond. Surface defects such as cracks, holes or voids shall be repaired prior to application. The base surface shall also be in-line & levelled before the application of plaster
- 2.6 **Pre-wetting of the substrate** - The surface shall be wet properly before application of plaster.
- 2.7 **Mixing:**

- 2.7.1 Plaster shall be thoroughly mixed with water before use in a mechanical stirrer for uniform and through mixing to ensure proper workability.
- 2.7.2 Mixing ratio of clean potable water to the weight of the powder shall be as per manufacturers specifications, depending upon the thickness of the plaster to be applied.
- 2.7.3 The entire plaster proposed to be used in specific work shall be mixed thoroughly and uniformly with water. No plaster shall be left unmixed in the container.
- 2.7.4 In exceptional cases, manual mixing shall be allowed with prior approval of Engineer –in- Charge. However, it shall be ensured that the plaster is mixed uniformly during manual mixing.
- 2.7.5 All arrangements for measuring, dosing etc. at site shall be made by the Contractor.
- 2.8 **Application:**
 - 2.8.1 Plaster shall be applied on the surface manually with a trowel.
 - 2.8.2 The first coat of mixed plaster will be applied on the moistened wall surface uniformly, going upward from the bottom.
 - 2.8.3 The thickness of the coating to be applied shall be as per the manufacturer's specifications.
 - 2.8.4 The first coat of the plastered surface shall be allowed to dry as per manufacturer's specifications before applying second coat. The surface after second coat shall be allowed to dry completely and same process shall be followed for subsequent coats.
 - 2.8.5 The curing shall be done as per manufacturer's specifications.
 - 2.8.6 The entire quantity of plaster shall be used within 2 to 3 hours or as per manufacturer's specifications, after mixing with water. No extra water shall be added in the mixture made.
 - 2.8.7 For application in exterior surfaces, necessary measures like covering the surface with net and water curing as per manufacturer's specification shall be undertaken.
- 2.9 **Coverage:**
 - 2.9.1 The coverage for 12 mm thick plaster shall be 23 Kg per sqm. (approx.).
 - 2.9.2 The coverage for 18 mm thick plaster shall be 35 Kg per sqm. (approx.).
 - 2.9.3 The contractor shall maintain proper records for receipt and consumption of the plaster for verification of Engineer-in – Charge.
- 2.10 **Measurement** - The mode of measurement shall be as per cement plaster items of respective thicknesses as per CPWD specifications 2009.

3. Acrylic texture plaster

- 3.1. The Contractor shall procure and submit the samples of approved make and shade along with catalogue, for the approval of the Dean(IPS) prior to execution of the item.
- 3.2. Based on the samples approved by the Dean(IPS) , the contractor shall prepare the mock-up at site for approval of material and quality of workmanship by the Engineer-in- Charge. Only after the approval of mock-up, the contractor shall start the mass work. **The mock-up shall not form part of the work.** The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.
- 3.3. Once the material and mock up are approved, the entire quantity of various materials shall be procured from the approved manufacturer or its authorized dealer, preferably, in one lot to keep variations to the minimum.
- 3.4. The work shall be carried out as per the manufacturer's specifications.
- 3.5. The contractor shall obtain and submit to the IITB the manufacturer's test certificate / report for compliance of the material to the relevant standards along with each lot of material supplied for the work.
- 3.6. The material shall consist of two parts: Scratch-plaster and Terra-coat.
- 3.7. Scratch-plaster - It shall have two components which comes in liquid & powder form. These shall be mixed at site before application in the ratio 25kg. Powder in 1.0 litre of liquid. Powder shall be made-up of Acrylic powder polymer , inert filler material in powder form, finally graded silica (450 micron to 1.00mm graded) particles, Anti-fungal agents, Emulsifying agent (Extender) to prevent lumping of powder during mixing, Titanium di-oxide pigments formaking it water-proof from exterior while allowing trapped water vapour breathability &Thixotropic agent for maintaining consistency of mix. & to prevent flowing of mix during application. The surface to be covered shall be pre-cured & shall be applied with surface stabilization primer before application of Scratch-plaster.
- 3.8. Terra-coat - It shall be made-up of Acrylic Co-polymer emulsion, crushed & precisely graded silica particles (500 micron & down size), high quality rutile (Purest form) grade Titanium di- oxide, fungicide, plasticizers & anti-corrosive agent This shall be applied over scratch-plaster into two or more coats to get approved shade & pattern

4. Melamine polish

- 4.1. The wood/veneer surface before polishing shall be well sanded to obtain smooth and even surface. A coat of appropriate wood sealer of the same manufacturer approved for melamine polish shall be applied over the surface before polishing. The surface shall be sand papered again to remove the excess filler material to obtain smooth even surface. Melamine polish of approved brand and manufacture in matt or glossy finish stained to required shade shall be machine sprayed in required coats over the prepared surface. Final polished surface shall be even, smooth and free from waviness. The natural grains of the wood /veneers shall be clearly visible from the final

polished surface. Consumption of the melamine polish shall not be less than 0.25 lits/sqm.

- 4.2. The material for melamine polish shall be of the approved make as specified.

1.13 Particular Specifications – Road work

1 General (applicable for all items under this sub-head)

- 1.1 The work under this sub-head in general shall be carried out as per the CPWD specifications, as per architectural drawings and as per directions of Dean(IPS)

2 Tiles and paver block

- 2.1 The work under this sub-head in general shall be carried out as per the CPWD specifications, as per the manufacturer's specifications, as per architectural drawings and as per directions of Dean(IPS) .
- 2.2 The Contractor shall procure and submit the samples of approved make, shade and thickness of various materials (tiles and paver blocks etc.) along with catalogue, for the approval of the Dean(IPS) prior to execution of the item.
- 2.3 Based on the samples approved by the Dean(IPS) for various tiles and paver blocks etc, the contractor shall prepare the mock-up at site for approval of material and quality of workmanship by the Dean(IPS) . Only after the approval of mock-up, the contractor shall start the mass work. If the quality of the workmanship and the material is as per the required standards and approved by the Engineer-in- Charge, the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor as directed by the Dean(IPS) and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.
- 2.4 Once the material and mock-up are approved, the entire quantity of various materials shall be procured from the approved manufacturer or its authorized dealer, preferably, in one lot to keep variations to the minimum.
- 2.5 The material (tile and paver blocks etc.) shall be supplied at site only after attainment of required strength at the factory itself.
- 2.6 The Dean(IPS) or his representative may, if required, shall inspect the factory during production of various tiles to assess the quality of the material and also collect samples from the factory itself. The IITB shall bear the cost of such visits of the officers of the IITB.
- 2.7 The material shall be transported to site well packed. These shall be handled carefully to prevent any damages. The material procured shall be free of any surface defect, edge damage and any other such defects. The defective / damaged material shall not be allowed to be used in the work. So, the contractor shall procure additional quantity of material to cover such contingencies. However, nothing extra shall be payable on this account.
- 2.8 Adequate care for various materials shall be taken before fixing as well as afterwards till completion of the work. It shall be protected from rains,

excessive humidity, chemical fumes, vibrations, dust etc. The contractor shall ensure careful handling and storage and prevent any rough handling, to prevent any edge damage or breakage. Any material (tiles and paver blocks etc.) with edge damaged or crack etc. shall not be allowed to be used in the work and shall be replaced by the contractor at his own cost. Similarly, adequate care shall be taken by the contractor while placing or removing and handling the material so as not to cause any damage. The finished work shall be cleaned as per manufacturer's specifications. Abrasive cleaners shall not be used to clean the marks

- 2.9 The work shall be carried out as per the manufacturer's specifications.
- 2.10 The tiles and paver blocks shall be fixed in required pattern and design in combination with tiles / paver blocks of different colours and shades in linear or curvilinear pattern as per the architectural drawings and the site conditions.
- 2.11 The contractor shall obtain and submit to the IITB the manufacturer's test certificate / report for compliance of the material to the relevant standards along with each lot of material supplied for the work.
- 2.12 For the enclosures with circular or curved profile, only the actual area of the respective works shall be measured under relevant sub-heads for payment and nothing extra shall be payable for labour, material, wastages and any other incidental charges.
- 2.13 For tiling and paver work, the joints between the different types of tiles and pavers shall be located as per the architectural drawings and the measurement shall be done as per item description.
- 2.14 The Contractor shall maintain the uniform level of the finished flooring of the different types unless specifically mentioned on the architectural drawings.
- 2.15 At the time of handing over, the finished areas (tiles and paver blocks etc) shall be free of any scratches, stains etc. These areas shall be properly cleaned before handing over. However, abrasive cleaners shall not be used to clean the marks and other scratches.

1.14 **Particular specifications for sanitary installations, water supply & drainage**

1. **General (applicable for items under this sub-head):**

- 1.1 The work under this sub-head in general shall be carried out as per the CPWD specifications, as per architectural drawings and as per directions of Dean(IPS) .
- 1.2 Before taking up the work, the contractor shall prepare integrated shop drawings showing details of various pipe lines running horizontally and vertically and obtain approval of Dean(IPS) . Integrated services drawings shall conform to local byelaws. The work shall be carried out as per approved integrated shop drawings for sanitary installations, water supply, rain water and drainage pipes.

- 1.3 Samples of all the pipes, fittings, fixtures etc., of make as per the list of approved materials shall be brought to site, well in advance, prior to start of any of the works and got approved by the Dean(IPS) .
- 1.4 Two sample toilets with all the pipelines, fittings and fixtures shall be prepared and tested for proper functioning of the system and got approved from the Dean(IPS) before taking up mass work. The sample toilet(s) shall form part of the main work if the performance is found satisfactory; otherwise, the same shall be dismantled and redone by the contractor at his cost.
- 1.5 The chasing, cutting and making holes in the masonry and / or cement concrete and / or RCC works shall be done carefully without causing any damage to the structure. As far as possible, mechanical cutters & core cutting machines shall be used in a workman like manner, for concealing the pipelines and fittings. The chases / holes, so made, shall be made good with the cement mortar of mix 1: 4 (1 cement: 4 coarse sand) after testing of the pipe lines for leakage. The cost of cutting cores in RCC, cutting holes in masonry & making good the same shall be inclusive in the respective item of drainage/water supply lines.
- 1.6 All vertical sanitary & GI pipes shall be fixed to hot dipped galvanized M.S supporting frame with “U” shaped G.I bolts, threaded at both ends, as specified, with GI nuts, GI washers, GI cleats etc. as approved by the Dean(IPS) . Supporting frame shall be fixed with approved anchor fasteners as directed by the Dean(IPS) . In all cases, pipelines shall be fixed, minimum 50 mm away from the finished wall face and shall not be fixed directly to the walls. **The cost of providing and fixing GI supporting frame shall be paid for separately under relevant items.**
- 1.7 All horizontal pipes shall be fixed to the soffit of beams / slabs etc. with G.I. hanger rods & G.I. frame work as per the approved shop drawings and as directed by the Dean(IPS) . The pipelines shall be clamped to the structural steel frame work with “U” bolts and nuts, washers, cleats etc., of length and diameter as required and as specified. **The G.I. frame work shall be paid for separately under relevant items.**
- 1.8 The contractor shall sequence the activities for external drainage and other pipe lines work in such a way that no hindrance is caused to other activities like laying of external electrical cable, development, landscape and road work etc.

1.15 Particular specifications – Aluminium work

1. The material for the work shall be procured from the approved manufacturer as per the list attached with the tender documents. The Contractor shall procure and submit samples of various materials to be used in the work for the approval of Dean(IPS) and no work shall commence before such samples are approved. Samples of un-anodized as well as anodized aluminium sections, neoprene gaskets, glass, stainless steel screws, anchor fasteners, hardware and any other material or components requiring approval of samples, in opinion of Dean(IPS) , shall be submitted for the approval as mentioned above. The above samples shall be retained as standards of materials and workmanship.

2. The Contractor shall prepare the shop drawings for the aluminium windows giving details of the various aluminium sections, neoprene gaskets, cleats, anchor fasteners, hardware, sealants, glass etc. and submit the same for the approval of Dean(IPS) .
3. Only after the approval of the samples and the shop drawings by the Dean(IPS) , the Contractor shall procure the material for the work. All materials brought to the site by the Contractor, for use in the work, as well as fabricated components shall be subject to inspection and approval by Dean(IPS) . The Contractor shall produce manufacturer's test certificates for any material or particular batch of materials supplied by him.
4. The Contractor shall prepare a finished sample of the aluminium window along with glazing panel and fittings etc. for approval of workmanship and material. Nothing extra shall be payable on this account.
5. Aluminium sections to be used for various works shall be appropriate to meet technical, structural, functional and aesthetic considerations. The anodizing shall be carried out in an approved factory / workshop as specified in the tender documents.
6. **Fabrication**
 - 6.1 All joints shall be accurately fabricated and be hairline in appearance. The finished surface shall be free from visible defects.
 - 6.2 All hardware used shall conform to the relevant specifications and as per samples approved by the Dean(IPS) . Design, quality, type, number and fixing of hardware shall be generally in accordance with architectural drawings and as approved by the Engineer-in- Charge before use.
 - 6.3 All doors, windows, ventilators and glazing etc. shall be made water tight with neoprene gaskets and weather silicone sealants to the satisfaction of the Dean(IPS) , for which nothing extra shall be payable.
 - 6.4 The frames shall be strictly as per Architectural drawings, the corners of the frame being fabricated to the true right angles. Both the fixed frames and openable shutter frames shall be fabricated out of sections cut to required length, metered and mechanically jointed for satisfactory performance. All members shall be accurately machine milled and fitted to form hairline joints. The jointing accessories such as aluminium cleats, stainless steel screws etc. shall not to cause any bi-metallic reaction by providing separators, wherever required.
 - 6.5 Vertical members of the aluminium frame work shall be embedded in the floors, wherever required, by cutting and making good of the floor.
7. **FIXING OF ALUMINIUM FRAME WORK**
 - 7.1 The screws used for fixing fixed aluminium frames of the aluminium windows to masonry walls/ RCC members and aluminium members to other aluminium members shall be of stainless steel of approved make and quality and of stainless steel grade 304. Threads of machine screws used shall conform to requirement of I.S. 4218.

- 7.2 For the aluminium windows, the gap between the aluminium frames and the R.C.C / Masonry and also any gaps in the various sections shall be filled with weather silicone sealant DC 795 of Dow Corning or equivalent in the required bite size, to ensure water tightness including providing and fixing backer rod , wherever required. The weather silicone sealant shall be of such approved colour and composition that it would not stain or streak the masonry / R.C.C. work. It should not sag or flow and shall not set hard or dry out under any conditions of weather and shall be tooled properly. The weather silicone sealant shall be used as per the manufacturer's specifications and shall be of approved colour and shade. Any excess sealant shall be removed / cleared. Nothing extra shall be payable for the above.
- 7.3 Fixing of glass panes shall be designed in such a way that replacing damaged / broken glass panes is easily possible without having to remove or damage any members or interior finishing materials.

8. ANODIZING

- 8.1 Aluminium sections shall be anodized as per I.S. 7088 – 1973. Anodizing to be as per grade AC 20 and not less than 20 microns thick when measured as per I.S. 6012, in colour and shade as approved by the Dean(IPS) The anodic coating shall be properly sealed by steam or dipping in de-ionized water as per I.S. 1868-1982 and / or I.S. 6057. Sealing quality shall be tested in accordance with the relevant standards. Nothing extra shall be payable on this account.
- 8.2 The Contractor shall satisfy himself by checking in the factory that the thickness of the anodic coating is found to be minimum 20 microns and sealing quality is appropriate everywhere. The testing shall be done in an approved laboratory by EDDY CURRENT METHOD as per I.S. 6012 for thickness. For testing the thickness of anodic coating of the anodized aluminium sections, the calibration shall be done on bare (un-anodized) aluminium sections of same type. If any material is found sub-standard, it shall be rejected.
- 8.3 All anodized aluminium works shall conform to relevant I.S. Codes relating to materials, workmanship, fabrications, finishing, erection, installations etc. In this connection I.S. Codes including I.S. 1868 – 1982, I.S. 733 – 1983, I.S. 1948-1961, I.S. 7088-1973, I.S. 6012-1970, I.S. 1285 – 1975, I.S. 740-1975 are considered relevant and applicable.
- 8.4 The exposed surface of the aluminium sections shall be protected against surface damage, dents, scratches etc. It shall, therefore, be provided with protective tape. After fixing and assuring of proper functioning of doors, windows, frame work for partitions / false ceiling etc. such protective tape shall be cleaned out / removed as per the directions of Engineer-in-Charge. Nothing extra shall be payable for above.

9. Glazing

- 9.1 All glass panes shall be retained within aluminium framing by use of exterior grade neoprenegaskets. Use of glazing or caulking compounds around the perimeter of glass will not be permitted. There shall be no whistling or rattling. Before installation of glass, Contractor shall ensure the following:
 - 9.1.1 All glazing rebates shall be square, to plumb, true to plane, dry and free from dust.
 - 9.1.2 Glass edge shall be clean and cut to exact size and grounded
- 9.2 Annealed float glass in doors, windows, ventilators and fixed glazing etc. shall be of approved make and standard quality conforming to C.P.W.D. Specifications.
- 9.3 4 mm thick glass panes shall be provided for openings not exceeding 0.5 sqm. For openings exceeding 0.5 sqm in area, 5.0 mm thick glass panes shall be provided unless specified otherwise.

10. PROTECTIONS AND CLEANING:

- 10.1 All glass panes shall be retained within aluminium framing by use of exterior grade neoprenegaskets. Use of glazing or caulking compounds around the perimeter of glass will not be permitted. There shall be no whistling or rattling. Before installation of glass, Contractor shall ensure the following:
 - 10.1.1 All glazing rebates shall be square, to plumb, true to plane, dry and free from dust.
 - 10.1.2 Glass edge shall be clean and cut to exact size and grounded
- 10.2 Annealed float glass in doors, windows, ventilators and fixed glazing etc. shall be of approved make and standard quality conforming to C.P.W.D. Specifications.
- 10.3 4 mm thick glass panes shall be provided for openings not exceeding 0.5 sqm. For openings exceeding 0.5 sqm in area, 5.0 mm thick glass panes shall be provided unless specified otherwise.

11. MEASUREMENT AND RATES:

- 11.1 Aluminium frame work shall be measured as per CPWD specifications.
- 11.2 For glazing, the actual area of the glass panels excluding the portion in the beading shall be measured in sqm up to two decimal places, for payment.
- 11.3 Stainless steel adjustable friction hinges and the aluminium handles for the openable side- hung windows shall be of "Earl Bihari", make or equivalent as approved by the Engineer-in- Charge. 2 nos. friction hinges shall be provided per shutter.

- 11.4 The cost of designing and preparation of shop drawings, all the samples, mock-up of window etc. is deemed to be included in the cost of the relevant items. Nothing extra shall be payable on this account.
- 11.5 The item for aluminium for fixed portions for aluminium windows and frame work for partitions shall include cost of all inputs of labour, material (anodized aluminium sections, including cleats, other fixtures, weather silicone sealants, stainless steel screws, nuts, bolts, rawl plugs, backer rods, polyethylene tapes etc. which shall be required for fabrication and erection of aluminium work) T & P, all incidental charges, wastages etc. involved in the work. However, for the purpose of payment, the weight of aluminium sections for the fixed window frame and frame work for partitions, shall be measured in Kg. The aluminium cleats, stainless steel screws, nuts, bolts, separators etc. shall not be measured separately for payment and their cost is deemed to be included in the cost of this item. The item for aluminium for frame work for fixed partitions shall also include cost of providing and fixing stainless steel anchor fasteners as required.
- 11.6 The item of aluminium for the openable aluminium shutters for windows and doors etc., shall include cost of all inputs of labour, material (anodized aluminium sections, including such as cleats / angles, other fixtures, stainless steel screws nuts, bolts, stainless steel hinges, weather silicone sealant etc. which shall be required for fabrication of aluminium work) T & P, all incidental charges, wastages etc. involved in the work. However, for the purpose of payment, the weight of aluminium sections for the window shutter (sash frame) shall be measured in Kg. The aluminium cleats, stainless steel anchor fasteners, screws, nuts, bolts, separators, stainless steel hinges, etc. shall not be measured separately for payment and their cost is deemed to be included in the cost of this item. The anodized aluminium snap beading for fixing glass panels in the openable shutters of the windows shall be measured separately (on weight basis) and paid under this item of aluminium frame work for window shutters.
- 11.7 The glass shall be paid for separately under relevant item. The cost providing and fixing neoprene gasket, felt etc. is included in the cost of this item and shall not be measured separately for payment.
- 11.8 The item for the aluminium frame work includes cost of making provision for fixing fittings, wherever required, as per the item description (The cost for providing fitting (handle, lock and buffer) shall be paid for separately).

1.16 Particular specifications for waterproofing treatment

1. WATER PROOFING TREATMENT

- 1.1 All the water proofing treatment shall be got executed through one of the specialized agencies as per the list of approved agencies attached with the tender. The water proofing agency shall carry out water proofing work with one of the approved water proofing compound mentioned in the tender. If so specifically requested by the contractor, he will be allowed to use other water

proofing compound meeting various technical parameters, subject to prior approval of Dean(IPS) .

- 1.2 The work under this sub-head in general shall be carried out as per the CPWD specifications, as per the manufacturer's specifications, as per architectural drawings and as per directions of Dean(IPS)
- 1.3 Ten years guarantee in prescribed proforma attached shall be given by the contractor for the water proofing treatment. In addition 10% (ten percent) of the cost of these items of water proofing under this sub head shall be retained as guarantee amount to watch the performance of the work executed. However, half of this amount (withheld) would be released after five years from the date of completion of the work, if the performance of the waterproofing works is satisfactory. The remaining withheld amount shall be released after completion of ten years from the date of completion of work, if the performance of the waterproofing work is satisfactory. If any defect is noticed during the guarantee period, it should be rectified by the contractor within seven days of issuing of notice by the Dean(IPS) / IITB and, if not attended to, the same shall be got done by Dean(IPS) / IITB through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. The guarantee amount can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period, is produced and deposited with the IITB.

15.LIST OF APPROVED MATERIALS & SPECIALIZED AGENCIES

Note:

1. The Contractor shall obtain prior approval from the Dean(IPS) before placing order for any specific material or engaging any of the specialized agencies. The Contractor shall make a detailed submittal with catalogues and highlighted proposed specifications, as well as full details of the works proposed to be executed by the specialized agency, as specified.
2. Wherever applicable, the Dean(IPS) may approve any material equivalent to that specified in the tender subject to proof being offered by the Contractor for equivalence to his satisfaction.
3. Unless otherwise specified, the brand / make of the material as specified in the item nomenclature, in the particular specifications and in the list of approved materials attached in the tender, shall be used in the work.
4. Reinforcement steel shall be procured from any vendors who have the license for at least 5 years for manufacture of BIS subject to prior written approval of Dean (IPS). Steel sample of all the lots procured shall be subjected to testing through recognised laboratories and shall be at contractors cost

A. MATERIALS:

1	CEMENT	ACC, ULTRA TECH, J. P. REWA, VIKRAM, SHREE CEMENT, BIRLA JUTE, CEMENT CORPORATION OF INDIA, AMBUJA CEMENT
2	WHITE CEMENT/ PUTTY	J.K., BIRLA OR EQUIVALENT
3	READY MIX CONCRETE	A.C.C., ULTRA TECH, RMC, GODREJ, SKYWAY, SWASTIK INFRALOGICS.
4	WATERPROOFING COMPOUND	PIDILITE, BASF, CICO, FOSROC, ROFF, KERACOL, SIKA
5	REINFORCEMENT STEEL	SAIL, TATA STEEL, RINL, JINDAL STEEL & POWER LTD., JSW STEEL LTD., MAKES CONFORMING TO CRITERIA MENTIONED IN TENDER DOCUMENT

6	MECHANICAL SPLICING SYSTEM WITH COUPLER	SPLICETEK INDIA PVT. LTD. DEXTRA INDIA PVT. LTD. ISHITA ENTERPRISES
7	STRUCTURAL STEEL	TATA STEEL, SAIL, RINL, VIZAG, JINDAL
8	CONCRETE BLOCKS	CONWOOD, GURJARI, HINDUSTAN, LOKGROUP, SAI BLOCK, VED PMC LTD.
9	AAC BLOCKS	AEROCON, SIPOREX, ULTRA TECH, ECOLITE, GODREJ
10	WOODEN FLUSH DOORS	KENWOOD, ANCHOR, KUTTY, GREENPLY, SHREEJI, KITPLY
10A	FRP DOOR SHUTTERS	MERINO, GREENLAM
11	HIGH PRESSURE LAMINATES	FORMICA, MERINO, GREENLAM, CENTURY
11.A	veneers	CENTURY, ARCHID, EURO, GREEN
12	FRD WOODEN FRAME & SHUTTERS	SUKRI, PROMAT, KUTTY, SIGNUM, KENWOOD, SHREEJI, TUFWOOD, NAVAIR
13	FRD METAL FRAME & SHUTTERS	SUKRI, SHAKTI MATE HORMAN, KUTTY, SIGNUM, NAVAIR
14	FIRE RATED GLASS	PILKINGTON, SCHOTT, SAINT GOBAIN, ASAHI, GUARDIAN
15	HARDWARE FOR FIRE RATED DOORS	DORMA, GEZE, HAFELE, ASABOLY, SHALIMAR
16	INTUMESCENT STRIPS	PROMAT, PEMKO, INTUMEX, ASTROFLAME
17	SS DOOR HARDWARE	DORMA, GEZE, HAFELE, ASABOLY, OZONE, SHALIMAR

18	MODULAR FURNITURE HARDWARE/ SSWIRE BASKETS	HETTICH/ HAFELE/ ASABOLY
19	PVC EDGE BANDING TAPE	REHAU/ DOLKIN
20	HOT MELT GLUE FOR EDGE BANDINGTAPE	KLEIBERIT 773.3 / HENKEL
21	WOOD WORK	SAL WOOD
22	PLYWOOD	GREENPLY, KITPLY, ANCHOR, ARCHID, CENTURY.
23	BLOCK BOARD	GREEN PLY / CENTURY /ANCHOR / ARCHID/KITPLY
24	STAINLESS STEEL	JINDAL, SAIL, TATA STEEL OR EQUIVALENT
25	VITRIFIED TILES/ CEREMIC TILES	SOMANY, KAJARIA, H & R JOHNSON, NITCO, ORIENT, RAK
26	POLYMER MODIFIED CEMENTITIOUS GROUT / CEMENT ADHESIVE / EPOXY GROUT	PIDILITE, KERACOL, ARDEX ENDURA, LATICRETE, BAL ENDURA,FERROUSCRETE
27	POLYMER MODIFIED ADHESIVE MORTARFOR FLY ASH BLOCKS	WALPLAST, ULTRA TECH, SOUND BUILD CARE LTD., ECOLITE, FERROUSCRETE, KERACOL, PIDILITE
28	P.V.C RAIN WATER PIPE	SUPREME, ASTRAL,ASHIRVAD, FINOLEX,PRINCE
29	READY MIXED CEMENT PLASTER	WALPLAST, ULTRA TECH, MADRAS CEMENT LTD, SOUND BUILD CARE LTD., FERROUSCRETE, PRECISE CONCHEM PVT LTD.
29.a	METAL FALSE CEILING	ARMSTRONG, GYPROC, HUNTERDOUGLES, USG BORAL

30	GYPSUM LIGHT WEIGHT PLASTER	GYPROC, FERROUSCRETE, ULTRTECH
31	PAINTS	ICI, ASIAN PAINTS, BERGER PAINTS, NEROLAC
32	WATERPROOFING CEMENT PAINT	SNOWCEM, BERGER PAINTS, NEROLAC, ASIAN PAINTS,
33	ACRYLIC TEXTURE PLASTER	ASIAN PAINTS, SPECTRUM PAINTS, HERITAGE
34	PAVER BLOCKS/ GRASS PAVERS/ KERBSTONE	VYARA, BASANT BETONS, SUPER, HINDUSTAN
35	SANITARY WARES	JAQUAR, PARRYWARE, HINDWARE, KOHLER, GROHE, STERNHAGEN
36	C. P. FITTINGS	JAQUAR, PARRYWARE, HINDWARE, KOHLER, GROHE, STERNHAGEN
37	S. S. SINK	NIRALI, DEEPALI, FUTURA,
38	C. I. PIPES & FITTINGS	NECO, KAPILANSH, SKF, HEPSCO
39	G.I. PIPES	TATA, JINDAL, PRAKASH SURYA,
40	G. I. FITTINGS	UNIK, R-BRAND, ZOLOTO
41	NP2 CLASS, R.C.C. PIPES	JAIN SPUN PIPE, K. K. SPUN PIPE, THE INDIAN HUME PIPE CO. LTD., PATEL HUME PIPES
42	ALUMINIUM EXTRUSION SECTIONS	JINDAL, HINDALCO, NALCO, INDIAN ALUMINIUM CO.
43	FLOAT CLEAR GLASS	SAINT GOBAIN, ASAHI GLASS, MODI GUARD, GUARDIAN

44	COATED GLASS	SAINT GOBAIN, ASAHI GLASS, GUARDIAN
45	CALCIUM SILICATE BOARD	HILUX, STARPAN, AEROLITE, PROMAT, VISAKA
46	UPVC PIPES AND FITTINGS	ASTRAL, FINOLEX, SUPREME, KISAN
47	CPVC PIPES AND FITTINGS	ASTRAL, SUPREME, FINOLEX, PRINCE
48	FLOOR SPRINGS /DOOR CLOSERS/ PANICBAR/ PATCH FITTINGS	DORMA, GEZE, HAFELE, HORMAN
49	S. S. GRATINGS	CHILLY, CAMRY,
50	FLOAT GLASS MIRROR	MODIGUARD, SAINT GOBAIN, ASAHI NP2 RCC Pipe
51	STAINLESS STEEL ANCHOR FASTENERS	HILTI, FISCHER
52	EPDM	AMEE RUBBER INDUSTRIES PVT. LTD. ,
		BOHRA RUBBER
53	ALL TYPES OF SILICONE	DOW CORNING, GE
54	SPACER TAPE / BACKER ROD	NORTON, BOW
55	FRICTION HINGES AND LOCKS	COTSWOLD, GIESSE, ALUALPHA
56	ALUMINIUM COMPOSITE PANEL	ALUDECOR, EUROBOND, ALSTRONG, ALUCOBOND
57	FROSTED GLASS FILM	GARWARE, LLUMAR, 3M
58	VINYL FLOORING	RESPONSIVE, TARKETT, POLYFLOR, GRABO
59	NP2 RCC PIPE	BIS MARKED

B. SPECIALISED AGENCIES:

1	WATERPROOFING WORK	PIDILITE, A. NAYAK Constructions Pvt. Ltd., LIKPROOF INDIA PVT. LTD., MODERN WATERPROOFING CO, INDIA WATERPROOFING CO., OVERSEAS WATERPROOFING CORP. KERACOL, NINA WATERPROOFING, NATIONAL WATER PROOFING
2	CURTAIN GLAZING	GLAZE TECNO INDIA, AJIT INDIA PVT. LTD., INNOVATORS FACADE SYSTEMS PVT. LTD., ALUMAYER INDIA PVT. LTD. OR ANY OTHER AGENCIES PROPOSED BY THE MAIN CONTRACTOR WHO HAS EXECUTED WORK OF SIMILAR NATURE AND QUANTUM.
3	GLASS PROCESSER	ASAHI GLASS, SEJAL, GLASSTECH, FG, GSC, IMPECT SAFETY, SAINT GOBAIN
4	PVDF COATING	AURA ARCHITECTURAL COATINGS, M. J. COATERS PVT. LTD., S P ARCHITECTURAL COATINGS PVT LTD., AMECO, RADIANT ANODISERS PVT. LTD.

16. TENDER DRAWING DETAILS:

Please refer attached Annexures: List of drawings for followings:

1. Annexure “A”: Architectural Drawings.
2. Annexure “B”: Interior Drawings.
3. Annexure” C”: Structural work Drawings
4. Annexure “D”: Plumbing & Fire Fighting work Drawings.
5. Annexure “E”: Electrical works Drawings.
6. Annexure “F”: HVAC works Drawings.
7. Annexure “G”: Signages

17.FORMS FOR GUARANTEE BONDS

GUARANTEE BOND FOR REMOVAL OF DEFECTS OF WATER PROOFING WORKS.

This Agreement made this _____ day of _____ two thousand and _____ between

_____(Name of the contractor, hereinafter called the Guarantor on the one part) and Director IITB (hereinafter called the Government on the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the contract) dated _____ and made between the GUARANTOR on the one part and the IITB Government on the other part for construction _____ (Name of the work) where by the GUARANTOR, *interalia*, undertook to render the 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 ten years from the date of completion of the work.

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 ten years to be reckoned from the date of completion of the work as a whole.

Provided that the GUARANTOR will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or alteration and for such purpose.

- (a) Misuse of roof shall mean any operation which will damage water proofing treatment, like chopping of firewood and things of the same nature which might cause damage to the roof;
- (b) Alteration shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby water proofing treatment is removed in parts;
- (c) The decision of the Engineer – in - Charge with regard to cause of leakage shall be final

During this period of guarantee, the GUARANTOR shall make good all defects and in case of any defects being found, render the building water-proof at his cost to the satisfaction of the Engineer – in

– Charge / authorized representative of IITB, and shall commence the work for such rectification within seven days from the date of issue of the notice from Engineer – in – Charge / authorized representative of IITB calling upon him to rectify the defects, failing which the work shall be got done by IITB / IITB through some other Contractor at the GUARANTOR'S cost and risk. The decision of the Engineer – in – Charge / authorized representative of IITB as to the cost, payable by the Guarantor shall be final and binding.

That if the GUARANTOR fails to execute the necessary rectification of water proofing or commits breach there under, then the Guarantor will indemnify IITB and his successors against all loss, damage, cost expense or otherwise which may be incurred by him by reasons of any default on the part of GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and / or cost incurred by the Government / IITB, the decision of the Engineer – in – Charge / IITB will be final and binding on the parties.

IN WITNESS WHEREOF these presents has been executed by
the Obligator

Director. IITB and by _____ and
for and on behalf of the Director, IITB on the day, month and year first above written.

Signed, sealed and delivered by **OBLIGATOR** in the presence of:

1.

2.

SIGNED FOR AND ON BEHALF OF DIRECTOR IITB by -----in the presence of:

1.

2.

GUARANTEE BOND FOR REMOVAL OF DEFECTS IN CURTAIN GLAZING & OTHER RELATED WORKS.

This Agreement made this _____ day of _____ two thousand and _____ between _____ (Name of the contractor, hereinafter called the Guarantor on the one part) and the Director IITB (hereinafter called the Government on the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the contract) dated _____ and made between the GUARANTOR on the one part and the IITB on the other part for construction _____ (Name of the work) where by the GUARANTOR, *interalia*, undertook to carry out structural analysis and design, preparation of shop drawings, setting out, design, supply, fabrication, installation, aligning, fixing, protection and testing of the curtain glazing and other related works, all as specified and set out in the contract and as per the correct international / national standards.

AND WHEREAS THE GUARANTOR agreed to give a guarantee (for all works as stated above) for the following :

1. System

- 1.1 Structural design has been carried out for design loads, as specified, thermal stresses, building movements and the consequent deflections without compromising the performance characteristics.
- 1.2 That deflections in the framing members shall be within permissible limits as specified.
- 1.3 Structural stability, safety, integrity and required performances of the work for all design works and building movements as specified.

2. Material

- 2.1 Glass (single, laminated or DGUs) – Substrate, coatings, lamination of laminated glass, insulation of DGUs
- 2.2 Sealant – Material used, performance of sealant used, usage as per the requirement of structural design and functional requirement, compatibility with different substance and sealants, bite size, quality assurance during sealing of DGUs and fixing glass to glass and glass to the aluminium frame, etc.
- 2.3 EPDM / Silicone gaskets – for ozone resistance and other properties as specified etc.
- 2.4 Aluminium – material quality, tempering requirement, suitability of aluminium grade and anodizing etc.
- 2.5 Anchor fasteners – suitability and strength requirements as per manufacturers' specifications etc.

3. Performance

- 3.1 Water tightness, wherever specified in the Contract.
- 3.2 Workmanship
- 3.3 Integrity of system during movements within and relative to the building structure.

- 3.4 Indemnify the IITB against all claims of whatsoever nature due to defective designing by the contractor, material & workmanship etc. and /or non-performance of the work during the guarantee period.

NOW THE GUARANTOR hereby guarantees that the work executed by him shall perform to the specified standards of quality and workmanship during the guarantee period of ten years to be reckoned from the date of completion of work.

During this period of guarantee, the guarantor shall make good all defects and if any defect is noticed during the guarantee period, it shall be rectified by the contractor within seven days of issue of notice to the contractor, at least temporarily, to the satisfaction of the Dean(IPS) , till the permanent rectification of the defects / replacement of defective materials is carried out by the contractor, in maximum four months period, retaining same aesthetic and other functional parameters of the original work. If not attended to, the same shall be got done by the IITB / IITB through other agency at the risk and cost of the contractor which shall be final and binding on the contractor.

That if the Guarantor fails to execute the necessary rectification or commits breach there under, then the Guarantor will indemnify IITB and his successors against all loss, damage, cost expense or otherwise which may be incurred by him by reasons of any default on the part of GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and / or cost incurred by IITB , the decision of the Dean(IPS) will be final and binding on the parties.

IN WITNESS WHERE OF these presents has been executed by the
OBLIGATOR

_____ and
by

_____ and for and on behalf of Director. IITB. on the day
month and year first above written.

SIGNED, SEALED AND DELIVERED by OBLIGATOR in the presence of:

1.

2.

SIGNED FOR AND ON BEHALF OF DIRECTOR. IITB. BY

in the
presence of:

1.

2.

PART-C

COMPONENT
(E&M)

**ADDITIONAL
CONDITIONS
&
PARTICULAR
SPECIFICATIONS
(For E & M Component)**

18.SPECIFICATIONS FOR INTERNAL ELECTRICAL INSTALLATION WORKS

Sub Head –I: Providing Internal EI and Fans.

1.0 The work shall be generally carried out in accordance with tender conditions and the Following specification and rules.

- a) CPWD General Specification for electrical work part I Internal 2013 as amended up to date.
- b) CPWD general specification for electrical work part II External 1994 as amended up to date.
- c) CPWD general specification for electrical work part IV Sub-Station 2013 as amended up to date.
- d) Indian Electricity Act 2003 amended up to date.
- e) National Electrical Code.
- f) Indian Electricity Rule 1956 amended up to date.
- g) National Building Code 2016 as amended up to date

2.0 All materials required to be used on works shall be got approved from the Engineer-in-charge well in advance before placing procurement order.

3.0 No T & P shall be provided.

4.0 Earthing, cement concrete works and testing of the installation shall be done in presence of the Engineer -in-charge or his authorized representative.

5.0 On completion of work the contractor shall test the installation and produce test certificate in accordance with the CPWD specification failing which bill payment will be withheld proportionately.

6.0 All debris at site shall have to be removed by the contractor before handing over the installation to the IITB.

7.0 General arrangement of the drawing of panel board shall be got approved from Dean (IPS) before commencement of its fabrication.

8.0 Cement required for the work shall have to be procured by the Contractor himself.

Electrical Contractor will make recess in brick work by cutting chases for provision of conduits and metal boxes according to the elevational drawings for electrical services. Electrical contractor will fix the conduits and boxes and there after close the chases up to the surface of masonry work in cement mortar 1:4 (1 cement :4 sand). Thereafter surface of chases shall be plastered and finished by the contractor to ensure smooth and even surface. Nothing extra shall be paid to the contractor for above operations

irrespective of whether the chases are carried out before or after plastering of the wall.

- 9.0** The contractor shall make his own arrangement for storage and watch and ward of materials. He Shall remain responsible for watch and ward of installation and other fittings till these are commissioned and handed over to the IITB.
- 10.0** Contractor is advised to visit the site of work to have an idea for the execution of work, failure to do so will not absolve him of responsibility to do the work as specified in agreement.
- 11.0** All the light and fans points should be properly earthed with 1.5 sqmm, FRLS PVC insulated copper wire.
- 12.0** All metallic parts must be properly bonded to the earth. Earthing lugs shall be provided to all copper earth wires and shall be fixed whenever required by means of anodised bolts and nuts.
- 13.0** Any damage made to wall ceiling etc. of the building made by the contractor shall have to be made good upto the original finish as per requirement within the tendered amount. Nothing extra will be paid on this account.
- 14.0** Concealed metal boxes & modular accessories shall be of same make.
- 15.0** Number of inspection boxes for conduit should be barest minimum, rather these should be avoided.
- 16.0** The fabrication drawing shall be got approved from the Dean(IPS) before start of work.
- 17.0** All MCCBs shall be with **Ics=100% of Icu** rating only.
- 18.0** All ACBs shall be with **Ics=100% Icu =Icw** rating only.
- 19.0** The technical specification of LED fittings are enclosed. All the LED fittings i/c driver shall be under the comprehensive warranty of 5 years from the date of completion of work.
- 20.0** One sample of 2 ft x 2 ft LED panel & One sample of LED Down Lighter fixture shall be got tested at UL Lab anywhere in India and testing shall be witness by the Engineer in charge. All tests to be establish as per BOQ and specification of the fixtures.
- 21.0** Associate agency of electrical contractor shall be engaged for execution of minor component. (Electrical Works) after approval of IITB

Sub Head -I (Internal EI)

List of Approved makes of Equipment and material of E&M Services

SL No	Description of items/equipment's	Approved Makes
1	FRLS Copper Wire	Duly ISI marked: Finolex / Havells / R R Kabel
2	Power Cable	Duly ISI marked: Finolex / Havells / R R Kabel/ Polycab
3	Telephone Cable/wire & Cat 6 LAN Cable/Cat 6 Patch Cord/RJ 11	Duly ISI marked: Finolex/ Legrand / Dlink/ Mollex
4	GI/ MS Pipe	Duly ISI marked: TATA / Jindal (Hissar) / Sail
5	PVC conduit and accessories	Duly ISI marked: Precision/Asian/Polycab/ Pressfit
6	BLDC Ceiling Fan	Atomberg- Gorilla/Super Fan /Havells/Crompton
7	Rising main/Bus duct	Legrand/L&T/ Schneider
8	Tap off box/ End feed unit	Legrand/L&T/Schneider /ABB
9	ACB	L&T U power/Legrend DMX ³ /Schneider Master Pack MW/Siemens 3 WL
10	MCCB	Schneider compact NSX/Legrend DPX ³ /Siemens 3 VL/L & T Dsine
11	MCB DB's /MCB/RCBO/RCCB/Isolator	Legrand /Hager/Siemens / ABB /L&T
12	Cable Gland / Lugs/Thimble	Comet / Jainsons / Braco/Dowells
13	Modular Switches/ Sockets / Modular Plate with base frame/GI	Legrand -Arteor / / MK- Element/Schneider- opale/ Havells

	switch box	
14	Telephone socket/TV antenna socket/Data Socket (Rj45 socket)	Legrand -Arteor / / MK-Element/Schneider- opale
15	LED light fitting /LED Tube	Phillips /Wipro / Havells
16	LED Wall Mounted Decorative Luminar	LUKER/ Phillips/Wipro/ Havells
17	LED Dimmable Track light/ Track light /Track	Philips /Wipro
18	UPS	Vertiv (Emersion)/Autometers Alliances - Pegasus/ Schneider/Legrand-Numeric
19	Maintenance free battery for UPS	Excide/Amron/Rocket/Amar-Raja
20	Telephone Junction box & Module	ITL / Krone /MALSON
21	Tv Co-axoal Cable	RR Kabel/Havells/polycab/Finolex
22	LT panel	Peaton Electrical Company Ltd/ ABAK /Pristine /Adlec/ Tricolite/ Advance Power & Switchgear Pvt Ltd Haridwar
23	Perforated hot dipped GI Cable Tray	OBO/Indiana/MK/Erico
24	Wiremesh hot dipped GI Cable Tray	OBO/Legrand/MK
25	Pre galvanized / Hot dipped GI Under floor Trunking & Junction Box	OBO/Legrand/MK
26	Exhaust Fan/ Fresh Air Fan	Usha/Havells/Crompton
27	Energy meter	Havells/L &T /Siemens/ conserve /Schneider
28	Muti function meter	AE/ L&T /conserve /Schneider
29	CT	AE/Kappa/L & T

30	ATS	Vertiv(Emerson) /L&T/Siemens/GE/ Schneider/ASCO
31	Early steamer type Lighting -- Arrester / Surge/ Flash Counter	Indelec /ABB Furse/ Purcel /Tercel
32	U Rack	Valrack / /Rittal/ Cisco/Wipro
33	DWC Pipe/HDPE Pipe	Rex/ Natni /Polymer /Gemini
34	Occupancy sensor	Legrand /Schneider/Wipro/Phillips/Siemens
35	Aviation light	Bajaj/ Insta power/Spectrum/Crompton
36	LAN Switch	Cisco//Extreme/Juniper
37	Patch cord	AMP/Dlink/TP link/ Legrand
38	Cat 6 Patch cord	Legrand/AMP/Dlink/Mollex
39	LIU	AMP/Dlink/Cisco/Legrand
40	12 Fibre patch /patch cord	AMP/Dlink/Cisco/Legrand
41	Telephone Tag box	ADC Krone/Legrand/Cisco/ITL
42	Access control biometric cum access reader	Bosch/Honeywell/HID
43	Fibre optice cable	Legrand/AMP/Dlink/Molex
44	Motion /Day Light Sencer	Legrand/Wipro/ Schneider/Philips
45	Any other Materials -Not mentioned above	Shall be got approved from the Dean (IPS) before use at site.

19.ADDITIONAL SPECIFICATIONS FOR WET RISER AND SPRINKLER SYSTEM

Sub Head - II:- SITC of Wet riser and Sprinkler System.

1. The work shall be carried out as per CPWD General Specifications for Electrical Works, Part-I Internal (2013), Part-II (External-1994), Part-V (Wet Riser & Sprinkler System-2006). In case of any deviation between these additional conditions and specifications and the provisions contained in CPWD General Specifications, these additional specifications shall have precedence. Nothing extra shall be paid for complying with these additional specifications which are mandatory.
2. GA Detail drawing showing relative positions of Wet riser, double-headed hydrant, Sprinkler pipe, hose-reel ,drain pipe and the valves to each other, at floor level should also be got approved from Dean(IPS) before start of work.
3. All materials used in the work as far as applicable shall comply with the relevant Indian Standard specifications with all its up to date amendments. These materials having ISI mark shall have precedence over the ones conforming to ISI specifications. Details of applicable standard are given in APPENDIX-E of CPWD General Specification for Electrical Works PART-V (Wet Riser & Sprinkler System-2006)
4. The contractor shall make his own arrangement for storage and watch and ward of materials whether the same brought by him or supplied by the IITB. He shall remain responsible for watch and ward of installation and other fittings till these are commissioned and handed over to the IITB.
5. All metallic parts must be properly bonded to the earth. Earthing lugs shall be provided to all copper earth wires and shall be fixed whenever required by means of anodised bolts and nuts.
6. Any damage made to wall ceiling etc. of the building made by the contractor shall have to be made good up to the original finish as per requirement within the tendered amount. Nothing extra will be paid on this account.
7. The detailed working drawing shall be prepared by the contractor approved from Dean(IPS) .
8. The fabrication drawing shall be got approved from the Dean(IPS) before start of work.
9. All the items to be used in the work should be new and of good quality and will be got approved from the Dean(IPS) before usage in work. The sample of the item shall have to be submitted in advance for this purpose
10. The contractor has to make his own arrangement for the safety of his workman. IITB shall not be responsible in case of any accident taking place during the work.

11. Associate specialized agency engaged for execution of minor component. (firefighting and wet riser Works) to be approved by IITB.

List of approved makes of equipment and materials for Wet riser and Sprinkler System		
Sr. No	Description of items/equipment's	Approved Makes
1	Hydrant & Sprinkler pump	Grundfos/ Kirloskar / Mather & Platt / KSB
2	Pressurization (Jockey Pump)	Grundfos/ Kirloskar / Mather & Platt / KSB
3	Terrace Pump	Grundfos/ Kirloskar / Mather & Platt / KSB
4	Electric Motors	Siemens / Kirloskar /Crompton /ABB/ Bharat Bijlee
5	Anti Vibration Mounting	As per OEM / OEA
6	Starters	L&T / Siemens / ABB
7	MCCBs	Schneider compact NSX/Legrend DPX ³ /Siemens 3 VL/L& T Dsine
8	Power Cables / Control Cable	Duly ISI marked: Finolex / Havells / R R Kabel/ Polycab
9	Digital Ammeter/Volt meter/Multifunction Meter	AE/ L&T /Neptune/conzerve/Schneider
10	Selector Switches	Kaycee / L&T / AE / BCH
11	Current Transformer	AE / Kappa / L&T
12	Indicating Lamp/Push Button/LED	L&T / RAAS Control / Schneider Electric / Vaishno
13	Cable Gland/ Cable Lugs	Comet / Jainsons / Braco/Dowells
14	Pressure Switches	Indfos / Danfoss / Honeywell / Johnson / Stefa
15	Contactors & Relays	L&T / Siemens / Telemecanique/ABB
16	Gunmetal - Gate Valve/ NRV/ Ball Valves/ Check Valves	Leader / Zoloto/ Sant/ Kirloskar /Advance/Audco.

17	CI - Sluice Valve/ Butterfly Valve	Leader / Kirloskar /Advance/Audco./Zoloto/ Hammer
18	Y-Strainer	Leader / Kirloskar /Advance/Audco./Zoloto / Hammer
19	Electronic Timer	L&T / Minilec/Schneider
20	GI Pipes	Jindal (Hissar)/ TATA / Sail
21	Lead Acid Batteries	Exide / Amaron / Rocket/ Amar Raja
22	Pressure gauge	H-Guru/ Metzger/ Bestobell/ Star Scientific /Fiebig
23	G.M. Hydrant Valve	Padmini/ New Age / Omex / Minimax / Superex
24	Branch Pipe	Padmini / New Age / Omex / Minimax / Superex
25	Hose Coupling	Padmini / New Age / Omex / Superex
26	Fire Hose Pipe	Padmini / New Age / Omex / Jayshree / Superex
27	First-AID Rubber Reel	Dunlop / Jyoti / Padmini / New age/ Superex/Omex
28	First Aid Hose Reel	Dunlop / Jyoti / Padmini / New age/ Superex/Omex
29	Rubber Mat	Any ISI Marked
30	Sprinkler Heads	HD / Spraysafe / Tyco / Grinnell
31	Annunciation Panel	Minimax / Digicon / Agni/Honeywell/Bosch
32	Installation Control Valve	HD / Spray safe /Tyco / Grinnell
33	Anchor Fastener	Fisher / Hilti / OBO
34	Drum of Hose Reel	New Age / AAG / Padmini
35	Cast Iron Stand Post	New Janta Metal Works /New Age / AAG / Padmini
36	MV Panel	Peaton Electrical Company Ltd/ ABAK /Pristine / Adlec / Tricolite /Advance Power Switchgear

		Pvt.Ltd., Haridwar or equivalent
37	Portable Fire Extinguisher	Cease Fire/ Minimax/ Safex/Safe Guard
38	Any other material not mentioned above	Shall got approved from the engineer –in –charge before use at site.
39	Sand Buckets with stand	New age / AAAG India

20.ADDITIONAL SPECIFICATIONS FOR DRINKING, FLUSHING, DE-WATERING AND BOOSTER PUMPS AND LIST OF APPROVED MAKE FOR PLUMBING, DRAINAGE, STORM WATER.

Sub Head III:-SITC of Drinking, flushing ,de-watering, & Land Scape

1. The work detailed shall be carried out as per CPWD General Specifications for Electrical Works, Part-I Internal (2013), Part-II (External-1994).
2. All materials used in the work as far as applicable shall comply with the relevant Indian Standard specifications with all its up-to-date amendments.
3. The successful tenderer shall make his own arrangement for storage and watch and ward of materials whether the same brought by him or supplied by the IITB. He shall remain responsible for watch and ward of installation and other fittings till these are commissioned and handed over to the IITB.
4. All metallic parts must be properly bonded to the earth. Earthing lugs shall be provided to all copper earth wires and shall be fixed whenever required by means of anodised bolts and nuts.
5. Any damage made to wall ceiling etc. of the building made by the contractor shall have to be made good upto the original finish as per requirement within the tendered amount. Nothing extra will be paid on this account.
6. The detailed working drawing shall be prepared by the successful bidder approved from Engineer-in- charge.
7. The fabrication drawing shall be got approved from the Dean(IPS) before start of work.
8. All the items to be used in the work should **be new** and of good quality and will be got approved from the Dean(IPS) before usage in work. The sample of the item shall have to be submitted in advance for this purpose.
9. The contractor has to make his own arrangement for the safety of his workman. IITB shall not be responsible in case of any accident taking place during the work.
10. Associate agency of electrical contractor shall be engaged for execution of minor component.(Electrical Works)

List of approved makes of equipment and materials FOR Drinking, flushing , de-watering, & booster pump

SL No	Description of items/equipment's	Approved Makes
1	Pump	Kirloskar / Mather & Platt / KSB/Grundfos
2	Starters	L&T / Siemens / ABB
3	MCCB	Siemens-3VL/L&T-Dsine/ABB/Schneider compact NSX/Legrand-DPX ³
4	Power Cable	Duly ISI marked: Finolex / Havells / R R Kabel/ Polycab
5	Selector Switches	Kaycee / L&T / AE / BCH
6	Digital Ammeter/Volt meter/Multifunction Meter	AE/Schneider/Conzerve/Neptune/L&T
7	Current Transformer	AE / Kappa / L&T
8	Indicating Led Lamp/Push Button	L&T / RAAS Control / Schneider Electric / Vaishno
9	Cable Gland /Cable Lugs/Thimble	Comet / Jainsons / Braco/Dowells
10	Contactors & Relays	L&T / Siemens / Telemecanique/ABB
12	Gunmetal - Gate Valve/ NRV/Ball Valve/Check Valve	Leader / Zoloto/ Sant/ Kirloskar /Advance/Audco.
13	C I Butterfly Valve	Leader / Kirloskar /Advance/Audco./Zoloto/ Hammer
15	Electronic Timer	L&T / Minilec/Schneider/Siemens
16	GI Pipes	Jindal (Hissar)/ TATA / Sail
17	Pressure gauge	H-Guru/ Metzger/ Bestobell/ Star Scientific /Fiebig
18	Any other material not mentioned above	Shall got approved from the engineer –in –charge before use at site.

List of approved makes of equipment and materials FOR Plumbing, drainage & storm		
S.	Description	Approved Makes
1	Vitreous chinaware	
a.	European Water Closet	Parryware / Hindware/Cera/Sternhagen
b.	Indian Water Closet	Parryware / Hindware/Cera /Sternhagen
c.	Wash hand basin	Parryware / Hindware/Cera/Sternhagen
2	Health Faucet	Jaquar / Grohe / Kohler/Sternhagen
3	Toilet paper Roll Holder	Jaquar / Grohe / Kohler/Sternhagen
4	coat hook	Jaquar / Grohe / Kohler/Sternhagen
5	Bib tap	Jaquar / Grohe / Kohler/Sternhagen
6	waste coupling	Jaquar / Grohe / Kohler/Sternhagen
7	Pillar Cock	Jaquar / Grohe / Kohler/Sternhagen
8	Bottle Trap	Jaquar / Grohe / Kohler/Sternhagen
9	flexible water pipe	Jaquar / Grohe / Kohler/Sternhagen
10	Sink taps	Jaquar / Grohe / Kohler/Sternhagen
11	C.P brass waste coupling	Jaquar / Grohe / Kohler/Sternhagen
12	flexible water pipe	Jaquar / Grohe / Kohler/Sternhagen
13	Concealed bath shower	Jaquar / Grohe / Kohler/Sternhagen
14	towel rail	Jaquar / Grohe / Kohler/Sternhagen
S.	Description	Approved Makes
15	Soap Holder	Jaquar / Grohe / Kohler
16	Angular Stop cock	Jaquar / Grohe / Kohler
17	Floor trap	Jaquar / Grohe / Kohler
18	Flushing Cistern (Concealed type)	Jaquar / Grohe / Kohler
19	Health Faucet	Jaquar / Grohe / Kohler
20	Two way Bib tap	Jaquar / Grohe / Kohler
21	Pai of Towel Hook	Jaquar / Grohe / Kohler
22	Glass, Mirror	Modi Guard, Saint Gobin,
23	Stainless steel Sink	Nirali / Franke
24	Floor Drain Fixture, Rain Water	Supreme / Prince Piping Systems / Ajay

25	G.I / M.S Pipes	TATA / Zenith / Jindal-Hissar
26	G.I Malleable fittings	Unik / Jain Sons / Kirti
27	C.P. Grating for Floor Trap	Chilly / GMGR / Neer
28	GM or copper alloy Gate / Peet / Globe / Check valve	Sant / Leader / Zoloto
29	Ball Valve	Sant / Zoloto /Itap
30	GM / Forged Brass Ball Valves	Itap / Zoloto / RB
31	Air Valve / Kinetic Air Valve	Zoloto / ITAP / RB
32	Water meter	Capston / Keycee / Paramount. To be BMC approved
33	Sluice valve / Foot valve (ball type)	Kirloskar / IVC / Danfoss / Normex
34	C.I Water quality pipes	Electrosteel / Kapilansh/Keshospun
35	C.I Soil quality pipes	Neco / Saint Gobain/ Kapilansh
S. No.	Description	Approved Makes
36	C.I Frame & Cover	Neco / Saint Gobain
37	S.W Pipe & Gully Trap	Kashmira, Rajura, Girco, Perfect, C.I.or approved eq.
38	RCC Hume pipe	IHP, Pranali, Premier, Shreeji, Pragati, Usha, JSP or app. eq
39	SFRC frame & cover / gratings	Bharat, Shreeji, SS, KK or approved eq.
40	HDPE Pipe	Supreme / Mahavir
41	SS Pipes	Viega
42	SWR-UPVC pipe & fittings	Supreme / Prince Piping Systems / Ajay or
43	Water supply – PVC pipes & fittings	Ashirwad/ Ajay / Astral
44	Pig Lead	Hindustan Zinc
45	PVC flushing Cistern	Parryware / Hindware
46	Pressure Gauge	Fiebig / H. Guru

47	Foot Valve (Ball type)	Normex /Zoloto/Itap
48	SBR / EPDM Gaskets	Prabhat, Orient, Paul, Durable or approved eq.
49	C.I fittings / Specials	Electrosteel / Kapilansh/NECO
50	Flush Valves	Jaquar / Grohe / Kohler
51	Check Valve – WaferType	Advance / Danfoss / Kirloskar
52	Check Valve – Dual Plate	Advance / SKS
53	Check Valve Forged Screwed	Leader / RB / Sant / TBS / Zoloto
54	Check Valves (slim type)	Zoloto / Intervolve
55	Butterfly Valve	Itap / C&R / Audco
56	Ball Valve (15 to 40 mm)	Sant / Zoloto
57	Pressure Reducing Valve	VARIE (Vartsila) / Honeywel/Zoloto
58	Cockroach trap	Chilly
59	CI double flanged non-return valve	Kirloskar, IVC, Leader,
S. No.	Description	Approved Makes
60	Cast Iron Pipes & Fittings Manhole covers and frames	
a.	As per IS:3989 (Pipes & Fittings)	Kapilash
b.	As per IS:1729 (Manhole covers and frames)	Raj Iron Foundry Agra
c.	As per IS:1536 (CIClass LA Pipes)	IISCO / NECO /Electrosteel
61	D.I. Manhole Covers & Frames	Neco / Kapilansh
62	CILA fittings	Kartar valves & fittings
63	Suspended Manhole and Gully Trap	Patel Pattern
64	Drip Seal	ACQUA Bond / Vinod Cement Co. Chandianah
65	GI pipe sealent	Henkel - LOCTITE 55
66	Pipe clamp & supports	Chilly / Euroclamp / Easyflex / Gripple
67	D. I. Pipes	Electro Steel / Jindal / Lanco Kalahasthi

68	Copper Pipes & Fitting	Flowflex – Rajco / Viega – Max flow
69	UPVC Pipe	Ashirwad/ Ajay / Astral
70	CPVC pipes	Ashirwad/ Ajay / Astral
71	PB Pipe	Flexalen – Thermaflex / George Fisher
72	Solenoid Valve	Avcon / Danfoss
73	FRP frames, covers and gratings	Everlast / Thermodrain / Fibro cast
74	Enamel Panting of pipes etc. (low VOC)	Asian (ADCOLITE ONLY) / Goodlas Nerolac / ICI
75	Ball Float Valve	Esseti / HBD / Zoloto
76	NRV – Ball type – Sewage application	Danfoss / Silverspark
77	Y Strainer CI	Emerald / Sant / SKS / Zoloto
S.	Description	Approved Makes
78	Water Pumps	Grundfos/DP/Wilo/KSB/Kirloskar
79	Anti Vibration Mounting & Flexible Connections	Cori / Dunlop / Flexionics / Kanwal Industrial Corporation / Resistoflex /
80	Pressure Switch	Indfoss / Danfoss
81	HDPE corrugated underground Sanitary Drainage pipe	D-Rex
82	Electronic Flow Meter	Krohne (Forbes Marshall) / Rockwin
83	Level Controller & Indicator (Water)	Auto Pump / Cirrus Engineering / Elegant Controls / Technika / Techtrol
84	MH / Water Tank Plastic Steps	KGM / Patel / Pranali Industries
85	Fastner	Fisher / Hilti
86	Fire Sealant	Birla 3 M / Hilti / Promat / STI (USA)/ Fire master
87	Manhole (Prefabricated)	OK Play / Supreme
88	Temperature Sensor/ Gauge	Forbes Marshall / Danfoss / Wika
89	Pressure Vessel	ELBI / Wellmate/ Aventura

21.ADDITIONAL SPECIFICATIONS FOR AUTOMATIC FIRE ALARM & PA SYSTEM

Sub Head – IV:- SITC of Addressable Fire Alarm & PA System

The work shall be executed as per CPWD General Specifications for Electrical Works Part – I (Internal) 2013, Part – II (External) 1994, EN-54 or NFPA-72 or BS 5839-1:2013 as amended up to date relevant I.E. Rules. BIS / IEC and NBC and as per directions of Dean(IPS) . These additional specifications are to be read in conjunction with above and in case of variations; specifications given in this Additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read along with schedule of quantities for the work.

1. SCOPE OF WORK

- 1.1 These specifications shall cover the Design, Supply, Erection, Testing, and Commissioning of Intelligent Addressable Fire Alarm System.
- 1.2 Complete set of architectural and other Services drawings showing the general character of

Building construction and drawings showing the areas to be covered by the Fire Alarm System with location of detectors and other components will be submitted by Agency for the approval of the same.

- 1.3 The drawings indicate only the general scheme of requirement and the extent of work covered in this contract. The equipment and their associated works such as Cabling, etc. may be re-arranged in the space allotted subject to the approval of Dean(IPS) . It is the Contractor's responsibility to ensure that his work is coordinated with the work of other agencies/client.

2. SCHEDULE OF REQUIREMENTS

- 2.1 Tenderers are advised that the location of detectors and other accessories etc. as given in these drawings and specifications are indicative and for tenderers guidance.
- 2.2 It is the intent of these specifications to define a state-of-art integrated Fire Alarm System, which is user friendly, modular, flexible and expandable. The system is to be designed, installed, customized, tested, commissioned and supported by a local office or agent of the manufacturer by Engineers skilled in providing functional and efficient solutions to the needs of the Engineer in charge.
- 2.3 The contractor or the manufacturer of major components shall have an in-place support facility in Mumbai equipped with Competent Support Staff, Spare Parts Inventory and all the necessary Test and Diagnostic Equipment to provide support within 24 hours of any breakdowns.

- 2.4 The entire installation shall be in accordance with the requirements and stipulations of the National Building Code & CPWD specifications.
- 2.5 All system components and sub-systems are to be fault tolerant and provide satisfactory operation without damage at + 10% of the rated voltage and at + 3 Hz variation in line frequency.

3. TECHNICAL DATA

- 3.1 The Tenderer shall submit comprehensive technical information for all the equipment and material.
- 3.2 Technical catalogues and performance Tables/ Curves of all equipment and machines must be submitted with the offer.
- 3.2.1 Information given by the tenderer under chapter "SCHEDULE OF TECHNICAL DATA" is meant for general information only. In case of discrepancies between tender specifications and details given by the tenderer under chapter "SCHEDULE OF TECHNICAL DATA", the decision of Dean(IPS) will be final and binding on Contractor unless departures are indicated by the Tenderer under "SCHEDULE OF DEPARTURE FROM SPECIFICATION" as mentioned here-in-after.

4 PERFORMANCE GUARANTEE AND TESTING

- 4.1 The Contractor shall execute the work on the basis of indicative designs hereby given and accepted by Him with or without modifications or new designs submitted by him at the tender stage and accepted by Engineer in charge, as the case may be. All Variations, i.e. additions, omissions or substitutions necessitated at any time for any reason whatsoever, shall be deemed to have been accepted by the Contractor as not vitiating the performance based nature of this contract. If any such variations, irrespective of whether such variations are intended to be executed by other agencies employed by the Dean(IPS) , have any bearing on the performance of this Contract, the same shall immediately be brought to the notice of Dean(IPS) by the Contractor in writing. In any case the Contractor shall have to guarantee for due and proper performance of the works agreed to be so erected.
- 4.2 The Fire Detection installation shall be designed and guaranteed to perform as indicated in other parts of these specifications and drawings read in conjunction with statutory requirements.
- 4.3 All equipment shall be tested at manufacturer's Works **as per latest relevant specifications** or in the absence of specification approved testing methods shall be followed and Test Certificates/Reports in presence of consultant & Clients representative submitted to the Dean(IPS) .
- 4.4 In addition to the above, all equipment and systems shall be tested after installation as required by Various statutory authorities, certifying agencies and as required by various sections of these specifications.
- 4.5 The Contractor shall take full responsibility for proper operation of the entire system including debugging and proper calibration of each component and sub-system.

- 4.6 The Contractor shall leave necessary provisions required for fixing instruments, gauges, meters, etc. for testing the installation even if these are not shown on the drawings. All such instruments, services etc. needed for the tests shall be arranged by the Contractor at his own cost.
- 4.7 It is the sole responsibility of Contractor to obtain all the necessary approvals from the statutory authorities, either prior to, during or after installation as required. All tests specified herein-after
and witnessed/ approved by Dean(IPS) , may be deemed to be invalid at the option of Dean(IPS) , if the requisite, final and unconditional approvals from the concerned statutory authorities are not obtained by the Contractor.
- 4.8 The Contractor shall intimate in writing to Dean(IPS) as and when individual components of the installation are ready for tests required for further progress of erection. All such tests shall be carried out as per these specifications and/ or as directed by Dean(IPS) and recorded in the presence of Dean(IPS) or his authorized representatives.
- 4.9 On completion of erection, the contractor shall thoroughly clean all the equipment, inspect and check the entire installation for correctness and completeness and furnish a detailed report on all components of the installation to Dean(IPS) .
- 4.10 The Contractor shall intimate in writing to Dean(IPS) , the proposed date of initial startup.
- 4.11 The Contractor shall, on approval of Dean(IPS) , proceed with necessary pre-commissioning activities and tests and put the installation into initial operation and start-up during which preliminary adjustments and addressing shall be carried out.
- 4.12 Based on preliminary observations during the initial operation described above, necessary modifications/repairs/ replacements/ etc. if any shall be carried out by the Contractor to the entire satisfaction of Engineering- charge. On successful completion of initial operation, the Contractor shall proceed with trial runs.
- 4.13 Notwithstanding approval of tests or equipment or materials by Dean(IPS) etc., up to the tests in static state as described here-in above, the Contractor shall be required to perform site tests to prove correctness of ratings and performance of equipment and materials supplied and installed by him, in normal operating condition.
- 4.14 All equipment shall be capable of performing the duties specified in these specifications without damage, distortion or failure of any component.
- 4.15 The performance of various equipment individually shall not be less than quoted ratings and consumption of power shall not exceed the ratings quoted by the tendered, when tested in normal operating condition. Otherwise the equipment / material are liable for rejection.
- 4.16 All test instruments shall be calibrated for accuracy prior to taking the performance tests.

- 4.17 Failing satisfactory performance of equipment and/ or overall installation after rectification etc. as stated above, the Engineer– in-Charge, at his sole discretion, reserves the option of charging

liquidated damages for such non-performance or demand supply and installation of new installation all at no extra cost to Dean(IPS) or demand for full refund of all "On Account" made to the Contractor for that part of the work which has failed to perform, and the Contractor shall be obliged to do so as directed by the Dean(IPS) .

5 CODES & STANDARDS

- 5.1 The Fire Alarm system shall comply with latest requirements of **EN-54 or NFPA-72 or BS 5839- 1:2013 and IS standards.**

- 5.1.1 In general the system and all major components shall have **UL or FM or VDS or EN 54** .

Approval

as mentioned against respective items in the BOQ.

6 INSTALLATION:

- 6.1 Installation shall be in accordance with the local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.
- 6.2 All fire detection and alarm system devices, control panels and remote annunciators shall be flushmounted or surface mounted as per instructions of the Dean(IPS) .
- 6.3 Manual call boxes shall be suitable for surface mounting or semi-flush mounting and shall be installed at a height of not less than 1,000 mm, or more than 1200 mm above the finished floor level.
- 6.4 At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect. the factory trained representative shall demonstrate the system function and then train minimum 3 client personnel for operating the system.

7 DEMONSTRATION :

- 7.1 The Contractor shall completely check out, calibrate and test all connected hardware and software to ensure that the system performs in accordance with the approved specifications and sequences of operations submitted.
- 7.2 This demonstration shall consist of the following:
- a) Display and demonstrate each type of data entry to show site specific customizing capability.
 - b) Demonstrate parameter changes.
 - c) Demonstrate scan, update and alarm responsiveness.

8 MANUALS

The following manuals shall be provided at the time of Handing over:

- 8.1 An Operator's Manual shall contain graphic explanations of keyboard use for all operator functions specified under Operator Training.
- 8.2 Computerized printouts & Pendrive of all data file layouts including all point processing programming details, flowcharts, etc.
- 8.3 On completion of works "**As Built**" drawings for completed installation shall be prepared by the Contractor and 5 (Five) copies of the same will be supplied to the Dean(IPS) . In addition, 5 (Five) sets of all Operation Manuals, Technical Literature for the various components of equipment, Controls and Accessories installed, Recommended Spares and Services Manuals will be supplied by the Contractor to the Dean(IPS) .

9. TRAINING & HANDING OVER

- 9.1 All training by the Contractor shall utilize manuals and as-built documentation and the on-line help utility.
- 9.2 **Operator training shall include:**
 - a) Sequence of Operation review
 - b) Sign ON - Sign OFF
 - c) Selection of all displays and reports
 - d) Commanding of points, keyboard
 - e) System initialization
 - f) Trouble shooting of sensors (determining bad sensors)
 - g) Password modification
- 9.3 **Supervisor training shall include:**
 - a) Password assignment/modification
 - b) Operator assignment/modification
 - c) Operator authority assignment/modification
 - d) Point disable/enable
 - e) Terminal and data segregation/modification.

10 GUARANTEE

10.1 The contractor shall guarantee the entire Intelligent Addressable Fire Alarm system installation as per specifications both for components and for system as a whole. All equipment shall be guaranteed for **One year from the date of handing over to the IITB** against unsatisfactory performance or breakdown due to defective design, manufacture and/or installation. The installation shall be covered by the conditions that the whole installation or any part thereof found defective within one years from the date of completion shall be replaced or repaired by the contractor free of charge as decided by the Dean(IPS) .

10.2 **The guarantee shall cover the following:-**

- a) Quality, strength and performance of materials used.
- b) Safe mechanical and electrical stress on all parts under all specified conditions of Operation.
- c) Satisfactory operation during the guarantee period.
- d) Performance figures and other particulars as specified by the tenderer.

10.3 Labour to trouble shoot, repair, reprogram or replace system components shall be furnished by the contractor at no charge to the Dean(IPS) during the guarantee period.

10.4 All corrective software modifications made during guarantee period shall be updated on all user documentation.

11. MISCELLANEOUS:

11.1 The onus of incorporating the **statutory requirements as per local rules** and obtaining necessary approval for the fire alarm systems shall rest fully with the Contractor.

11.2 The installation shall be carried out using new Equipment/ Materials complying with applicable standards in a workmanship like manner. Dean(IPS) reserves the right to reject any part of installation having poor workmanship

12. SYSTEM DESCRIPTION

12.1 SCOPE OF WORK AND EXCLUSIONS

The work shall comprise entire labour including supervision and all materials necessary to make a complete installation to the entire satisfaction of the IITB. The term complete installation shall mean, not only major items of equipment covered by these specifications, but also incidental sundry components necessary for complete execution and satisfactory performance of the installation, with all labour charges, whether or not these have been mentioned in detail in the tender documents. The work shall include data entry, programming, startup test and demonstration, training of personnel for maintenance and operation, submission of construction and installation drawings and wiring diagrams, as built documents and system guarantee.

12.1.1 The Contractor's scope of work will include all items of work as per these specifications, drawings, terms and conditions of contract etc. and briefly described in schedule of quantities.

This shall include, but not be restricted to the following:-

- a) Intelligent Addressable Smoke Detectors
- b) Intelligent Addressable Thermal Detectors
- c) Intelligent Addressable Optical /Thermal type Multi-sensor Detectors
- d) Addressable Manual Call Points (Resetting Type)
- e) Microprocessor Based Modular Intelligent Addressable Main Fire Alarm Control Panel for connecting and monitoring the Fire Detectors and other devices along with necessary software for programming and configuring the system.
- f) Low /High Intensity Hooters activated from the Panel.
- g) Providing suitable compatibility in the Main Fire Alarm Control Panel for the Public Address System, audio Amplifiers, speakers & required wiring.
- h) All other works associated with above items as per specifications, drawings and conditions of contract and the Mumbai Fire Brigade requirements except those specifically excluded in Schedule of Quantities.

12.2 GENERAL DESCRIPTION OF INTELLIGENT FIRE ALARM SYSTEM

12.2.1 The detectors shall be Addressable Intelligent optical/ Thermal / multi sensor type as specified in the BOQ.

12.2.2 The number of detectors and location shall confirm to relevant standards.; Addressable intelligent multi-sensor(optical cum thermal) detectors shall be used in the general areas / lobby. Addressable intelligent heat detectors in electrical shafts. The detectors shall give the visual and audible alarm at the control Panel.

12.2.3 **Addressable Control Modules** shall be provided in suitable location for the purpose of shutting off Fire Dampers/ AC indoor units on detection of smoke within its zone and for switching-on exhaust / ventilation fans in the event of fire.

12.2.4 Monitoring modules shall be provided to monitor and address contact-type input devices like flow switch.

12.2.5 **The fire alarm panel shall operate on 240V+ 10% 50Hz.** The FAS shall also be provided with a dedicated stand by power supply system (battery and charger) capable of maintaining the system for a period of not less than 24 hours after failure of ac power supply after which sufficient battery shall remain to provide full load operation for at least 30 minutes in line with IS 2189.

12.2.6 The system should be able to detect any type of smoke, fire and heat in the respective site area.

12.3 DETAILED DESCRIPTION OF THE SYSTEM COMPONENTS:

BASIS OF DESIGN: The Fire Alarm System shall have the following features

- 12.3.1 An Intelligent Modular/ Expandable Fire Alarm System (IFAS) shall be provided to effect total control over the life safety services required in the building.
- 12.3.2 The system shall be provided with Addressable fire alarm initiating, annunciating and control devices.
- 12.3.3 The addressable and intelligent system shall be such that smoke sensors, thermal sensors, manual call points, etc., can be identified with point address.
- 12.3.4 The FAS shall be able to recognize normal and alarm conditions, below normal sensor values that reveal trouble condition, and above normal values that indicate either an alarm condition or the need of maintenance.
- 12.3.5 Read-out or address an actual detector location. The operator shall also be able to adjust alarm and alarm thresholds and other parameters for the smoke sensors.
- 12.3.6 Provide a **maintenance/pre-alert/fault alarm** capability at smoke sensors to prevent the detectors from indicating a false alarm due to dust, dirt etc.
- 12.3.7 Provide alarm verification of individual smoke sensors. Systems that perform alarm verification on a zone basis shall not be acceptable. Alarm verification shall be printable on the printer to enhance system maintenance and identify possible problem areas.
- 12.3.8 Provide local alpha-numeric point address of device and current condition of the point.
- 12.3.9 Each detector shall use state-of-the-art Microprocessor Circuitry with error, detector self- diagnostics and supervision programs.
- 12.3.10 The detection of the fire shall be taken at the detector level.
- 12.3.11 Provide outputs that are addressable, i.e. outputs shall have point address. The operator shall be able to command such points manually or assign the points to Logical Point Groups (Software Zones) for pre-programmed operation.
- 12.3.12 In the event of a fire alarm, but not in a fault condition, the following action shall be performed automatically.
 - a. The System Alarm LED on the main fire alarm control panel shall flash.
 - b. A local sounder shall be sounded.
 - c. The LCD display on the main fire alarm control panel shall indicate all information associated with Fire Alarm condition including the type of alarm point and its location within the premises.
 - d. History storage equipment shall log the information associated with the Fire Alarm Control Panel condition, along with the time and date of occurrence.

- e. All system output programs assigned via control-by-event programs that are to be activated by a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

12.4 FIRE ALARM CONTROL PANEL (FACP)

The Fire Alarm control panel shall have the following features:-

- 12.4.1 FACP shall have its own microprocessor, software and memory
- 12.4.2 The panel should be modular microprocessor based in nature and shall be of loops as per BOQ.
- 12.4.3 FACP shall supervise detection circuits and shall generate an alarm in case of abnormal conditions.
- 12.4.4 FACP shall provide general purpose inputs for monitoring such functions as low battery or AC power failure. FACP shall provide tamper protection and commendable outputs, which can operate relays or logic level devices.
- 12.4.5 Smoke/ Heat detectors shall be powered using the FACP-based smoke/Heat detection circuits. FACP shall provide for resetting smoke/heat detectors, fault-isolation and sensor loop operation. It shall be possible to mix different fire devices within the same FACP to optimize field wiring.
- 12.4.6 It shall be possible for the panel to have a loop length with different modules **offering 500 mtr. Loop length** of devices from the panel
- 12.4.7 FACP shall provide monitoring and control of one floor or area or for multiple floors or areas.
- 12.4.8 FACP shall meet the following requirements to assure the integrity and reliability of the system :
 - a. The FACP shall be UL/FM / VDS/EN 54 listed independently as a fire alarm control panel.
 - b. The FACP should have integrated power distribution module and fixed cabling done internally to guarantee a clear and tidy cable feed.
 - c. The panel should have a minimum 80 character display with white background lighting and keypad. The display should enable a flexible design of the operating menu with variable keys and message windows.
 - d. FACP should have menu Based operation.
 - e. All materials and components used in the panel are specified as per UL / VDS/FM/EN 54 or higher.
 - f. The panel should have a 230V AC power supply unit in plug-in design with rack and panel connector and a 24VDC/6A output power supply. The module should be protected against overvoltage and reverse polarity. The output voltage is monitored and regulated externally.

g. LCD display at the FACP shall be provided to indicate point in alarm or trouble. In such systems, means for manually scanning the points in trouble shall be provided and a trouble and alarm LED shall be used to indicate that there are points in alarm/trouble. The alarm/trouble LED shall only extinguish when all alarm/troubles are cleared from the loop.

h. It shall be possible to command test, reset and alarm silence from the FACP. FACP should have freely configurable detector zone displays.

12.4.9 FACP switches shall allow authorized personnel to accomplish the following :

a) Acknowledge a general alarm condition.

b) Silence the local audible alarm.

c) It shall be possible to Silence the the alarm indicating devices (hooters).

d) Reset all zones (Logical Point Group) / points, after all initiating devices have returned to normal.

e) Perform a complete operational test of the memory with a visual indication.

f) Test all panel LEDs for proper operation without causing a change in the condition of any zone (Logical Point Group)

g) Walk Test

12.4.10 The FACP shall have **Drift Compensation facility** to compensate for environment.

12.4.11 FACP shall be backed up with its built-in UPS power.

12.4.12 FACP shall be provided with following features : System Status Reports

Printer Interface

System Point Report

12.4.13 The display on FACP shall provide indication for AC Power, System Alarm, System Trouble/Security Alarm, Display Trouble and Signal Silence. This would mean that in the event of change of any logic, detector / zone sequence alteration, the operator can initiate these by use of the LCD touch pad & alpha-numeric keys on the FACP panel to reconfigure the above parameters.

12.4.14 Power supply unit of FACP shall have following characters :

i. The main power supply shall be 230 VAC \pm 10%, 50 Hz \pm 3% and shall in turn provide all necessary power of the FACP

ii. It shall provide a separate battery control module with charger.

iii. For ease of service, all wiring terminal blocks shall be plug-in type.

12.5 DETECTORS & ADDRESSABLE DEVICES

12.5.1 General features common to all detectors:

- a) Built-in-response indicator: Each detector shall incorporate indicator “LED” at the detector which shall blink in normal condition and glow steady on actuation of the detector to locate the detector which is operated while on fire. The detector shall not be affected by the failure of the response indicator lamp. The Led **should be visible from a 360 deg view**.
- b) Maintenance: All detectors shall be fitted either with plug-in system or bayonet type connections only, from the maintenance and compatibility point of view.
- c) Construction: The components of the detectors must not be damaged by static over voltage.

12.5.2 Addressable Optical/Thermal Smoke Detectors

- a) Smoke detectors shall be addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. The detectors shall be ceiling mounted type.
- b) The area covered by each smoke/heat detector shall be as per EN-54 or NFPA-72 or BS 5839- 1:2013 and IS guidelines.

12.5.3 Addressable Thermal Detectors

- a) Thermal detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops.
- b) The detectors shall use an electronic detector to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel.

12.5.4 Addressable Manual Stations

- a) Addressable manual stations shall be provided to connect to the Fire Alarm Control Panel loops.
- b) The manual stations shall on command from the Control Panel send data to the panel representing the state of the manual station.
- c) Stations shall be suitable for surface mounting or semi flush mounting.

12.5.5 Addressable Monitor Modules shall have the following features:

- a) Programming of the input normal state "open" or "closed" independently selectable for each input
- b) Pulse contact monitoring for detection of high resistance contacts
- c) Monitoring of contacts for "open" and "closed" states on lines
- d) For flush/ surface mounting in standard electrical boxes
- e) Addressing of interface either automatically or via code switch
- f) (allowing unique assignment of Installation location to address)

12.5.6 Addressable Control Module shall have the following features:

- a) Output should be electrically isolated from loop
- b) Switching of currents and voltages up to **Max of 6 A/30 V DC or 10 A at 120 V AC/ 230V AC/ 24VDC**
- c) Owner supply to interface via two-wire line (line supply)
- d) Addressing of interface either automatically or via code switch (allowing unique assignment of Installation location to address)

12.5.7 Addressable Sounder shall have the following features :

- a) The Electronic Hooters shall be compatible with the Fire detection and alarm panel offered.
- b) It shall be roof mounted or wall mount type.
- c) It shall be microprocessor based intelligent, addressable type .
- d) It shall work at the same operating voltage of detectors.
- e) It shall generate audio alarm on command from the fire detection and alarm panel.
- f) It shall be able to carry out self diagnosis and automatic device mapping.
- g) It shall be able to withstand ambient temperature upto 50 deg.C.
- h) It should be able to generate at least **3 different type of tones**

12.5.8 Response Indicators

Remote Response Indicator shall be installed outside the areas normally kept closed to identify the detectors response even if the room is locked. These indicators shall be able to indicate the status of the corresponding detectors in these areas.

12.5.9 Repeater Panel

The Microprocessor Based Fire Alarm Repeater Panel shall have the following features.

- a) It shall display events as in the main panel.
- b) It shall have features for acknowledgement, silence, reset of alarm/trouble.
- c) Navigational keys shall be available for scrolling and selecting required menu.
- d) It shall have system status LEDs.
- e) The repeater panel shall function by drawing its required power from the Main Fire alarm controlpanel or it shall have its own separate power supply unit with battery back-up.

12.5.10 PUBLIC ADDRESS CUM EMERGENCY VOICE EVACUATION SYSTEM

a) EVAC PA controller capable of adding 8 zones in the system with full DSP functionality with Minimum 8 control inputs and 8 control outputs. Built in message manager

for 100 emergency/business calls up to 60 minutes. Impedance measurement and Pilot Tone supervision for speaker line monitoring. .Frequency response (ref. 1 kHz) 50 Hz to 15 kHz .

b) 2 x 500W Class D, high efficiency amplifier. 70/100V loudspeaker output voltages, galvanically separated, 4 automatic selectable audio inputs. Audio input level limiter, RMS output power limiter, Self protection from high temperature , DC short circuit protection, Mains under voltage protection, DC supply under voltage protection, Ground fault protection, Inrush current limiter, Frequency response, ref 1 kHz 0 to - 3db at rated power 50Hz to 15kHz, signal to noise ratio (A-weighted) > 95db.

c) Call Station Multilanguage LCD display, gooseneck microphone with supervised electrets microphone, pop shield and permanent monitoring, integrated loudspeaker for system sounds. Five menu/function keys, 15 customizable function and speed dial buttons. Possible to use keys (push buttons) for Zone select, source select, level control, emergency on/off, message on/off, failure acknowledge/reset, Switching output trigger on/off or 0 to 10V, select scheduled events, scheduled event on/off. Call Station is completely supervised by system controller. Call station should have provision of programming it as a Numeric Keypad.

12.5.11 FACP Software

A brief description of the Software is given below.

- a) It shall display the alarm status of the detectors, manual call points
- b) It shall check, display and log the health of different components in the system.
- c) It shall be able to generate and print alarm status reports, fault status reports.
- d) It shall have facility for alarm acknowledgement, reset and test functions.
- e) It shall facilitate the programming of the fire detection and alarm panel and other components.
- f) It shall be possible to program and display different messages of normal, fault and alarm conditions.
- g) A back up CD with the FACP software and all the data in the system as per final configuration/programming of the FACP panel and all system components shall be provided to the IITB at the time of handing over.

12.6 12.6

12.6 Installation

- a) Installation shall be in accordance with the EN-54 / NFPA-72/BS 5839- 1:2013 and IS guidelines, local and state codes, and as recommended by the major equipment manufacturer.
- b) All fire detection and alarm system devices, control panels and remote annunciator shall be flush mounted or surface mounted as per direction given by E-in-C.

- c) Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting.
- d) Commissioning Procedure shall be carried out in a methodical sequence as follows Start-up,

Configuration, Operability adjustment, Stable operation, Final adjustment

- e) The Contractor shall finalize captured FDAS data to be recorded and the manner in which the data is to be taken in association with CPWD.

12.7 Training

- a) Training shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- b) The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

13.0 LIST OF APPROVED MAKES OF EQUIPMENT AND MATERIALS

- 13.1 The equipment and materials to be used in the execution of this contract shall be selected from the following list unless otherwise specifically agreed by Dean(IPS) .
- 13.2 The successful contractor shall prepare a list of equipment and materials selected from the approved list, proposed to be used by him for execution of the contract. Before placing orders on suppliers or delivering the equipment and materials to site, the Contractor shall obtain approval from Dean(IPS) , whose decision shall be final and binding on the Contractor.
- 13.3 Any equipment or material not specified under here but required for execution of the work shall be as per Technical Specification, of best quality, preferably with ISI approval and from a reputed manufacturer for which the prior approval of the Dean(IPS) is required.

- 14.0** Associate specialized agency shall be engaged for execution of minor component.
(Addressable fire alarm system & Public Address System Works)

**LIST OF APPROVED MAKES OF EQUIPMENT AND MATERIALS FOR
Addressable FIRE ALARM SYSTEM**

Sr. No.	Description of Item/equipment	Approved Makes
1.	Addressable Fire Detectors	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
2.	Addressable optical cum Thermal Detectors	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
3.	Addressable Thermal Detectors	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
4.	Addressable Manual call Points	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
5.	Intelligent Addressable Main Fire Alarm ControlPanel with Battery Backup/ Repeater panel/Mimic Panel	NOTIFIER-onyx series-3030E / BOSCH-FPA5000 /Honeywell-ESSER/ Siemens-FIRE FINDER
6.	Addressable Monitor Module	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
7.	Addressable Control Module	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
8.	Addressable Low Intensity Hooters /Microphone/ Amplifiers/ Speakers/ TelephoneJack/Telephone hand set	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
9.	Response indicator	NOTIFIER- onyx series / BOSCH-FPA series /Honeywell-ESSER/ Siemens-FIRE FINDER
10.	2 Core Copper Cable	Duly ISI marked: Belden/ Lapp Kabel /

		Finolex/ RRKable/ Havells
11	PVC conduit and accessories – ISI Marked	Duly ISI marked: precession/Asian/Polycab/ Pressfit
12	PA System	Bosch-Paviro/Honeywell-intevio/ Bose
13	Power Amplifier	Bosch/Honeywell/Bose
14	Speaker	Bosch/Honeywell/Bose
15	Any other material not mentioned above	Shall be got approved from the engineer –in – charge before use at site.

22.ADDITIONAL SPECIFICATIONS FOR HVAC SYSTEM

Sub Head – V:- SITC of HVAC SYSTEM.

The work shall be executed as per CPWD General Specifications for Electrical Works Part – I (Internal) 2013, Part – II (External) 1994. BIS / IEC and NBC and as per directions of Dean(IPS) . These additional specifications are to be read in conjunction with above and in case of variations; specifications given in this Additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read along with schedule of quantities for the work.

1. SCOPE OF WORK

- 1.1 These specifications shall cover the Design, Supply, Erection, Testing, and Commissioning of HVAC System. Complete set of architectural and other Services drawings showing the general character of

Building construction and drawings showing the areas to be covered by the HVAC System with location of Indoor VRF Unit like cassette, AHU and other components will be submitted by Agency for the approval of the same.

- 1.2 The drawings indicate only the general scheme of requirement and the extent of work covered in this contract. The equipment and their associated works such as Cabling, etc. may be re-arranged in the space allotted subject to the approval of Dean(IPS) . It is the Contractor's responsibility to ensure that his work is coordinated with the work of other agencies/client.

2. SCHEDULE OF REQUIREMENTS

- 2.1 Tenderers are advised that the location of detectors and other accessories etc. as given in these drawings and specifications are indicative and for tenderers guidance.
- 2.2 It is the intent of these specifications to define a state-of-art HVAC, which is user friendly, modular, flexible and expandable. The system is to be designed, installed, customized, tested, commissioned and supported by a local office or agent of the manufacturer by Engineers skilled in providing functional and efficient solutions to the needs of the Engineer in charge.
- 2.3 The contractor or the manufacturer of major components shall have an in-place support facility in Mumbai equipped with Competent Support Staff, Spare Parts Inventory and all the necessary Test and Diagnostic Equipment to provide support within 24 hours of any breakdowns.
- 2.4 The entire installation shall be in accordance with the requirements and stipulations of the National Building Code & CPWD specifications.

- 2.5 All system components and sub-systems are to be fault tolerant and provide satisfactory operation without damage at + 10% of the rated voltage and at + 3 Hz variation in line frequency.

3. TECHNICAL DATA

- 3.1 The Tenderer shall submit comprehensive technical information for all the equipment and material.
- 3.2 Technical catalogues and performance Tables/ Curves of all equipment and machines must be submitted with the offer.
- 3.2.1 Information given by the tenderer under chapter "SCHEDULE OF TECHNICAL DATA" is meant for general information only. In case of discrepancies between tender specifications and details given by the tenderer under chapter "SCHEDULE OF TECHNICAL DATA", the decision of Dean(IPS) will be final and binding on Contractor unless departures are indicated by the Tenderer under "SCHEDULE OF DEPARTURE FROM SPECIFICATION" as mentioned here-in-after.

4 PERFORMANCE GUARANTEE AND TESTING

- 4.1 The Contractor shall execute the work on the basis of indicative designs hereby given and accepted by Him with or without modifications or new designs submitted by him at the tender stage and accepted by Engineer in charge, as the case may be. All Variations, i.e. additions, omissions or substitutions necessitated at any time for any reason whatsoever, shall be deemed to have been accepted by the Contractor as not vitiating the performance based nature of this contract. If any such variations, irrespective of whether such variations are intended to be executed by other agencies employed by the Dean(IPS) , have any bearing on the performance of this Contract, the same shall immediately be brought to the notice of Dean(IPS) by the Contractor in writing. In any case the Contractor shall have to guarantee for due and proper performance of the works agreed to be so erected.
- 4.2 The HVAC installation shall be designed and guaranteed to perform as indicated in other parts of these specifications and drawings read in conjunction with statutory requirements.
- 4.3 All equipment shall be tested at manufacturer's Works **as per latest relevant specifications** or in the absence of specification approved testing methods shall be followed and Test Certificates/
Reports submitted to the Dean(IPS) .
- 4.4 In addition to the above, all equipment and systems shall be tested after installation as required by Various statutory authorities, certifying agencies and as required by various sections of these specifications.
- 4.5 The Contractor shall take full responsibility for proper operation of the entire system including debugging and proper calibration of each component and sub-system.

- 4.6 The Contractor shall leave necessary provisions required for fixing instruments, gauges, meters, etc. for testing the installation even if these are not shown on the drawings. All such instruments, services etc. needed for the tests shall be arranged by the Contractor at his own cost.
- 4.7 It is the sole responsibility of Contractor to obtain all the necessary approvals from the statutory authorities, either prior to, during or after installation as required. All tests specified herein-after and witnessed/ approved by Dean(IPS) , may be deemed to be invalid at the option of Engineer-in- charge, if the requisite, final and unconditional approvals from the concerned statutory authorities are not obtained by the Contractor.
- 4.8 The Contractor shall intimate in writing to Dean(IPS) as and when individual components of the installation are ready for tests required for further progress of erection. All such tests shall be carried out as per these specifications and/ or as directed by Dean(IPS) and recorded in the presence of Dean(IPS) or his authorized representatives.
- 4.9 On completion of erection, the contractor shall thoroughly clean all the equipment, inspect and check the entire installation for correctness and completeness and furnish a detailed report on all components of the installation to Dean(IPS) .
- 4.10 The Contractor shall intimate in writing to Dean(IPS) , the proposed date of initial startup.
- 4.11 The Contractor shall, on approval of Dean(IPS) , proceed with necessary pre-commissioning activities and tests and put the installation into initial operation and start-up during which preliminary adjustments and addressing shall be carried out.
- 4.12 Based on preliminary observations during the initial operation described above, necessary modifications/repairs/ replacements/ etc. if any shall be carried out by the Contractor to the entire satisfaction of Engineering- charge. On successful completion of initial operation, the Contractor shall proceed with trial runs.
- 4.13 Notwithstanding approval of tests or equipment or materials by Dean(IPS) etc., up to the tests in static state as described here-in above, the Contractor shall be required to perform site tests to prove correctness of ratings and performance of equipment and materials supplied and installed by him, in normal operating condition.
- 4.14 All equipment shall be capable of performing the duties specified in these specifications without damage, distortion or failure of any component.
- 4.15 The performance of various equipment individually shall not be less than quoted ratings and consumption of power shall not exceed the ratings quoted by the tendered, when tested in normal operating condition. Otherwise the equipment / material are liable for rejection.
- 4.16 All test instruments shall be calibrated for accuracy prior to taking the performance tests.

- 4.17 Failing satisfactory performance of equipment and/ or overall installation after rectification etc. as stated above, the Engineer– in-Charge, at his sole discretion, reserves the option of charging

liquidated damages for such non-performance or demand supply and installation of new installation all at no extra cost to Dean(IPS) or demand for full refund of all "On Account" made to the Contractor for that part of the work which has failed to perform, and the Contractor shall be obliged to do so as directed by the Dean(IPS) .

5 CODES & STANDARDS

- 5.1 The HVAC system shall comply with latest requirements of National building code and CPWD Specification 2017.

- 5.2 In general the system and all major components shall have **as per CPWD specification.**

- 5.3 ASHRAE Standard 15-2010, safety standard for refrigeration system. [ASHRAE POCKET GUIDE (8TH EDITION) –PAGE NO.158]

- 5.4 ASHRAE POCKET GUIDE (8TH EDITION) –PAGE NO.84-86, TABLE NO.5.2

- 5.5 SMACNA

- 5.6 [ASHRAE POCKET GUIDE (8TH EDITION) –PAGE NO.127, TABLE NO 9.10]

- 5.7 ASHRAE 62 (Ventilation for acceptable indoor air quality)

6 INSTALLATION:

- 6.1 Installation shall be in accordance with the local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.
- 6.2 All HVAC equipment shall be flush mounted or surface mounted as per instructions of the Engineer-in-charge.
- 6.3 At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

7 DEMONSTRATION :

- 7.1 The Contractor shall completely check out, calibrate and test all connected hardware and software to ensure that the system performs in accordance with the approved specifications and sequences of operations.
- 7.2 This demonstration shall consist of the following:
- Display and demonstrate each type of HVAC equipment for their functioning.
 - Demonstrate parameter changes in respect of cooling/ heating requirement.

8 MANUALS

The following manuals shall be provided at the time of Handing over:

- 8.4 An Operation Manual of manufacture of equipment.
- 8.5 On completion of works "**As Built**" drawings for completed installation shall be prepared by the Contractor and 5 (Five) copies of the same will be supplied to the Dean(IPS) . In addition, 5 (Five) sets of all Operation Manuals, Technical Literature for the various components of equipment, Controls and Accessories installed, Recommended Spares and Services Manuals will be supplied by the Contractor to the Dean(IPS) .

9. TRAINING & HANDING OVER

- 9.4 All training by the Contractor shall utilize manuals and as-built documentation and the on-line help utility.
- 9.5 Operator training shall include:
- a) Sequence of Operation review
 - b) Sign ON - Sign OFF
 - c) Selection of all displays and reports
 - d) Commanding of points, keyboard
 - e) System initialization
 - f) Trouble shooting of HVAC equipment's.

10 GUARANTEE

- 10.1 The contractor shall guarantee the entire HVAC system installation as per specifications both for components and for system as a whole. All equipment shall be guaranteed for **One year from the date of handing over to the IITB** against unsatisfactory performance or breakdown due to defective design, manufacture and/or installation. The installation shall be covered by the conditions that the whole installation or any part thereof found defective within one years from the date of completion shall be replaced or repaired by the contractor free of charge as decided by the Dean(IPS) .
- 10.2 **The guarantee shall cover the following:-**
- a) Quality, strength and performance of materials used.
 - b) Safe mechanical and electrical stress on all parts under all specified conditions of Operation.
 - c) Satisfactory operation during the guarantee period.
 - d) Performance figures and other particulars as specified by the tenderer.
- 10.3 Labour to trouble shoot, repair, reprogram or replace system components shall be furnished by the contractor at no charge to the Dean(IPS) during the guarantee period.
- 10.4 All corrective software modifications made during guarantee period shall be updated on all user documentation.

11. MISCELLANEOUS:

- 11.1 The onus of incorporating the **statutory requirements as per local rules** and obtaining necessary approval for the HVAC systems shall rest fully with the Contractor.
- 11.2 The installation shall be carried out using new Equipment/ Materials complying with applicable standards in a workmanship like manner. Dean(IPS) reserves the right to reject any part of installation having poor workmanship.

12. SYSTEM DESCRIPTION

12.1 SCOPE OF WORK AND EXCLUSIONS

As per CPWD General specification of HVAC.

Unless otherwise indicated in Schedule of Quantities and drawings, the Contractor's scope of work will exclude only the following items of work and services, which will be arranged by the Engineer-in-charge

13.0 Associate specialized agency shall be engaged for execution of minor component.(HVAC System Works)

VARIABLE REFRIGERANT FLOW / VOLUME

General Description

1. All Variable Refrigerant Volume Air Conditioners shall be totally Factory assembled, charged with refrigerant, wired, piped and tested at the factory by OEM.
2. The System shall comprise of Air-Cooled scroll, rotary, inverter / digital compressors type Outdoor units, and a variety of indoor units connected by Common Refrigerant Piping, ref nets, piping, etc. and Power and Control Cabling.
3. All bolts, nuts, screws, washers, plates, etc. and all other fittings on all VRV system components shall be plated or passivated to resist corrosion.

VRV/ VRF System

1. The VRV System shall provide stable, trouble free and safe operations, and provide flexibility in operation of Indoor Units with independent control of each Indoor Unit, including stepless partial operation.
2. It shall be possible to switch on only those Indoor Units that require Cooling in individual Areas, zones or shops.

3. The capacity of Indoor and Outdoor Units shall be matched, sleeplessly, and shall include multi Compressor cut off / speed control, by pass or any other means of capacity Control for stable operations of System.
4. The System shall be capable of automatic operation even with varying Outdoor and Indoor requirements and make up of low Outdoor Temperatures to achieve lower Power Consumption, without any manual adjustments.
5. All Systems shall be modular in nature and easily upgradeable / inter connectable for larger capacities.
6. Units shall have hermetically sealed Scroll Compressors, to ensure high EER.
7. The refrigerant gas shall be necessarily R 410a
8. All Units shall be Air Cooled type.
9. The System shall incorporate all required controls for parallel operation of Compressors, Condensers, Fans, and Indoor Units as well as Refrigerant liquid control.

Power Supply

1. All the outdoor units of the system shall be suitable to operation at 415 V, 50 Hz, 3 phase, 4 wire AC supply whereas all indoor units shall suitable for operation at 230 V, 50 HZ single Phase supply.

Outdoor Units

The Condenser coil shall be Air-cooled type with copper tubes and aluminium fins. The condenser coils shall be of adequate size and shall have an integral sub cooler circuit for sub cooling of the liquid. Condenser coil shall have a refrigerant side working pressure of 400 psig with anti-corrosive treatment. Condenser shall have multiple piping and cabling connection option. Pump down facility should be provided in the refrigerant system by providing good quality hand / shut off valves to avoid loss of Refrigerant gas during maintenance. The condenser fans shall be propeller type, with aluminium blades, low speed, and low vibration levels and quite in operation with IP 55 Protection. All the compressors of the outdoor units must be hermetically sealed scroll type. Each module of outdoor unit must have separate 1 No. of inverter compressor, suitable to operate at heat load proportional to indoor requirement. "Anti-Corrosive" treatment (Blue Fins) for Al fins of Condenser Coils is mandatory and shall carry warranty of at least Five (5) years. The treatment should be suitable for areas of high pollution and salt laden air. The outdoor units must be suitable for more than 150 Meter Refrigerant piping between outdoor unit & the farthest indoor units and total piping of 300 Meter for all the indoor units. Allowable level difference between outdoor unit & indoor units shall be 50 Meter in case of outdoor unit on top & 40 Meter in case of outdoor unit at bottom. Allowable level difference between various indoor units connected to one outdoor unit shall be up to 15 m. Back up operation, in case of failure of one of the compressors of outdoor unit, for single module outdoor units or failure of one of the modules in case of multiple modules outdoor units shall be possible. The VRV outdoor unit shall always be supplying at least 33% of back up operation, of the

full load capacity. The outdoor unit shall employ system of equal run time for all the compressors, inverter or on/ off type, within each outdoor unit – Single Module or Multi Module.

Starter for the Outdoor Unit compressor shall “Direct online” type. Inverter compressor of the unit shall start first & at the minimum frequency, to reduce the inrush current during starting.

Refrigerant control in the outdoor unit shall be through Electronic Expansion Valve. Complete refrigerant circuit, oil balancing/ equalizing circuit shall be factory assembled & tested.

The outdoor units shall conform to Technological Guideline for Harmonic Suppression – JAEF 9702-1995. High Harmonic Environmental Target Level for Power Distribution system shall be 5%.

Safety Devices to be provided such as High-Pressure Switch, Overload protector, Fusible plug, Overload relay etc. Should be part of standard fitments in VRV systems.

ODU shall have all variable speed compressors with its controls to work at 415 ± 20 Volts with all necessary protections for overload, voltage fluctuations.

Indoor Units

Hiwall:

With decorative look to match with the interior Layout of Corded Remote type complete In PVC construction. Evaporating unit comprising of DX Cooling coils, blower, electric motor, insulated sandwiched drain Tray, and junction box for electrical connections, 20-micron HDPE washable filter etc.

Ducted Unit:

The cooling coils shall be made of Copper Tubing having extended aluminium fins. The tubes shall be mechanically expanded for positive bonding between tubes and fins. The cooling coil circuit shall be fed with liquid refrigerant through the expansion device and distributor. The blower shall be statically and dynamically balanced and designed for silent operation at required airflow rates against required static pressure. The filters shall be washable synthetic media type arranged for convenient cleaning and replacement. The drain pan shall be fabricated out of heavy steel sheet. Insulated with expanded polyethylene sheet. The casing shall be of heavy gauge GI, duly powder coated for weather protection.

Cassette:

The unit must have in built drain pump, suitable for vertical lift of 750 mm. The unit casing shall be Galvanized Steel Plate. Indoor unit must be insulated with sound absorbing thermal insulation material, Polyurethane foam. The noise level of unit at the highest operating level shall not exceed 45 dB (A), at a vertical distance of 1.5 m from the grille of the unit. Unit shall have provision of connecting fresh air without any special chamber & without increasing the total height of the unit (288 mm maximum). The unit shall be

supplied with suitable decorative panel.

The unit shall be supplied with Resin Net filter with Mold Resistance. The filter shall be easy to remove, clean & reinstall. The unit will be connected in series to a suitable outdoor unit & it must be possible to operate the unit independently, through corded/ cordless remote specified in the “Bill of quantities”.

The unit shall be supplied with following from the factory

- Operation Manual
- Installation Manual
- Paper pattern for installation
- Drain hose/ Clamp metal/ Washer fixing plate/ Sealing pads/ Clamps/ Screws/
- Washer for hanging bracket/ Insulation for fitting

Refrigerant Piping & Insulation:

All refrigerant piping shall be in high grade copper 18 Gauge (1.21 mm) including all connections, Tees, Reducers, etc. Required nos. of Refrigerant joints with insulation should be provided for uniform flow of refrigerant through all Indoor units. All refrigerant piping shall be insulated with 19mm/13mm thickness of Closed Cell nitrile rubber Insulation material. All joints on the insulation should be sealed with good quality sticking compound. All joints should be covered with 2” wide Aluminium tape. Entire Refrigerant piping inside& outside the building should be installed on the wall / ceiling /Terrace/ shaft Laid on the Factory manufactured Perforated 16 G GI Cable Trays.Sufficient valving shall be included to allow compressors to be removed for service & to allow the refrigerant to be pumped in to and contained in the condenser. The unit shall be equipped with a liquid line shut off valve, filter drier, liquid line sight glass, and solenoid valve & insulation where required to prevent condensation forming.

Pressure Testing & Evacuation

After brazing of the complete piping, the next step is to the test the system for leakages if any. Complete leak testing and proper evacuation is a must as non-condensable gases and moisture in the system will have ill-effects on system behaviour as below:

- Pressure in the system rises.
- Operating current rises.
- Cooling or heating performance drops drastically.
- Moisture in the system may freeze and block the small opening of valves and capillaries.
- Moisture in the system reacts with oil in presence of refrigerant and forms organic and inorganic acids, which in turn react with copper. Copper gets deposited on hot surfaces like bearing surface of compressor shaft, discharge side of scroll set etc. and can damage the compressor severely.

- Therefore, the tubing connecting the indoor unit and outdoor unit must be pressure tested and evacuated properly to expel the non-condensable gases and moisture from the system.

Pressure Testing

Check visually that all piping is properly brazed.

Note that all service valves of the outdoor unit are closed at this stage.

- Use a TEE connection for connecting both liquid and suction service valve.
- The Oil balance tube leak test is not necessary if only one outdoor unit is installed.
- Add a Pressure Test Oil Equalizer line also in case of multiple ODU's installation.
- Always pressurize both suction and liquid side of piping system.
- Pressurize the system in steps of 100, 200, 300, 400 and 550 psig. Check for any leak at each step using soap bubbles. Pressure must be within 2 psig after two hours.
- Do a leak-test of all joints of the tubing; any bubbles indicate a leak. Wipe off the soap with a clean cloth after a leak test.
- Keep pressurized for 12-24 hours and check for any drop in pressure.
 - After the system is found to be free of leaks, release the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder.
- When the system pressure is reduced to normal, disconnect the hose from the cylinder.

Drain Piping:

Condensate from the Indoor unit shall be drained through properly installed drain piping designed to prevent any accumulation of condensate in the drain pan. Drain piping shall be made of rigid PVC pipe of 6 Kg/cm sq. pressure rating with water tight threaded connections & 9 mm thick nitrile rubber insulation. Leading from the Indoor unit to a suitable drain point. Complete drain piping shall be made leak proof and water tight by means of precise installation and the use of leak proof sealant / adhesives.

TREATED FRESH AIR UNIT

SCOPE

The scope of this section comprises of the supply of double-skin "Treated Fresh Air Units conforming to the following specifications. The manufacturer or their principals shall have at least 10 years of designing and manufacturing experience directly in the product i.e. Treated Fresh Air unit.

TYPE

The Treated Fresh Air units shall be two stream units in double skin construction, comprising of supply air section. The supply air section shall include the following sections if defined in the Bill Of Quantities: Cooling/Heating Section, Prefilter section, MERV-13 section, Damper Section, Inspection Section. Option shall be available for Digital Air Flow Measurement, Pressure Transmitter and Filter Cleaning Alarm if required in the Bill of Quantities.

CAPACITY

The Treated Fresh Air units shall be of such capacities and static pressures as mentioned in the Bill of Quantities.

CASING

The unit should be devoid of any welded construction and should be of cabinet type. All the frames should be assembled using glass fibre reinforced nylon joints/corners to make a self-supporting frame. **The Casing leakage shall be in accordance with relevant EUROVENT standard that is CLASS B.**

The panels shall be of double skin construction with inner casing 0.8mm Galvanized Steel Sheet and outer casing 0.8 mm preplasticised precoated GI Sheet. The Insulation material 43 mm thick, CFC free puff shall be injected between two galvanized sheets.

A safety “trip switch” shall be provided to automatically cutoff the electrical supply to the fan when access door is opened. The motor shall be energy efficient & TEFC (IP55) 3-phase squirrel cage connected to an electrical panel consisting of starters etc.

The Inspection and access panels shall be hinged type. The hinges shall be casted, powder coated Zinc alloy. Flushed Locks and Handles shall be of glass fibre reinforced polyamide. Other panels will be screwed on to the frame with sealant and soft rubber gasket thus making the joints air tight. All screws used for panel fixing shall be covered with PVC caps.

Special hollow gaskets and seals shall be used on inspection doors and to create separation between the airstreams to ensure negligible air leakage and mixing

The entire casing shall be mounted on electro galvanized channel frame work with level screws. Condensate drain pan shall be fabricated from 18 g GSS/SS construction.

SUPPLY AIR SECTION

The supply air section shall comprise of the following:

FAN SECTION

The fan shall be centrifugal forward curved or backward curved, double inlet double width type. The impeller and the fan casing shall be made of hot galvanized sheet steel. The impeller shall be mounted on a solid shaft supported to housing with angle iron frame and pillow block heavy duty ball bearing. The impeller shall be statically and dynamically balanced. The fan shall be selected such that unit noise level is less than 85 db. Fan housing and motor shall be mounted on a common galvanized steel or aluminum block base which can be drawn out from side for ease of maintenance. A quarter pin lock arrangement between the slide and guide pin lock arrangement between Fan and TFA outlet should be provided.

MOTOR AND DRIVE

Fan motor shall be energy efficient and suitable for 415 \pm 10% volts, 50 cycles, 3 phase squirrel cage, totally enclosed fan cooled with IP – 55 protection & IE-3 / IE-4. Motor shall be designed for quiet operation. Drive shall be provided through belt – drive arrangement. Belts will be of oil resistant type.

FILTER SECTION

The filter section shall be normally designed for deep folded disposable synthetic prefilters for Class EU3. The filter elements shall be mounted on rails and shall be easily pulled out for replacement. The rails shall be provided with efficient gaskets to minimize the risk of leakage. If mentioned in the Bill Of Quantities the section shall be designed to include filters upto class EU 8 .

DAMPER SECTION

Damper section shall contain a built in damper of aluminum profile with leakage class III. The damper blades shall be connected with plastic gear wheels with a gasket of silicon rubber to produce tightness between the blades.

COOLING COIL SECTION

The cooling coil section shall be available in two options as below, and shall be selected based on the details mentioned in the Bill Of Quantities. Upto 8 row deep - long

The cooling coil section shall be suitable for DX type.

SHEET METAL WORK

OPTION – I (FACTORY FABRICATION AS PER SMACNA STANDARDS)

1. SCOPE

The scope of this section comprises supply fabrication, installation and testing of all sheet metal / aluminium ducts, supply, installation, testing and balancing of all grilles, registers and diffusers. All to be in accordance with these specifications and the general arrangement shown on the Drawings

2. DUCT MATERIALS

1. RAW MATERIALS

Galvanizing shall be Class VII – light coating of zinc, nominal 180gm/sq.m surface area and Lock Forming Quality prime material along with mill test certificates. In addition, if deemed necessary, samples 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.

2. GAUGES, BRACING BY SIZE OF DUCTS

All ducts shall be fabricated from galvanized steel / aluminium of the following thickness, as indicated as below:

1.2.2.1 For Ducts with external SP upto 250 Pa (To be used for Hotels & Commercial Projects)

Rectangular Ducts G. S.	Pressure 250 Pa		
	Duct Section Length 1.2 m (4 ft)		
Maximum Duct Size	Gauge	Joint Type	Bracing Spacing
1–750 mm	26	C & S/ SS	Nil
751 – 1000 mm	26	4 Bolt Transverse Duct Connector- (TDC) / Slip-on E	Nil
1001 – 1200 mm	24	4 Bolt TDC / Slip-on E	Nil
1201 – 1500 mm	24	4 Bolt TDC / Slip-on F	Nil
1501 – 1800 mm	22	4 Bolt TDC / Slip-on H	Nil
1801 – 2100 mm	20	4 Bolt TDC / Slip-on I	Zeebar Stiffener 1-S
2101 – 2700 mm	18	4 Bolt TDC / Slip-on I	Zeebar Stiffener 1-S

OR

1.2.2. For Ducts with External SP upto 500 Pa (For Hospital & Clean room jobs, where AHU SP is specified as 75 mm and above. Not Suitable for OTs)

Rectangular Ducts G. S.	External Pressure 500 Pa		
	Duct Section Length 1.2 m (4 ft)		
Maximum Duct Size	Gauge	Joint Type	Bracing Spacing
1–600 mm	26	C & S/ SS	Nil

601-750 mm	26	4 Bolt Transverse Duct Connector- (TDC) / Slip-on E	Nil
751-1000 mm	24	4 Bolt TDC / Slip-on F	Nil
1001-1200 mm	22	4 Bolt TDC / Slip-on G	Nil
1201-1300 mm	20	4 Bolt TDC / Slip-on H	Nil
1301-1500 mm	18	4 Bolt TDC / Slip-on H	Zeebar Stiffener 1-S
1501-1800 mm	18	4 Bolt TDC / Slip-on I	Zeebar Stiffener 1-S
1801-2100 mm	18	4 Bolt TDC / Slip-on J	Zeebar Stiffener 2-S
2101-2250 mm	18	4 Bolt TDC / Slip-on J	Zeebar Stiffener 2-S
2251-2400 mm	18	4 Bolt TDC / Slip-on J	Zeebar Stiffener 2-S
2401-2700 mm	18	4 Bolt TDC / Slip-on J	Zeebar Stiffener 2-S

'C'-cleat; 'S'-S cleat; 'SS'-Standing S cleat;

*Distance of reinforcement/bracing from each joint. Bracing material to be same as of material used for joining of duct sections.

FOR ALUMINIUM DUCTS MATERIAL SHALL BE ONE COMMERCIAL GAUGE HIGHER WITH 22 G AS MINIMUM

3. FABRICATION STANDARDS & EQUIPMENT

All duct construction and installation shall be in accordance with SMACNA standards. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

1. Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, for required duct rigidity and leakage free characteristics. No longitudinal seams permitted along any face side of the duct.

2. All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.
3. All edges to be machine treated using lock formers, flanges and rollers for turning up edges.

4. DUCT CONSTRUCTION

All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes.

Ducts so identified on the Drawings shall be acoustically lined and insulated from outside 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. The fabricated duct dimensions should be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps. Ducts shall be straight and smooth on the inside with longitudinal seams shall be airtight and at corners only which shall be either Pittsburgh or snap button as per SMACNA practice, to ensure airtightness. All ducts up to 75cms width within conditioned spaces shall have slip and drive (C & S/SS) joints. The internal ends of slip joints shall be in the direction of airflow. Care should be taken to ensure that S/SS Cleats are mounted on the longer side of the duct and Cleats on the shorter side. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint. Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Air-turns (vaness) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence. 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 ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing. All sheet metal connection, partitions and plenums, required to confine the flow of air to and through the filters and fans, shall be constructed of 18 gauge GSS / 16gauge aluminium, thoroughly stiffened with 25mm x 25mm x 3mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Access doors shall be not less than 45cm x 45cm in size. Plenums shall be shop/factory fabricated panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards GS sheet and riveting shall be done from outside. Self-adhesive Neoprene rubber / UV resistant PVC foam lining 5mm nominal thickness instead of felt, shall be used between duct flanges and between duct supports in all ducting installation.

5. INSTALLATION PRACTICE

All ducts shall be installed generally as per tender drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor: 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

b) 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 conduits, the ducts shall be transformed, divided or curved to one side (the required area being maintained) all as per the site requirements. 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 owner's site representative. All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of galvanized steel rods and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel rod under ducts. The spacing between supports should be not greater than 2.0 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats or fully threaded galvanized rods can be screwed into the anchor fasteners. 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 be 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 contractor's work in the building. Where ducts pass through brick or masonry openings, it shall be provided with 25mm thick TF quality expanded polystyrene around the duct and totally covered with fire barrier mortar for complete sealing. All ducts shall be totally free from vibration under all conditions of operation. Whenever ductwork is connected to fans, air handling units or blower coil units that may cause vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge. Flexible connections shall be constructed of fire retarding flexible heavy canvas sleeve at least 10cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both sides of the flexible connection. The flexible connection shall be suitable for pressure at the point of installation.

Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

6. DAMPERS

a. Dampers: All duct dampers shall be opposed blade louver dampers of robust 16 G GSS construction and tight fitting. The design, method of handling and control shall be

suitable for the location and service required.

b. Dampers shall be provided with suitable links levers and quadrants as required for their proper operation. Control or setting device shall be made robust, easily operable and accessible through suitable access door in the duct. Every damper shall have an indicating device clearly showing the damper position at all times.

c. Dampers shall be placed in ducts at every branch supply or return air duct connection, whether or not indicated on the Drawings, for the proper volume control and balancing of the air distribution system.

7. FIRE DAMPER

a. Whenever a supply/return duct crosses from one fire zone to another, it shall be provided with approved fire damper of at least 1½ hour fire rating as per UL555/1995 tested by CBRI. This shall be curtain type fire damper.

b. Fire damper blades shall be one piece folded high strength 16 gage galvanized steel construction. In normal position, these blades shall be gathered and stacked at the frame head providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through fusible link of temp 70o C.

c. In case of fire, the intrinsic energy of the folded blades shall be utilized to close the opening. The thrust of the suddenly released tension shall instantly drive the blades down and keep it down without the use of springs, weights or other devices subject to failure.

d. Fire damper sleeves and access doors shall be provided within the duct in accordance with the manufacturer's recommendation.

e. The contractor shall also furnish to the Owner, the necessary additional fusible links (spares), as recommended by the manufacturer, at the time of commissioning of the installation.

8. SUPPLY AND RETURN AIR GRILLES

Supply & return air grilles shall be of either steel or aluminium sections as specified in schedule of quantities. Steel construction registers shall have primer Coat finish whereas extruded aluminium grilles / registers shall be either Anodized or Powder Coated as specified in Schedule of Quantities. These registers shall have individually adjustable louvers both horizontal and vertical. Supply air registers shall be provided with key operated opposed blade extruded aluminium volume control damper anodized in matt black shade.

The grilles / registers shall be suitable for fixing arrangement having concealed screws as approved by Architect. Linear continuous supply cum return air register shall be extruded aluminium construction with fixed horizontal bars at 15 Deg. inclination & flange on both sides only (none on top & bottom). The thickness of the fixed bar louvers shall be minimum 5.5 mm in front and 3.8 mm in rear with rounded edges. Flanges on the two sides shall be 20 mm/30 mm wide as approved by Architect. The grilles shall be suitable for concealed fixing. Volume control dampers of extruded aluminium anodized in black colour shall be provided in supply air duct collars. For fan coil units horizontal fixed bar grilles as described

above shall be provided with flanges on four sides, and the core shall be & suitable for clip fixing, permitting its removal without disturbing the flanges.

a. All registers shall be selected in consultation with the Architect. Different spaces shall require horizontal or vertical face bars, and different width of margin frames. These shall be procured only after obtaining written approval from Architect for each type of register.

b. All registers shall have a soft continuous rubber/foam gasket between the periphery of the register and the surface on which it has to be mounted. The effective area of the registers for air flow shall not be less than 66 percent of gross face area.

c. Registers specified with individually adjustable bars shall have adjustable pattern as each grille bar shall be pivot able to provide pattern with 0 to +45-degree horizontal arc and up to 30-degree deflection downwards. Bars shall hold deflection settings under all conditions of velocity and pressure.

d. Bar longer than 45 cm shall be reinforced by set-back vertical members of approved thickness.

e. All volume control dampers shall be anodized aluminium in mat black shade.

f. In case of continuous grilles / diffusers, dummy grilles shall be blanked-off using GI sheet duly painted black.

g. All square / rectangular diffusers, slot diffusers to have insulated plenum installed above dampers from OEM factory & not to be constructed at site.

9. DOCUMENTATION & MEASUREMENTS FOR DUCTING

All ducts fabricated and installed should be accompanied and supported by proper documentation viz:

a) Bill of material/Packing list for every duct section supplied.

Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct gauge-wise.

Each and every duct piece to have a tag number, which should correspond to the serial number, assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement and verification. Unless otherwise specified, measurements for ducting for the project shall be on the basis of Centreline measurements described herewith Ductwork shall be measured on the basis of external surface area of ducts. Duct measurements shall be taken before application of the insulation. The external surface area shall be calculated by measuring the perimeter comprising overall width and depth, including the corner joints, in the centre of each duct section, multiplying with the overall length from flange face to flange face of each duct section and adding up areas of all duct sections. Plenums shall also be measured in a similar manner. For tapered rectangular ducts, the average width and depth shall be considered for perimeter, whereas for tapered circular ducts, the diameter of the section midway between large and small diameter shall be adopted, the length of tapered duct

section shall be the centreline distance between the flanges of the duct section. For special pieces like bends, tees, reducers, branches and collars, mode of measurement shall be identical to that described above using the length along the Centreline.

The quoted unit rate for external surface of ducts shall include all wastage allowances, flanges and gaskets for joints, nuts and bolts, hangers and angles with double nuts for supports, rubber strip 5mm thick between duct and support, vibration isolator suspension where specified or required, inspection chamber/access panel, splitter damper with quadrant and lever for position indication, turning vanes, straightening vanes, and all other accessories required to complete the duct installation as per the specifications. These accessories shall NOT be separately measured nor paid for.

b) Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith:

- I. Grilles and registers - width multiplied by height, excluding flanges. Volume control dampers shall form part of the unit rate for registers and shall not be separately accounted.
- II. Fire dampers - shall be measured by their cross-sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary collars and flanges for mounting, inspection pieces with access door, electrical actuators and panel. No special allowance shall be payable for extension of cross section outside the air stream.
- III. Flexible connection - shall be measured by their cross-sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary mounting arrangement, flanges, nuts and bolts and treated-for-fire requisite length of canvas cloth.

9. TESTING AND BALANCING

After the installation of the entire air distribution systems completed in all respects, all ducts shall be tested for air leaks by visual inspection as per SMACNA standards. The entire air distribution system shall be balanced using an anemometer. Measured air quantities at fan discharge and at various outlets shall be identical to or less/excess than 5 percent in excess of those specified and quoted. Branch duct adjustments shall be permanently marked after air balancing is completed so that these can be restored to their correct position if disturbed at any time. Complete air balance report shall be submitted for scrutiny and approval, and four copies of the approved balance report shall be provided with completion documents.

OPTION- II (SITE FABRICATION)

AIR DISTRIBUTION

(AS PER “BIS” STANDARD)

1 SCOPE

The scope of this section comprises supply fabrication installation and testing of all sheet metal / aluminium 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.

2 DUCT MATERIALS

All ducts shall be fabricated from galvanized steel sheets /aluminium sheets of the following thickness as indicated in Schedule of Quantities.

G S S

Rectangular ducts up to 75 cm	24 gauge
Rectangular ducts 76 to 150 cm	
And all Oval ducts.	22 gauge
Rectangular ducts 151 to 225 cm	20 gauge
Rectangular ducts greater than 225 cm	18 gauge

Sheet metal ducts shall be fabricated out of galvanized steel sheets. Fabrication of ducts shall be through well-conditioned Triplex lock former or multiple lock formers, conforming to relevant BIS Codes. Sheets used shall be produced by Hot Dip Process and galvanizing shall be Class VII- Light Coating of zinc, Nominal 180 gm /Sq. m surface area. Samples of sheet from each lot selected at random by Owner's site representative shall be subject to approval & gotten tested for thickness and zinc coating at contractor's expenses.

3 All ducts shall be fabricated and installed in workmanlike manner, generally conforming to relevant BIS Codes. Round exposed ducts shall be die-formed for achieving perfect circle configuration.

a. Ducts so identified on the Drawings shall be acoustically lined and insulated from outside 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. Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made airtight.

b. All exposed ducts up to 60 cm width within conditioned spaces shall have slip joints - or flanged joints. The internal ends of slip joints shall be in the direction of air flow. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

c. Changes in dimensions and shape of ducts shall be gradual. Air-turns (Vanes) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

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 withstanding seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

e. All sheet metal connection, partitions and plenums required to confine the flow of air to and through the filters and fans shall be constructed of 18 gage GSS / 16 gauge aluminium, thoroughly stiffened with 25 mm x 25 mm x 3 mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Doors shall be not less than 45 cm x 45 cm in size.

f. Plenums shall be panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards G S sheet and riveting shall be done from outside.

g. Self-adhesive rubber lining minimum 5 mm thick instead of felt shall be used between duct flanges and between duct and duct supports in all ducting installation.

4 All ducts shall be installed generally as per tender Drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor.

a. 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.

b. 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 conduits, the ducts shall be transformed, divided or curved to one side (the required area being maintained) all as per the site requirements.

c. 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 Owner's site representative.

d. All duct work shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of galvanized steel rods and galvanized steel angle/channel under ducts at no greater than 2-meter Centre. All vertical duct work shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates left in slab at the time of slab casting.

e. Galvanized steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods and angles/ channels shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash /anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats.

f. 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 be 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 Contractor's work in the building. Where ducts pass through brick or masonry openings, it shall be provided with

25 mm thick TF quality expanded polystyrene around the duct and totally covered with fire sealant such as fire barrier mortar for complete sealing.

g. 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 vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge. Flexible connections shall be constructed of flame retardant, waterproof, silicon rubber impregnated flexible connection at least 10 cm long securely bonded, and flange bolted on both sides. Sleeve shall be made smooth and the connecting duct work rigidly held by independent supports on both sides of the flexible connection. The flexible connection shall be suitable for pressure at the point of installation.

h. Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

5 MEASUREMENTS FOR DUCTING

Unless otherwise specified, measurements for ducting for the project shall be on the basis of Centre-line measurements described herewith:

a) Duct Work shall be measured on the basis of external surface area of ducts. Duct measurements shall be taken before application of the insulation. The external surface area shall be calculated by measuring the perimeter comprising overall width and depth, including the corner joints, in the Centre of each duct section, multiplying with the overall length from flange face to flange face of each duct section and adding up areas of all duct sections. Plenums shall also be measured in similar manner.

For tapered rectangular ducts, the average width and depth shall be considered for perimeter, whereas for tapered circular ducts, the diameter of the section midway between large and small diameter shall be adopted, the length of tapered duct section shall be the Centre line distance between the flanges of the duct section.

For special pieces like bends, tees, reducers, branches and collars, mode of measurement shall be identical to that described above using the length along the Centre line.

The quoted unit rate for external surface of ducts shall include all wastage allowances, flanges and gaskets for joints, nuts and bolts, hangers and angles with double nuts for supports, rubber strip 3 mm thick between duct and support, vibration isolator suspension where specified or required, inspection chamber / access panel, splitter damper with quadrant and lever for position indication, turning vanes, straightening vanes, and all other accessories required to complete the duct installation as per the Specifications. These accessories shall NOT be separately measured nor paid for.

b) Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith:

i. Grilles and registers - width multiplied by height, excluding flanges. Volume control dampers shall form part of the unit rate for registers and shall not be separately accounted.

ii. Fire dampers - shall be measured by their cross-sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary collars and flanges for mounting,

inspection pieces with access door, electrical actuators and panel. No special allowance shall be payable for extension of cross section outside the air stream.

iii. Flexible connection - shall be measured by their cross-sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary mounting arrangement, flanges, nuts and bolts and treated-for-fire requisite length of canvas cloth.

6 TESTING AND BALANCING

After the installation of the entire air distribution system is completed in all respects, all ducts shall be tested for air leaks by visual inspection as per BIS standards.

The entire air distribution system shall be balanced using an anemometer. Measured air quantities at fan discharge and at various outlets shall be identical to or less/excess than 5 percent in excess of those specified and quoted. Branch duct adjustments shall be permanently marked after air balancing is completed so that these can be restored to their correct position if disturbed at any time. Complete air balance report shall be submitted for scrutiny and approval, and four copies of the approved balance report shall be provided with completion documents.

INSULATION

Acoustical Insulation

Acoustical Insulation for Ducts

1. All connecting ducts to Package Units / AHUs shall be soundproof insulated to a distance of 6 m or as specified or as shown on the design.
2. Acoustical insulation shall be 25 mm thick resin bonded glass wool having density of 32 kg/m³
3. **Application**
 1. Clean all internal duct surfaces
 2. Pre-cut the insulation to the size desired, allowing 25 mm excess at downstream joints.
 3. Install self-adhesive pins spaced along the inner face of duct. The pins should start within 75 mm of upstream transverse edges of the liner and 75 mm from longitudinal joints and should be placed at a maximum of 300 mm on Centres around the perimeter of the duct, except that there may be a maximum of 300 mm from a corner break.
 4. Apply coat of Foster Duct as Adhesive 81 - 22 on the duct surfaces as per manufacturer's recommendations.
 5. Impale insulation through the pins and assure insulation is stuck to the adhesive.
 6. Fix self-retaining washers on to the pins. Do not compress insulation more than 3 mm.
 7. Bend the pins so as to prevent protrusions or tears

8. It is recommended that all exposed leading edges & joints be coated with Foster Duct as Adhesive 81 - 22.

Application

1. Fix 25 mm x 25 mm GI / Al. angle frame at 600 mm Centres.
2. Fix insulation + BGT & finish with 24G perforated aluminium sheets.

THERMAL INSULATION (INDOOR)

External thermal insulation shall be provided as follow:

Thermal insulation shall be 19 mm thick class O, Elastomeric nitrile rubber insulation with fire retardant.

Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work.

Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubbers sheets to size with sufficient allowance in dimension. Material shall be fitted under compression and no stretching of material shall be permitted. A thin film of Synthetic Rubber based adhesive shall be applied on the metal surface and then on the back of the insulating material sheet. When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. Also, care should be taken to prevent the trapping of air bubbles between metal sheets and insulating material sheet. All duct flanges should be covered properly with a 150mm wide strip of insulation sheet after gaining uniform height by applying multiples layer of 75mm wide strip of insulation sheet from the both side of flanges. All longitudinal and transverse joints shall be sealed with K-FLEX adhesive tapes of 50mm (wide) x 3mm (thick). The adhesive shall be strictly as recommended by the manufacturer. The detailed Application specifications are as per the manufacturers

Application manual.

Exposed Roof Insulation:

The exposed roofs, Ceiling shall be insulated with 50 mm thick aluminium foil faced resin bonded fibre glass insulation (on duct) of density 24 kg/cu.m or mineral wool insulation (non-combustible) of density 44 kg/cu m after applying two coats of cold setting adhesive.

Exposed Roof Insulation:

The exposed roofs, Ceiling shall be insulated 25mm Thick Nitrile rubber insulation with wiremesh & Mechanical protection.

GRILL & DAMPER

SUPPLY AND RETURN AIR GRILLES/DIFFUSERS

Supply & return air Grille shall be of either steel or aluminium sections as specified in schedule

of quantities. Steel construction registers shall have primer Coat finish whereas extruded aluminium Grilles shall be either Anodized or Powder Coated as specified in Schedule of Quantities. These registers shall have individually adjustable louvers both horizontal and vertical. Supply air Grilles shall be provided with key operated opposed blade extruded aluminium volume control damper anodized in matt black shade.

The Grilles shall be suitable for fixing arrangement having concealed screws as approved by Architect. Linear continuous supply cum return air register shall be extruded aluminium construction with fixed horizontal bars at 15 Deg. inclination & flange on both sides only (none on top & bottom). The thickness of the fixed bar louvers shall be minimum 5.5 mm in front and 3.8 mm in rear with rounded edges. Flanges on the two sides shall be 20 mm/30 mm wide as approved by Architect. The grilles shall be suitable for concealed fixing. Volume control dampers of extruded aluminium anodized in black colour shall be provided in supply air duct collars. For fan coil units horizontal fixed bar grilles as described above shall be provided with flanges on four sides, and the core shall be & suitable for clip fixing, permitting its removal without disturbing the flanges.

- a. All Grilles shall be selected in consultation with the Architect. Different spaces shall require horizontal or vertical face bars, and different width of margin frames. These shall be procured only after obtaining written approval from Architect for each type of register.
- b. All Grilles shall have a soft continuous rubber/foam gasket between the periphery of the register and the surface on which it has to be mounted. The effective area of the registers for air flow shall not be less than 66 percent of gross face area.
- c. Grilles / Registers specified with individually adjustable bars shall have adjustable pattern as each grille bar shall be pivot able to provide pattern with 0 to +45-degree horizontal arc and up to 30-degree deflection downwards. Bars shall hold deflection settings under all conditions of velocity and pressure.
- d. Bar longer than 45 cm shall be reinforced by set-back vertical members of approved thickness.
- e. All volume control dampers shall be anodized aluminium in mat black shade.
- f. In case of continuous grilles / diffusers, dummy grilles shall be blanked-off using GI sheet duly painted black.
- g. All square / rectangular diffusers, slot diffusers to have insulated plenum installed above dampers from OEM factory & not to be constructed at site.

DAMPERS

- a. Dampers: All duct dampers shall be opposed blade louver dampers of robust 16 G GSS construction and tight fitting. The design, method of handling and control shall be suitable for the location and service required.

b. Dampers shall be provided with suitable links levers and quadrants as required for their proper operation. Control or setting device shall be made robust, easily operable and accessible through suitable access door in the duct. Every damper shall always have an indicating device clearly showing the damper position.

c. Dampers shall be placed in ducts at every branch supply or return air duct connection, whether or not indicated on the Drawings, for the proper volume control and balancing of the air distribution system.

VENTILATION

Scope:

1. Scope of work under this section comprises the supply, erection, testing and commissioning of the ventilation / exhaust system of the capacities set forth in the Schedule of Equipment.
2. All fans shall be static and dynamically balanced.

INLINE FAN

1. Fans shall be 'Buffalo' or equivalent, non-overloading type. The fan C.F.M. static pressure, class arrangement, width, direction of rotation, mode of discharge, etc. shall be as indicated in the Schedule of Equipment and in the applicable drawings or as required.
2. The scroll shall be manufactured from hot dip galvanized sheet steel with side plates of Aero-dynamic profile.
3. Fans shall be provided with stationary inlet vanes as a standard accessory. Movable inlet vanes shall be provided only where specified for automatic control. Movable inlet vanes shall be complete with necessary linkages for actuation by automatic controls.
4. Fans shall also be provided with heavy duty outlet dampers mounted in a separate frame, wherever required.
5. All Class I fans shall be provided with sleeves bearing with generous oil reservoir, drain plug, oil level indicator, etc. Class II and III fans shall be provided with heavy duty ball bearings pre-greased & self-aligning.
6. Fans shall be driven by electric motor as specified in the Schedule of Equipment. Motor ratings are only tentative and where a fan requires a higher capacity motor, the Contractor shall clearly point out the requirements and make his offer accordingly. Motor ratings shall be at least 5% over limit load plus transmission losses.
7. Exhaust fans handling corrosive fumes shall be made of non-corrosive materials or coated with corrosion resistant paints with epoxy of chlorinated rubber base.

AXIAL FAN

1. Units shall be complete factory assembled, tested and of approved manufacturers.
2. Fans shall be driven by an electric motor as specified in the Schedule of Equipment. Motor ratings are only tentative and where a fan requires a higher capacity motor, the Contractor shall clearly point out the requirements and make his offer accordingly. Motor ratings shall be at least 5% over transmission losses.
3. Fan shall have limit switch with Aluminium wire guard to shut off the fan.

Testing and Balancing

After the installation of the entire system is completed in all respects, system shall be tested & balanced for required performance. Fan shall be tested for the performance and test results shall be furnished.

Painting

1. On completion of the erection and testing, fans shall be painted with the two coats of an appropriate paint of approved colour.

Installation

The concrete foundations required for the fans shall be prepared by the Owner to the drawings supplied by the Contractor. However, the Contractor Shall supply all foundation bolts, base plate, wherever required, vibration

Eliminators, etc. And shall also ensure that all the above accessories are Placed securely in proper position while the foundation is cast. Vibration eliminators shall be provided with an efficiency of not less than 80%.

Fan inlet and outlet connections shall be by means of flexible canvas Connections. Fan belt drive shall be complete with belts, belt, sheaves and Suitable belt guard. For all kitchen exhaust or any other high temperature exhaust, flexible connection at the fan inlet and outlet shall be of double lobe grease and fire-resistant Neoprene sheets. Grease – tight access panels of sufficient size and shall have to be provided with 50 mm drain plug at the bottom of the fan for grease removal.

FLOW CONTROL DEVICE

Constant Airflow Regulators shall solely operate on duct pressure and require no external power supply. Each regulator shall be pre-set and factory calibrated, requiring no field adjustment to the airflows as indicated on the schedule, and shall be rated for use in air temperatures ranging from -25° to 140°F (-32° to 60°C.) Constant Airflow Regulators shall be capable of maintaining constant airflow within +/- 10% of scheduled flow rates (15% for units 50 CFM or less), within the operating range of 0.2 to 0.8 in. w.g. differential pressure, or 0.6 to 2.4 in. w.g. on high-pressure models, or 0.1 to 0.42 in. w.g. on low-pressure models. Regulators shall be provided as an assembly consisting of a 94V-0 UL ABS plastic body housed within a round sleeve for mounting in round duct. Each round sleeve must be fitted with a lip gasket to ensure perimeter air tightness with the interior surface of the duct.

ELECTRICAL INSTALLATION

Scope

Scope of this section comprises the supply and installation of all electrical equipment such as motors, motor control Centres, starters, cables, interlocks, etc. as required.

Codes, Standards and Statutory Regulations

Codes, standards and statutory regulations to be used for design and constructions are given below. In general, all equipment, material as well as design and constructions shall be in accordance with the latest issues of Indian and relevant standards currently in force. The installation shall be carried out in accordance with the Indian Electricity Act and Rules.

Electric Supply System/Rated Voltage

415 volts, 3 phases, 4 wire, 50 Hz with solidly grounded neutral.

Variation in electric supply under which motor shall be operated continuously without any adverse effect will be as follows:

- a) Voltage : +/- 5%
- b) Frequency : +/- 5% variation
- c) Any combination of voltage and frequency.

Equipment and Materials

All equipment shall be as per specifications, and/or drawings supplied along with the tender documents. Equipment/materials shall be suitable for local climatic conditions as specified in the tender.

All equipment shall be of robust construction. Enclosure of equipment shall be dust, damp and vermin proof. Equipment for outdoor installation shall have weather proof enclosures requiring no further protection by the purchaser.

Approval

The Contractor shall be responsible for obtaining approval of drawings from statutory/local authority as required.

Motor Control Centre

Motor control Centre shall consist of incoming switch fuse units/isolator and a starter mounted inside the wall or floor mounting type cubicle made out 2 mm thick MS sheet. Anti-corrosion and phosphatizing treatment shall be given to the sheets by a standard 5 tank/7 tank process. All feeders shall be provided with two position (on-off) isolators, load break and quick make and break type. All isolators shall be suitable for front of board operation. Isolators for motor feeders shall preferably be of the 'motor duty' type i.e. capable of interrupting the locked rotor current of induction motors, which will be 6/8 times the full load current.

Isolators shall be interlocked with door to prevent opening or closing of the door in the closed

('ON') position of the isolator, in case of compartmental type of feeders. All live terminals on the isolators shall be adequately shrouded to prevent accidental contact and danger to the personnel. Caution name plate "CAUTION LIVE TERMINALS" shall be provided at all points where the terminals are likely to remain live and isolation if possible, only at remote ends e.g. Incoming Terminals of Incomer.

Fuses & Fuse Fittings

All fuses shall be of the non-deteriorating, high rupturing capacity, link, mounted in suitable fuse carriers or fuse bases.

Contactors

1. Contactors shall be magnetic, air brake type, generally in accordance with BS 775/IS 2959.
2. All contactors in power circuits of motor starters or other feeders shall be adequately rated for the duty required and operating conditions. Minimum rating shall, however, not be less than 16 amps.
3. Contactor coils shall preferably be of draw out type for easy replacement. Coil voltage shall be 220V AC. Contactor coils shall operate satisfactorily between 110% and 85% of the nominal coil voltage. Drop off voltage for AC coils shall be between 80% and 45% of the nominal voltage.
4. Making and breaking capacities of the contactors shall be suitable for AC2 and AC3 categories of duty as per IS 2959 unless the contactors are required for special duty such as inching or plugging duty or capacitor duty, in which case, they will be suitably rerated.
5. Each contactor shall be provided with 4 normally open and 4 normally closed auxiliary contacts or as required by the control scheme. If necessary, auxiliary relays or contactors may be provided to obtain necessary number of auxiliary

Contacts. Auxiliary contacts shall preferably be convertible from NO to NC and vice versa.

Protective Devices

All feeders shall be protected by appropriate protective devices such as fused, combined bimetallic thermal overload and single phasing preventer relays. Single phasing preventer relays (SPPRS) shall operate on the principle of unbalanced currents due to single phasing. BMR's and SPPRS shall preferably have a changeover contact which can be converted from hand reset to self-reset and vice versa and used for contactor control as well as alarm/indication. Current transformer, when specified, shall be of bar primary, ring type or wound type, and in accordance with IS 2705 or BS 2046 or BS 81. Class and ratio of CTs shall be specified. VA burden of CTs shall be suitable for the load burden. Ammeters (144 square) voltmeters, PF meters, Run Hour meters and Kilowatt Hour meters shall be provided and shall be of industrial grade accuracy, suitable for flush mounting and in accordance with IS 1248. Suitable selector switches shall be provided in conjunction with ammeters and voltmeters. Indicating Neon lamps used shall be of low voltage, low burden type with series resistor to increase lamp life and to protect equipment from short circuits caused by broken filaments. Lamp covers shall be provided with interchangeable coloured lenses of Perspex or equivalent unbreakable materials. Lenses should not get discoloured in course of time, due

to the heat generated by the lamps. Name plates showing the condition indicated by the lamp shall be affixed near to the lamps. Rating of terminal blocks for power and control circuits shall be at least 30 Amps and 15 Amps respectively. Terminals in control circuits shall be suitable for receiving one conductor per terminals of specified sizes. Terminals for power circuits shall be designed for receiving aluminium conductors and shall be screw clamp type or equal. Terminals for control circuit shall be suitable for receiving copper conductors. Star/Lock/Shake proof or Spring Washers shall be provided to prevent sparking due to vibrations. Special terminals with copper strips mounted on insulating supports may be provided for large cables. Where terminals, suitable extension bars with off- set may be provided. Location of controls for motor starters or other feeders shall be specified. Normally one 'stop' push button with stay-put feature (lockable) and one reset push button for hand resetting of BMR shall be provided on the door of the compartment. Colour used for push buttons shall be as follows:

- Stop push button - Red
- Start push button - Green
- Reset push button - Black

(Note: In case 'Stop', and 'Reset' are combined, only red colour will be used.) Name plates indicating the function of the push button shall be affixed near to the push buttons.

Wiring

Internal wiring of MCCs for power and control shall be carried out with copper conductor PVC insulated cables of PVC covered copper/ aluminium tapes. Wiring of components mounted on doors shall be carried out with single strand 2.5 sq. mm copper conductor flexible cables. Wires and cables shall be neatly arranged and bunched together with suitable clamps made of insulating material. Wire harnesses shall be adequately supported along the MCC metal work. Identification ferrules or tags shall be attached to each wire at each point connection. Sizes of conductors for power wiring shall be determined by the manufacturers on the basis of full load current under specified conditions, protective fuse rating and appropriate rating factors as applicable. Minimum size of conductor shall be 2.5 sq. mm Minimum size of conductor for control wiring shall be 1.5 sq. mm. The following colour code shall be used for determining the colour of wires used for internal wiring. Manufacturer shall obtain specific approval of the purchases, if this colour coding cannot be observed for any reason whatsoever:

- Earth - Green
- Neutral - Black
- 230V, A.C. phase - Red/Yellow/Blue,
- To neutral - Black

All wiring shall be carried out in accordance with approval and certified panel wiring diagrams. Vendor shall check all wiring from point to point for correctness. All wires shall be numbered, and the numbers shall be indicated on the relevant drawings.

Earthing

All metal work of the MCC and non-current carrying metallic parts of the equipment in the MCC shall be securely bonded together by adequate means e.g. use of earthing washer for bolted connections or tapped holes for mechanical connections. One copper earth bus running through the entire length of the MCC shall be provided preferably along with the terminal chambers. Size of the earth bus shall be such as to withstand phase to earth or 2 phases to earth short circuit for one second. The minimum size of the busbar shall be 25 x 3 mm. The terminals complete with hardware and cable sockets shall be provided on the earth bus for connection to external system.

Name Plates and Labels

1. One name plate giving designation of the MCC shall be affixed prominently on to the MCC. (Details of designation will be given). Each feeder shall also be labelled giving following details:
 - i) Feeder No.
 - ii) Feeder Designation (Eqpt.Ref.No.etc.)
 - iii) Description
 - iv) Rating (HP/KW/Amps)
2. All components whether mounted inside the MCC or on the door shall be permanently and clearly labeled with their reference number and/or letter or their function (rating of fuse shall form part of the fuse designation).
3. Labels for feeder designation shall be of laminated plastic or rear engraved Perspex with white letters on black background.

Labels for feeder designation shall be fixed on the doors on respective feeders with chrome-plated self-tapping screws. Designation labels shall be identical in size to permit interchanging if required later.

Miscellaneous

All hardware used shall be plated or passivated to resist corrosion. Type of plating or passivation shall be subject to the approval of the Consultant. All fixing screws shall preferably be raised head type.

Drawings

1. Contractor shall furnish the following to the Consultant for his approval before commencement of fabrication:
 - a. General Arrangement Drawing showing overall dimensions, arrangement of feeders, foundation plan,
Positions of cables entries, weight of MCC and sections in which MCC will be dispatched.

- b. Single Line Diagram for the MCC showing rating of various components used for all feeders complete with feeder numbers, designations, descriptions, ratings, etc.
 - c. Schematic and panel wiring diagrams for all feeders.
 - d. Terminal plan for MCC, showing feeder numbers, terminal numbers and terminal markings.
1. After the final approval, six prints and one clear film reproducible of each of the above drawings shall be furnished.
 2. The Contractor shall note that he shall bear full responsibility for any error, discrepancies, omissions, etc. in the drawings irrespective of whether such drawings have been approved or not. Approval of drawings shall not relieve the Contractor of his liability to complete the work in accordance with the specifications and other conditions of contract nor shall it exonerate the vendor from any of his guarantees.

Testing and Inspection

1. The following tests shall be carried out on the Motor Control Centres after completion of all work:
- IV. All power and control circuits for MCCs shall be tested for insulation resistance with a 500-volt megger, before and after the high voltage test.
 - V. High voltage test shall be carried out on all power and control circuits at 2000 volts A.C. voltage applied for one minute.
 - VI. Low voltages continuity test on all power circuits shall be carried out from busbars to the outgoing terminals of each feeder with switches and contactors in closed position.
 - VII. All control circuits and operations of equipment for all feeders shall be checked with only control supply made available to ensure satisfactory operation of all equipment such as push buttons, BMR reset, indicating lamps, timing relays, etc. All contactor coils shall be checked for presence of humming or chattering. Special requirements for various feeders indicated in the purchase data sheets shall also be checked.
 - VIII. Earth continuity test shall be carried out with a low voltage supply of not more than 6 volts, between various non- current carrying metallic parts of equipment, steel work, etc. and the earth bus provided in the MCC.
 - IX. Operation of all instruments and meters provided on the MCC shall be checked.
2. All the tests listed above shall be carried out in the presence of Owner's representative, during final inspection. Contractor shall provide all facilities such as power supply, testing instruments and apparatus required for carrying out the tests.
 3. Contractor shall give a notice of not less than two weeks for inspection and testing by the Owner's representative.

Electric Motors

Rating & Duty

1. Rating of the motors shall be as indicated in the Schedule of Equipment. Where the equipment supplied needs a higher rated motor, the Contractor shall clearly point out and motors shall be offered accordingly.
2. All motors shall be rated for continuous duty at maximum output.
3. Rated voltage for three phase motors shall be 415 volts.

Design Features

1. Motor body shall be of close grained cast iron construction and shall be provided with lifting hooks or eye bolts. The motor along with the fan and half coupling shall be dynamically balanced.
2. Fan provided for fan cooled motor shall be non-directional type.

Enclosure/Protections

1. Enclosure for motors shall be totally enclosed fan cooled (TEFC) unless otherwise specified - SPDP motors shall be used only where the desired output is not obtainable in a TEFC frame.
2. All outdoor motors shall be TEFC weather proof type.
3. Degree of protection for all motors shall be IP 44 as per IS 491.
4. Two earthing terminals comprising terminals studs, two plain washers, one spring washer and nut shall be provided on opposite sides of the frame. Studs shall be suitable to receive appropriate size of earth conductor.

Bearings

All motors shall have ball and/or roller bearings with limit lubricators.

Terminal Box

1. Terminal box shall be of ample size, suitable for termination of aluminium conductor cables (with cable sockets) which may be substantially derated for conditions of installation.
2. Motor terminals shall be of stud type, substantially designed and well insulated from the frame. Each terminal shall be complete with two flat washers one lock nut.
3. Number of terminals shall be as given below:
4. Squirrel Cate Motors upto 3.7 Kw - 3 Nos.
 Squirrel Cage Motors upto 3.7 Kw
 (With tinned copper links for
 delta connection) - 3 Nos.
 Slip Ring Motors - 3 Nos.

5. Terminal boxes of all motors shall be rotatable in steps of 90 degrees, without disturbing the motor winding connections to the terminal block. Separate terminal box shall be provided for connections to anti-condensation heaters in case of

Motors about 50 HP. If heater terminals are provided in the main terminal box, then insulating barrier shall be provided between them with caution name plate affixed on the terminal box. "CAUTION - LIVE HEATER TERMINALS."

6. Separate terminal boxes for starter and motor leads to be provided for slip ring motors. Where it is not feasible, an approved type of insulating barrier to be provided.

Temperature Rise

The temperature rises of motors when tested in accordance with IS 325 shall not exceed the limits specified therein.

Starting of Motors

1. All squirrel cage motors shall be suitable for full voltage starting. Motors of 10 HP and above will generally be started with star/delta or auto transformer starters which, in addition to protective devices, shall be provided with single phasing preventer.

2. Starting current at full voltage of slip ring motors shall be limited by the rotor resistance starter. Motor manufacturer shall furnish appropriate value of external resistance required to limit the starting current as well as to obtain the required torque. However, starting current with slip rings shorted shall not exceed 600% of full load current. Starting current of squirrel cage motors with full voltage starting shall not exceed 600% of the full load current with tolerance specified in IS 325.

3. Starting torque of squirrel cage motor started on full voltage shall not be less than 200% of the full load torque. Pull out torque of motors shall not be less than 200% of the full load torque.

Insulation

1. All motors insulation to be Class F with temperature rise limited to Class B.

Painting

All motors shall be painted in an approved manner using two priming coats and two finish coats. The final colour shall be to the Owner's requirements.

Performance Particulars

1. Following performance particulars for all motors to be furnished well in advance before finalizing orders for motors:

- a) Make
- b) Type
- c) Enclosure

- d) Class of Insulation
- e) Temperature Rise above 40 Deg.C ambient
- f) Rated Output
- g) Speed
- h) No load currents
- i) Full load current
- j) Locked rotor current
- k) Starting torque (DOL)
- l) Efficiency at full load, 3/4 load, 1/2 load
- m) Power factor at full load, 3/4 load, 1/2 load
- n) Details of rating for space heater
- o) Max. Size of aluminium conductor cable which could be connected to motor
- p) Rotor current at rated output
- q) Value of rotor resistance for different torque values

MV Distribution Boards

Construction

1. The salient features of constructions panels shall be as follows:
2. Sheet Steel - 2 mm thick for frames, 3mm cable gland plates and equipment
Mounting plates and 1.6 mm thick for front and rear
Doors and covers
3. Welded construction, with shipping section bolted together. All such joints to gasketed. Lifting lugs to be provided
4. The cubicles shall be totally dust and vermin proof conforming to IP 54 of IS 2147.
5. All doors to be hinged type with removable features..
6. The construction shall be such as to facilitate easy extension at both ends.
7. The design shall be such as to have individual feeders in separate compartments, with proper barriers between adjacent feeders, busbar chamber and cable box chambers.

Painting

1. All sheet steel work shall be properly cleaned and degreased. Rust and scale shall be removed by picking and phosphatizing. After phosphatizing, two coats of primer shall be applied followed by two coats of finishing synthetic enamel paint of approved shade as per IS-5. The painting shall be stove enameled.

Air Circuit Breakers

1. The circuit breaker shall be air-break, horizontal draw-out feature shall show 3 positions viz. SERVICE, TEST and ISOLATED. These positions along with 'OPEN' and 'CLOSE' positions shall be visibly marked.
2. All positions shall have provisions for locking. The ACB shall have shutter assembly and arc-chutes and mechanical trip features.
3. The ACB shall have 6 NO + 6 NC auxiliary contacts rated at 10 A, 240 V, AC.
4. 'RED' and 'GREEN' indicating lamps shall be provided on the cubicle.
5. The ACB door shall not have any lamps or instruments. All such accessories shall be mounted on a separate compartment.
6. The ACB shall have proper interlocks such that it cannot be 'plugged in or out' 'SERVICE' position, if the breaker is in 'ON' condition. It shall not be possible to operate as circuit breaker unless it is properly engaged in any of the three positions.
7. The ACBs to be with inherent U/V and shunt trip devices.
8. The operating mechanism shall be independent, manual spring charged stored energy type. The mechanism shall ensure quick-break, quick make action and the ACB shall be trip-free in operation.

Air Brake Switches

1. The air brake switches shall be of AC23, (heavy) duty, quick make-quick break, fault-make type as per IS 4047. The contacts shall be silver plated.
2. The switches shall be capable of withstanding the mechanical and thermal stresses produced by overloads and short circuits.
3. All switches of all ratings shall have inter-locks with the compartment doors. Switches of 250 A and above shall be lockable in the 'OFF' position. All live parts shall be shrouded. It shall be possible to intentionally defeat the interlocks if required.
4. 'RED' indicating lamp shall be provided for 'ON' indication.

Fuses:

All fuses shall be of HRC cartridge fuse-link type having a certified rupturing capacity of not less than 46 KA at 415 volts AC. The HRC fuses shall conform to IS 9224 1979. All fuses shall have visible indication to indicate 'Blown' condition.

HRC Fuse Carriers

1. The HRC fuse carriers/bases shall be of high-grade phenolic mouldings. The contacts shall be silver plated, and the contact blocks shall be suitable to receive the rated conductors of aluminium.
2. The fuse carriers shall have an aperture to view the conditions of HRC fuse mounted inside.

Contactors

1. The motor starter contactors shall be of the electro-magnetic, double-break, non-gravity type rated for uninterrupted duty suitable for operation under AC 3 utilization category as per IS 2959. The contacts shall be silver plated.
2. 2 NO and 2 NC auxiliary contacts shall be included.
3. The operating coils shall have Class 'E' insulation of wire and shall be suitable for operation of any specified control supply system.

Thermal Overload Relays

1. The thermal overload relays shall be 3 element, positive action, ambient temperature compensated with a time lag and adjustable settings. The setting range shall be selected in accordance with the ratings of the motor.
2. The relay shall be self-reset/hand reset as called for in the case of hand-reset, the reset button shall be fixed on the compartment door.
3. The relay shall have at least one 'NC' and one 'NO' or one change-over contact.

Moulded Case Circuit Breakers

1. The Moulded case circuit breakers, MCCBs shall be provided where certified. The MCCBs shall conform to the latest applicable IS 2516-1977.
2. For AC Circuits the MCCBs shall be triple pole construction and shall have independent manual opening and closing mechanism. The mechanism shall be quick-make and quick-break type and the breakers shall be trip-free in operation. The 'ON', 'OFF' and 'TRIP' mechanism shall be clearly indicated.
3. Bolted type neutral link to be provided with TP MCCB.
4. It shall be possible to mount accessories on the MCCBs like shunt-trip and under voltage release, alarm contacts, etc.
5. The MCCBs shall have thermal/static trip devices.
6. The MCCBs shall have rupturing capacities as specified in BOQ/Single Line Diagram.

Miniature Circuit Breakers

1. The MCBs shall be of single pole, double pole, triple pole or four poles as required. The MCBs shall be of magnetic type with a maximum rupturing capacity of 9 KA at 415 V.

Current Transformers

1. The CTs shall be of dry type and shall have short-time withstand rating equal to the short-time withstand rating of the associated switchgear for 1 second.
2. The measuring instrument CTs shall be of 15 VA, minimum accuracy class 1.0 and an instrument safety factor of 5.
3. The protection relay CTs shall be of 15 VA, minimum accuracy class 5P and an accuracy limit factor of 10.

Indicating Instruments and Meters

1. Electrical indicating instruments shall be 72 mm/96 mm/144 mm square size, suitable for flush mounting.
2. The zero adjustment shall be done from outside the cover.
3. The dials to be parallax free with black numerals on a white dial.

Indicating Lamps

1. All indicating lamps to be cluster type LED lamps.

Control and Selector Switches

1. The control and selector switches shall be of rotary type, adequately rated for the application but with a minimum rating of 10 Amps at 240 V AC and 1 Amp at 220 V DC. The plates shall have clear position markings.
2. The control switches shall have pistol grip handles spring return to normal. The selector switches shall have oval knobs and shall be contact stay-put type.

Push Buttons

1. The push buttons shall be of the momentary contact, push to actuate rated for 10 A at 240 V AC and 1 A 220 V DC. The 'START' push buttons shall be green and shrouded. The 'STOP' push button shall be red and unshrouded. All other push buttons shall be black.
2. The elements shall be enclosed with 1 'NO' and 1 'NC' contacts. It should be possible to add on easily extra elements to increase the number of 'NO' and 'NC' contacts.

Main and Auxiliary Buses

1. The busbars shall be of high conductivity copper/ aluminium alloy of E91E grade as stated in BOQ. The busbar shall be of uniform cross-section throughout the length of the panels.
2. All main and auxiliary busbars shall be insulated with sleeves. The sleeves shall be of high dielectric strength, non-corrosive and of phase and neutral colour.
3. The busbars shall be supported on cast epoxy/ resin/DMC/Fiberglass insulators and the spacing of the supports shall be such as to withstand the stresses of the short circuit currents. The busbar spacing's shall be adequate for 3 phase voltage upto 600 V.
4. The busbar shall be chosen for specific current ratings with a minimum density of 1 amp for sq.mm area.

Internal Wiring

1. All internal wiring shall be carried out with 1100 V/650 V grades PVC insulated/ XLPE, stranded conductor copper wires. The minimum size of wires shall be 2.5 sq.mm copper and for CTs also 2.5 sq.mm copper.

2. All individual control and CTs wiring shall be labelled with engraved identifications ferrules, yellow in colour with black letters.
3. All wiring shall be terminated on stud type terminal blocks through crimping sockets. No more than one connection shall be made on any one terminal block.
4. All spare auxiliary contacts of contactors and relays shall be wired to control terminal blocks.

Terminal Blocks

1. Terminal blocks for power and control shall be of reputed make stud type, with washers, nuts and locknuts. All adjacent terminals shall have insulating barriers.
2. All power terminal blocks shall be appropriately rated for current with a minimum of 30 Amps. The control terminal blocks shall be rated for a minimum of 10 A and suitable for at least 2 conductors each of 2.5 sq.mm.
3. All sets of power and control power terminal blocks shall be identified with engraved plastic labels, black background and white letters.

Identification Labels

1. All labels shall be black plastic with white engravings of letters of minimum 6 mm sizes.

Earthing

1. All switchgears shall have continuous run of earth busbar. The size and materials of the earth bus- bar shall be specified.

Tariff Advisory Committee and CPRI Tested

The switchgear shall be approved by the Tariff Advisory Committee (for Fire Insurance) and CPRI tested for short circuit test and enclosure test.

Tests

1. High Voltage test at 2.5 KV.
2. Power and Control Circuits Continuity Tests.
3. Insulation Resistance Test with 1000 V Meggar.
4. Operational Test.
5. Three Sets of Test Certificates to be submitted.

Drawings

1. Three sets of general arrangement drawings and wiring diagrams of all types of feeders shall be submitted.

Control Stations

1. Control station shall be of cast iron or cast aluminium enclosures, consisting of 'START' and 'STOP' push buttons and shall have stay put feature of twist unlock type.

Cable and Accessories

1. All cables shall be heavy duty PVC insulated armoured and PVC sheathed of 1.1 KV grade. Aluminium conductor cables shall be used for power and copper conductor cables shall be used for control wiring.

Glands

1. Glands used for termination shall be compression type. Cable glands shall be with single/double seal and cone and clamp for armoured clamping.
2. For safe and indoor areas, glands with single seal and for outdoor installation and hazardous areas, gland with double seals will be used. For use in corrosive areas, glands shall be coated with rust proofing lacquer after installation and provided with PVC hoods.
3. Cable lugs shall be of Dowell or equivalent approved make, suitable for connection of aluminium conductor cables. The cable lugs shall be of tinned copper and of soldering type for solid conductor cables. For stranded conductor cables, crimping type, tinned copper cable lugs shall be used.

Conduits and Accessories

Conduits wherever used with prior approval of the Contractor shall be of GI heavy gauge/black enamelled/PVC. All accessories, such as junction boxes, shall be duly approved by competent authorities. Terminal blocks of adequate rating are to be provided in the junction boxes.

Saddles

Saddles to be used for cleating cables or conduits shall be fabricated from MS or aluminium strips or any other approved material and shall be painted and dried before installation with chemical works type paint.

Cable Tags and Identification Ferrules

Cable tags and identification ferrules provided on cable cores/wires shall be of PVC/plastic. Cable tags shall be provided at every 15 meters and at all bends or change in routes.

Structural Steel

This shall include MS angles, channels, flats, etc. required for fabrication of cable trays, local supports for cables, control stations, etc. All steel sections shall be new and conform to IS 226.

Miscellaneous Materials

These shall include solders, fluxes, adhesive insulating tapes, PVC sleeves, petroleum conducting jelly, etc.

Earthing Material

Copper strips or wires of suitable sections shall be used for earthing in accordance with IS 3403.

All 3 phase 415 Volts equipment shall be earthed at two points and all single

Phase equipment at one point.

Painting

All metal work and metal parts of the MCC shall be thoroughly cleaned to remove rust, scale grease or any other matter. Suitable anti-corrosion treatment such as phosphatizing shall be given to the metal work. All exposed surfaces of the metal work shall then be given a priming coat of zinc chromate or equivalent and finished with two coats of paint of specified shade.

Drawing

Contractor shall submit 3 copies of control of schematic wiring diagram for refrigeration unit showing all protections and interlocks for Consultant's review and approval. After the final approval six prints and one clear reproducible of each drawing shall be furnished.

Installation

Motor Control Centres

Motor Control Centres shall be installed on welded construction channel framework. Framework shall be properly grouted by means of foundation bolts or anchor fasteners.

Cable Laying

As far as possible, cable shall be run in built-up trenches and on walls/ceiling. Cables shall be dressed and clamped to the wall/ceiling by means of GI strap saddles of minimum 3 mm thickness. Cables shall be kept away from wall ceiling by saddle bars of at least 6 mm thickness. Cables running in built-up trenches shall also be properly clamped when cable run is on side walls of trench. Cable entry into the building shall be through suitable GI pipes or hume pipes or trenches. All cable entry openings into the buildings shall be properly sealed with cold setting, PVC compound or other approved materials.

Cable Termination

PVC cables shall be terminated with compression type glands. For outdoor installation double seal compression glands shall be used. All cables shall be connected by means of suitable crimping type cable lugs. All connections shall be secure and vibration proof. All contact surfaces shall be coated with petroleum conducting jelly before connections are made.

Earthing

All metallic framework and non-current carrying metallic parts and enclosures of electrical equipment such as MCCB, motors, control station, etc. shall be bonded to one another and earthed by means of two separate earth conductors and connected to the plant earthing system

Motors

All motors shall be installed on a common foundation with the driver

Equipment coupled through flexible couplings or belt drive.

Leveling and alignment of motor and driven equipment to be carried out as

Per IS 900 to avoid undue strain on motors.

Insulation resistance of motor shall be measured before commissioning. In no case insulation resistance should be less than one Meg ohm. If it is less than one Meg ohm motor should be dried out as per procedure laid on IS 900. Pre- commissioning mechanical checks shall be carried out as per IS 900.

Cable termination and earthing of motors shall be carried out by Electrical Contractor.

On commissioning of motor, any defects like excess current, bearings getting hot, undue vibration or noise etc. are observed; it will have to be made good by the Contractor without any extra cost.

Testing and Commissioning

Operation Test

1. Energies only control circuits and carry out closing and tripping operations. (Where AC supply derived from main supply is used for operation, the switchgear bus may be energized). Check tripping of circuit breakers by manual operation of protective relay contacts. Check operation of mechanical closing and tripping devices. Check lockout conditions for closing of circuit breakers by simulating the required conditions. Check control, indications, sequence interlocks and alarms.
2. Polarity and connections of instrument transformers check for correctness of CT and PT connections provided with transformer. Check electrical continuity of secondary circuits with ELV tester. Adjust spacing of arcing horns/rod gaps.
3. Check operation of instruments, meters, relays and tripping of circuit breakers by primary/secondary injection as specified. This test will be carried out only if specifically called for by Contract Documents.
4. Check continuity of power circuits and earth continuity of all non-current carrying metallic parts with a low voltage (6V or less) continuity tester.
5. Carry out IIV test on power and control circuits if specifically called for in Contract Documents.

Motors

Check equipment for free movement of rotor and play, lubrication and for any other mechanical defects and direction of rotation.

Check commutators, slip rings, brushes, brush- holders, etc. for satisfactory conditions. Insulation test of motors between winding and ground. Use 500 V megger for MV motors and 1000 V megger for HV motors. Check electrical continuity with ELV tester.

Control Cables

Carrying insulation test on all power and control circuits. Check all equipment for satisfactory operation and correct wiring.

Wiring

1. Insulation test between phases, between each phase and neutral and between each phase/neutral and ground.
2. DC High Voltage Test on HV Cables in accordance with the relevant Indian Standards and Code of Practice. This test shall be carried out on cables, installed in final position and all joints and terminations have been made. The cables, however, may not be connected to the equipment so that the equipment may not be subjected to the test voltage.
3. In case of lighting wiring, insulation test shall be carried out on lighting feeders with branch circuits open. Branch circuits shall be tested separately with lamp holders, plug receptacles and lighting fittings in position but without lamps. In case of lighting circuits with lamp ballasts and glow starter's insulation resistance may be measured between phase and ground only.
4. In case of directly buried cables, insulation resistance of cables shall be measured before and after the back filling. Test all receptacles for correct phase sequence.

Earthing System

Continuity test for earth continuity conductors with ELV tester.

Operation test

After successful completion of the above tests, operational tests shall be carried out by the Contractor for checking the connections done by him and satisfactory operation of all the equipment supplied by him. This test shall be carried out initially without energizing power circuits. Various control conditions shall be simulated for the purpose of this test. Any defects detected during the tests such as blown fuses, damage to devices, shall be rectified by the Contractors, free of cost.

TECHNICAL DATA FOR ALL MAJOR EQUIPEMENTS

Technical data shall be furnished as follows:

1.0 VRV / VRF OR Dx Refrigeration system

- a) Manufacturer
- b) Type of Unit -
- c) Overall dimensions
- d) Operating weight
- e) Approx. noise level (db)
- f) Capacity in HP – IDU
- g) Total static pressure (ins W.G.)

Cooling Coils:

- a) Coil fin material
- b) Fin thickness
- c) No. of fins
- d) No. of rows deep
- e) Tube dia. (ins)

Filter Section:

- a) Pressure drops through filter When new (ins. WG)
- b) Efficiency

2.0 **Ventilation & Exhaust Fans:**

- a) Manufacturer
- b) Fan discharge position
- c) Speed (rpm)
 - d) Fan dia.
 - e) C.F.M.
 - f) Motor (hp) and make
 - g) Static pressure (ins. WG)
 - h) Balance (static and/or dynamic)

3.0 **Insulation:**

- a) Manufacturer
- b) Material
- c) "K" value

4.0 **Controls:**

- a) Manufacturer
- b) Thermostat type
- c) Humidistat type
- d) Damper motor type

5.0 **Electric Motors:**

- a) Manufacturer
- b) Type of motor and frame reference
- c) Rated output (hp)

- d) Range of working voltage
- e) No. of phases and phase connections
- f) Nominal frequency

SPECIFICATIONS - H.V.A.C. WORK

- g) Rated speed (rpm)
- h) Rated current (amps)
- i) Class of insulation
- j) Temperature rise with cooling air at 40 Deg.C
- k) Efficiency and power factor

6.0 Switch Gear:

A. Circuit Breakers

- a) Manufacturer
- b) Symmetrical short circuit at 415 volts
- c) Normal current (amps)
- d) O/L and E/F trip

MODE OF MEASUREMENT

1 Piping

Measurement of all piping shall be on the basis of Centre-line measurement described below:

Piping shall be measured in units of length along the Centre line of installed pipes including all pipe fittings, wastage, allowances, Pipe / Puff supports, flanges, gaskets, nuts & bolts, unions, bands, elbows, tees, concentric / eccentric reducers, inspection pieces, expansion loops, etc. The above accessories shall be measured as part of piping length along the Centre line of installed pipes, and no special multiples of pipe lengths for accessories shall be permitted.

Only refnet joints as Tees and Y joints shall be paid separately as they are not part of refrigerant piping.

All painting, labling, shall form part of the cost of equipment, piping, etc. No separate payment shall be admissible.

2 Sheet Metal Work

Sheet metal work shall be on the basis of measurement described below:

All Sheet metal ducting complete with ducts, supports, hangers, vibration isolation pads, turning vanes, girth angles, flanges, gaskets& food grade sealant, access panels erected in position shall be measured externally on the finished areas of the ducting and paid per unit area.

All manual control / splitter dampers sections with operating linkages, supporting, etc shall be included in the duct area. The price of dampers shall have to be included in the sheet metal installed ducting price. No separate payment shall be admissible.

Tapered rectangular ducts width & depth shall be considered for perimeter whereas for tapered circular ducts the diameter of the section midway between large & small diameter shall be adopted. The length of tapered duct section shall be the Centre line distance between the flanges of the duct section.

The quoted unit rate for external surface of ducts shall include all wastage, allowances where specified or required, inspection chambers / access panel with splitter damper and quadrant / lever for position indication and other accessories. These accessories shall not be separately measured nor paid for.

The measurement of ducts shall be carried out before applying insulation.

3 **Insulation**

Area of external duct insulation finished as per specification shall be calculated on the basis of finished duct area before insulation including flanges (including double cover of min 200 mm over flanges), dampers, VAV boxes, installation accessories, etc and paid at unit area.

Acoustic insulation shall be calculated on basis of external duct size including nut bolt, flanges, aluminium perforated sheets, all supporting accessories and paid for per unit area.

Room acoustic insulation shall be calculated on basis of finished installed area including all accessories and paid for per unit area.

All pipe insulation shall be linear length through fittings and valves. Pipe shall be measured along the length of the pipe including flanges, coupling, gaskets and all installation accessories. It is to be clearly noted that for the insulation measurement all these accessories including cladding, valves, orifice plates & strainer shall be considered strictly by linear measurement along the Centre line of pipes and no special rates shall be applicable for insulation of any accessories, fixtures or fittings whatsoever.

4 **Grilles**

Air distribution items shall be measured by the cross-section area.

Grilles / Diffusers, Linear diffusers (to be measured in Rmt / nos.) fire dampers, shall be measured based on cross-sectional area including flanges, mounting arrangements, nuts & bolts (inspection pieces / door with electrical actuator & panel for fire damper), aluminium opposed blade volume control dampers shall form part of supply air diffusers and shall not be separately measured nor paid for. Flexible insulated fiber glass ducting to be measured in Rmt, same as sheet metal ducting with all accessories. Curvature / Round grilles to be also measured in Rmt.

5 **Electrical installation**

Cost of motors, electrical panel, power and control wiring with GI tray, safeties, installation, all accessories shall be included in the cost of driven equipment (wherever indicated with equipment). Power cables, cable tray & earthing to be measured in Rmt. Cable terminations in double compression gland to be measured in numbers.

Panel shall be counted as no. of units. Quoted rates shall include as lump sum and not measurable length. All internal & power wiring, earthing connections from the control panel to the starter and motor / control wiring for interlocking, safety controls, control wiring for remote start / stop and automation as well as indication

as per the specifications. The quoted rate of panel shall also include all accessories, switchgears, contactors indicating lights, meters, Safety controls & interlocking, VFDs as per the specification and schedule of quantities.

The unit rate for cables include the cost of cables & clamps & GI tray installation, testing & commissioning, cable markers, ceiling support. No payment shall be made for left out and installed cut cable pieces.

The rates for cable termination work shall include the cost of copper / aluminium lugs of suitable size, Ni-Cd double compression cable glands etc.

Rubber mat shall be provided in front to cover the full length of all panels, where back space is provided for working from the rear of the panel, Rubber mat shall also be provided to cover the full length of panel. Cost to be included in panel cost.

6 **General Notes**

- i) Cost of painting, galvanization of all equipment, piping, etc. shall be included in each item, and no extra shall be paid.
- ii) MS Structural work except mentioned above to be measured in Kgs.

LIST OF APPROVED MAKES OF EQUIPMENT AND MATERIALS FOR HVAC SYSTEM

Sr. No.	Description of Item/equipment's	Approved Makes
1.	Outdoor VRV/VRF unit	Daikin/Toshiba/Mitsubishi / O General
2.	Indoor VRV/VRF unit	Daikin/Toshiba/Mitsubishi /O General
	Corded/ cordless remote	Daikin/Toshiba/Mitsubishi /O General
	Central controller	Daikin/Toshiba/Mitsubishi/ O General

3.	TFA Unit	Zeco/ Edgetech/ System Air
4.	Axial Fan/Inline Fan	Kruger/ Nicotra/ Zeco/system air/Maico
5.	Pre-Filters & Filters (non-flammable)	Airtech / Thermodyne / Uccomech
6.	Piping a) Cu piping - Soft (20G) b) Cu piping - Hard (18G)	Kobe (Japan) / Mandev Tubes / Met tubes (Malaysia) / Nissan / Rajco
7	Factory Fabricated GI duct	Zeco/Ducto fab/Nueteck/Rolastar
8.	Aluminium Grill /diffuser	Cosmos/Caryaire/Dyna craft/Air products
9.	Thermometer / Pressure Gauge	H-Guru/ Metzer/ Bestobell/ Star Scientific /Fiebig
10.	Nitrile Rubber Insulation	Armaflex/Thermaflex/A-flex/K-flex
11	Pre-filter/Hepa/Microvee Air Filer	Anfilco / Thermodyne / Purolator / Spectrum/Airtech
12	Starter	L&T / Siemens / Crompton / GE
13	Variable Frequency Drive	Allen Bradlly/ Danfoss/ ABB / Honeywell /Siemens/Schnieder
14	Actuator for fire damper	Siemens/ Honeywell /Belimo /Anergy
15	G.I. Sheet	Jindal / TATA / Sail
16	Underdeck Insulation(PIR),Polyisocyanurate	Asawa /P3 /Ballytherm/Kingspan /Paramount
17	Any other material not mentioned above	Shall got approved from the engineer –in –chargebefore use at site.

23.ADDITIONAL CONDITIONS AND SPECIFICATIONS FOR VERTICAL TRANSPORT SYSTEM

1.IIT Bombay proposes to erect SIX numbers 16-passengers elevator in Hostel 19 building at IIT Bombay.

2. SCOPE

The scope of Bid is to cover design, manufacture, supply, install, test, commission, obtain all necessary statutory approval and maintenance of Lifts during the Guarantee Period in the Building complex as per the Bid documents and Bid drawings.

During the guarantee period of Two years after successful commissioning, handing over of Lift and taking over by the Employer, the Bidder shall carry out comprehensive maintenance of Lift free of cost. After this guarantee period, the Employer will reserve the right to enter into Annual Maintenance Contract as described in the Bid document.

Employer reserves the right to select different agencies for the above works and award the work either directly or through the Main Contractor by nomination as specified elsewhere in the Bid.

3. The equipment supplied and erected shall be in accordance to updated version of IS-4666/1968, 1860/1968 & 1980 and 3534/1979. Fire protection requirement as per IS and local authority's requirement shall also be complied with. The Lifts in accordance with any other International Standards, which are superior than IS standard, shall also be considered.

4.The Bidder shall note the following in the Lift Service particulars covered herein.

a) Capacity & Numbers.

b) Travel height, number of stops and openings.

c)Type of Drive,

d) Type of Safety Gear, door safety

e) Type of Control and operation.

f) Interface leads to be left for Building Management / Automation System.

g)Amenities and finishes in Lift Car.

5. The Bidder shall furnish any other details relevant to the work and not covered in the Bid with financial bearing, if any, explicitly.

6.As the Bid documents shall form part of the Agreement, the provisions covered therein should be noted carefully and any deviation felt necessary therefrom shall be highlighted at the time of bidding only and not after. For this a statement of deviation, if any shall be prepared by Bidder and shall be enclosed in the first envelope superscribed "Technical Bid". If no deviation is proposed, still this form shall be submitted with an entry "No deviation proposed". No deviation in commercial conditions is acceptable.

7. The Bidder shall give rates for all items given in the schedule of quantities.

8.The current statutory requirement as per Lift Rules of Local Authority as applicable shall be

complied with, No extra payment shall be considered either due to escalation or amendments / modifications to Local Authority Rules issued during the contract period.

9.The Bidder/ Contractor shall be responsible to obtain necessary License from Lift Authority, Government of Maharashtra.

10. Terminal points:

The terminal point (s) Viz. Civil work and other services shall be as follows:

Civil works:

The Main Contractor shall complete the Lift shaft and pit to the required dimensions including plastering and painting. Hoist way / openings and the Machine room of required sizes shall be made available by the Main Contractor for erection of equipment well before its receipt at site. The Main Contractor shall be responsible for water proofing of the lift pit. The Main Contractor shall also complete lift machine room /closed required hoistway with lockable doors and windows in all respects including lighting. All other civil activities for Lift installation shall be within the scope of the Lift Contractor and shall fall within the Lift Contractor's responsibility.

All minor Civil works under Lift Contractor's responsibility include Cutting, Chasing and making good of the same at all levels, conceal the conduits and boxes for Panels. etc. The minor Civil work shall also include items connected with fixing of Sill plate / Sill slab projection, fixing of buffer springs in the lift, fixing and mounting beams, bearing plate etc. at the Lift Machine room if applicable.

Electrical Works:

Power supply – 1&3 Phase, 230/400 Volts 50 Hz Power supply will be provided at panel in ground floor by the Institute by a main switch in main panel.

The signals from the Fire mode services of the Lifts shall be integrated into the over all fire alarm system, forming part of the work site / building. For this purpose, sufficient potential free leads shall be

left by the lift vendor at appropriate locations from which the building will connect the interface to institute.

All bidders should visit the site before quoting. So it will be assumed that the work has been quoted considering present site condition and the work will be completed in all respect without claiming any extra cost/ work.

Particulars of Lift Service requirement

Sr. No.	Particulars	Recommended	Offered
1	Application	Passenger, PWD Compatible	
2	Capacity	16 (Sixteen) persons	
3	Load	1088Kg	
4	Number of Lifts	6 (Six)	
5	Speed	1.2 meters per second minimum	
6	Level	10 Levels (G+9)	
7	Travel	As per drawing	
8	Servicing	Lift should serve on all the floors. Thus servicing 10 levels and 10 openings same side.	
9	Size of the lift car	To be given to suit to available lift shaft.	
10	Pit depth	As per given drawing.	
11	Type of controller	Microprocessor based V3F	
12	Machine	Permanent Magnet gearless motor with regenerative drive.	
13	BMS compatibility	Potential free contacts and RS 485/Modbus/backnet card in the controller shall be provided for monitoring position, up and down movement of lift etc which can be used in later stage.	
14	Car enclosure	Inner surface of Car door shall be honeycomb finish stainless steel all as per General	

		specification. Ceiling finish : SS 304 Mirror finish. Size to be given	
15	Entrance width	To be given (as per standard to enable to enter wheel chair)	
16	Type of door	Power operated horizontal sliding center opening, open in front only.	
17	Car floor	Granite/ As decided by the architect	
18	Signal system- Position indicator	Digital floor position indicator in the car and at all landing TFT/LED type.	
19	Travel indicator	Detailed travel direction indicator in the car and at all landings is to be provided.	
		Gongs and visual indications at all landing for arrival of the car.	
		Overload warning audio and visual indicator inside the car(LIFT should not start)on overload)	
		Battery operated alarm bell and emergency light	
		Car Operating Panel with luminous buttons and 3 way intercom with vandal proof covers	
		Luminous hall buttons at all landings and inside the car with braille language.	
		Fireman switch at ground floor.	
		Display inside the car shall be TFT/LED type with time and date	

		indication.	
		Floor announcement in the car	
		Lift in use/lift out of order sign shall be in built with floor position indicator.	
20.	Power supply	400/415 V ,3 phase AC ,50 Hz AC	
21.	Auxiliary power supply	230V,+5% to -10%, 50 Hz AC	
22.	Levelling accuracy	+ - 3%	
23.	Speed variation	+ - 10% of rated speed.	
24.	Counter weight	Cast iron fillers fitted in steel channel frame of size and numbers as per manufacturers standard.	
25	Car and counterweight guiderails.	Machined guiderails of suitable size and fish plates.	
26.	Emergency supply	Inverter/UPS backup for at least 30 minutes and with maintenance free batteries.	
27.	FIRE LIFTS	<p>All the lifts shall be used as fire lifts.</p> <p>Fireman switch shall be provided at ground floor to enable the fire service personnel to ground the lift in case of emergency.</p> <p>The word “Fire Lift” shall be conspicuously displayed in fluorescent paint on all the fire lifts landing doors.</p>	
	Fireman switch	<p>Fireman Drive Provision for Fireman</p> <p>drive to be made to bring the car to the main floor immediately after the fire switch is operated.</p> <p>Thereafter the car is for operation</p>	

		<p>by the rescue person. All landing calls</p> <p>are ignored. Lift answers one car call at a time. The rescue person controls</p> <p>opening and closing of doors at a floor.</p> <p>Returns to normal when fire switch is opened.</p> <p>Fireman switch Drive to be provided to ground</p>	
28.	Intercom- 3 way	<p>The intercom system provided in the lift car has to be handsfree and with lifting cradle in the lift machine room and security desk of IITB. With telephone/intercom wiring.</p> <p>Pocket provision shall be made inside the car to provide IITB intercom flush to car which will be connected to IITB EPABX system.</p>	
29	Automatic Rescue Device	<p>ARD should monitor the normal supply in the main controller and shall activate rescue operations within 10 seconds of normal supply failure. It should bring the elevator to the nearest floor at a slower speed than the normal run. While proceeding to the nearest floor, the elevator will detect the zone and stop. After the elevator has stopped, it automatically opens the doors and parks with doors open. After the operation is completed by the ARD, the elevator is automatically switched over to normal operation as soon as power supply resumes.</p>	

		<p>In case the normal supply resumes during ARD in operation, the elevator will continue to run in ARD and the doors are fully opened. If normal supply resumes when the elevator is at the landing, it will be automatically be switched to normal power operations.</p> <p>All the lift safties shall remain active during the ARD mode of operation.</p> <p>Battery capacity should be adequate so as to operate the ARD at least 4 times a day. Provided the duration between usage is at least 30 minutes.</p>	
25	Voice announcement system	To announce the position of the elevator as the car stops at a level.	
26	Transmission	Steel ropes/belts	
27	Hall fixtures	TFT/LED PwD friendly	
28	Infra red	<p>Full-length infrared safety light curtain infrared operated doors safety system. To be provided. The Light Curtain to consist of infrared light beams passing between Car Door Entrances and one side of the Entrance the light source is being sensed by sensors. If an object cuts the light beams the receivers will sense and give door command to the door operating system. This is to sense the passenger movement without being getting in to physical contact of doors with human being or other materials like trolley, etc., which ensures the highest safety to</p>	

		the passenger and other items transported by Elevator This infra-red light curtain to operate as low as from 100 mm to a height of 2 meters so the system can even detect the movement of child pet etc., and thus ensures complete.	
29.	Standard features	As indicated in the tender.	
30	Tests	<p>TESTS AT SITE</p> <p>The following tests, specifications, shall be carried out to the satisfaction of the Engineer-In-Charge.</p> <p>i. The car shall be loaded until the weight on the rope is twice the combined weight of the car and the specified load. The load must be carried on for about 30 minutes, without any sign of weakness, temporary set or permanent elongation of the suspension rope strands.</p> <p>ii. The following items shall be tested :</p> <p>a. No load current and voltage readings both on 'Up' and 'Down' Circuits.</p> <p>b. Half load current and voltage readings both on 'Up' and 'Down' Circuits.</p> <p>c. Full load current and voltage readings both on 'Up' and 'Down' Circuits.</p> <p>d. Stalling current and voltage and time taken to operate overload.</p> <p>e.. Overload protection.</p> <p>f. Car and counterweight buffers</p>	

		<p>with contract load and contract speed.</p> <p>g.. Manual operation of elevator at mid-way travel.</p> <p>h. Safties</p> <p>i. Emergency operation.</p> <p>j. Emergency Rescue</p> <p>k. ARD testing as per specification.</p> <p>l. SPP</p> <p>m. Speed test</p> <p>n. Phase reversal</p> <p>o. Final limits</p> <p>p. Working of fireman switches</p> <p>Tests on completion shall also be performed to the satisfaction of Inspector of Lifts.</p>	
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Note:

1. The Contractor has to arrange at their own cost including supply, fabricate and erect in position structural steel required for support of machine, brackets for guide rails, fascia plates at all landings etc., including three coats of anti corrosive paint of approved make and connected civil works including necessary scaffolding in/out of lift wells, floors on partitions together and making good holes for fixing brackets in lift walls, grouting of all bolts, sills, brackets / control board/ button boxes, limit switches etc., all in position for all lifts together.
2. Provision shall also be made available in the controller and wherever necessary for the lift(s) to directly travel to ground floor on any signal from Fire Alarm Control Panel having lead to lift machine room, automatically, ignoring direction of travel and other pending commands as per special condition of the Bid.
3. The offer shall include identification of Fireman's Lift, having break glass panel and other specific functional requirement. Requirements indicated in the National Building Code of India (Equivalent to BS) in respect of Fire Protection requirements of lifts (Clause 'D-1.5' – Latest Issue) shall be fully complied with in respect of Design, Manufacturing and Erection of the Lifts.
4. Contractor shall provide full set of tools required for maintenance of lifts in the Lift Machine Room.

5. Notice required from the statutory authority shall be obtained.
6. Cost Includes; Factory inspection is to be arranged for two persons.
- QAP for factory inspection may be submitted.

Parameter	Specifications	Remarks
Application	Passenger, PWD Compatible	
Type	Machine room	
Motor	Permanent Magnet, Gearless	
Capacity	16 persons (1088 kgs)	
Level/stops	G+9 floor stops, Total run – 29.9 m. All doors open on same side.	
Speed	Minimum 1.5 m/s with jerk less acceleration, deceleration and stopping with 3mm level accuracy.	
Drive	Microprocessor based Triplex, Full Collective, AC VVVF Compatible for BMS (Only provision)	
Power supply	AC 400 / 440 V, 3 phase and single phase, 50 cycles/sec.	
Car design	Stainless Steel honeycomb finish of 304 Grade SS of 1.2 mm (Equivalent not accepted) or non-glossy finish Stainless less steel	
Car door	SS doors with SS Honeycomb finish 2 Hour Fire Rated	
Vision panel	N/A	
Car door protection	Multi beam full height infrared detector.	
Landing doors	SS doors with SS frame, automatic (power operated) Centre openings. Fire rated for 2 hours.	
Direction & Position indicators	Large display LED/TFT Car Position Indicator in COP at lower height. Additional position indicator at rear side of the lift cabin.	
Car Flooring	Granite flooring	
Car lighting	LED Lighting	
Ventilation	Side corner blower ventilation / fan arrangement.	

Parameter	Specifications	Remarks
Travel	29.9	
COP suitable for physically handicap & Visually impaired	<p>Protruding type Brail encrypted Car buttons</p> <p>COP on side middle panel with Brail with vandal proof cover at a height easily accessible by wheelchair bound or visually impaired passenger.</p> <p><i>Pocket Provision to install IIT intercom to be mounted flush to car which will be connected to IIT EPABX</i></p>	
Transmission	Belt/ropes	
Hall Fixtures	<p>LED/TFT hall position indicators to benefit visually impaired and physically handicap users</p> <p>Hall lanterns with car arrival going at a height not more than from finished floor level</p>	
Car size of	As per standard (to be specified by bidder)	
Door opening	Finished Door opening – 1000 x 2100 mm	
Pit depth	As per standard (to be specified by bidder)	
Overhead height	As per standard (to be specified by bidder)	
Hoist way dimensions	Currently provided in design – 2150 (w) x 2850 mm (d)	
Entrance height	To be specified by bidder considering finished size of the door. – 2100 mm	
Inside car height	As per standard (to be specified by bidder)	
Special features	<p>*Full Height 2D electronic cross beam detectors</p> <p>*Large display LED/TFT Car Position Indicator in COP at lower height with vandal proof cover.</p> <p>*Hand rails on three sides with height not more than 900mm from floor</p> <p>*Voice announcement for all COP operations for visually impaired user</p> <p>*Overload Warning with audio visual</p>	

Parameter	Specifications	Remarks
	<p>indicators</p> <ul style="list-style-type: none"> *Auto fan Cutoff * Door open/Door close button in car. * UPS for emergency light and fan *Fireman switch. *3 way intercom system. *Anti nuisance <p>As per lift rules, ARD is mandatory.</p> <ul style="list-style-type: none"> *Lift in use /lift out of order sign: lift out bn of order indication <p>Mirror on Rear side panel</p>	
Machine Room	<p>Height to be specified by bidder.</p> <p>Cross ventilation is required for MR.</p> <p>Emergency Light to be provided.</p> <p>I/O point required.</p> <p>Floor finish thickness to be specified by bidder.</p>	
Miscellaneous	Smoke window in lift shaft is required.	