

PART B

FOR E & M

BALANCE WORKS

(Minor Component)

INDEX

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**PROFORMA OF SCHEDULES A to F
(E & M Components)**

SCHEDULE 'A'

Schedule of quantities (E & M works): Page NO. 224-256

Electrical work Minor component: ₹ 2,89,64,818/-

SCHEDULE 'D'

Extra schedule for specific requirements/documents for the work, if any, are attached.

SCHEDULE 'E'

Reference to General Conditions of contract: GCC 2023 for Construction works & CPWD 7 as amended /modified up to last date of submission of e-tenders.

Name of work:- Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Residence, internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I.

(SH:- Balance work)

Estimated cost of work (E&M Services): ₹ 2,89,64,818/-

- (i) Earnest Money: As per PART A of NIT
- (ii) Performance Guarantee: As per PART A of NIT
- (iii) Security Deposit: As per PART A of NIT

SCHEDULE 'F' – General Rules & Directions

Officer inviting tender

As per civil work Part-A

Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2(c)

See below under Clause 12.

Definitions:

2(vi) Engineer-in-Charge for Electrical work

EE (Elect.),
Dehradun Central Elect. Division,
CPWD, Dehradun
or Successor thereof.

2(viii) Accepting Authority

As per civil work Part-A

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

15%

2(x) (a) Standard schedule of Rates	DSR 2025 (E&M), amended upto date
2(xi) Department	Central Public Works Department.
9 (ii) Standard CPWD contract form GCC	GCC 2023 for Construction works & CPWD 7 as amended /modified up to last date of submission of e-tenders.
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.
ii)	Maximum allowable extension with late fees @ 0.1% per day of performance Guarantee amount beyond the period provided in (i) above.
Clause 2	Authority for fixing compensation under Clause 2
Clause 5	Number of days from the date of issue of letter of acceptance for reckoning date of start
Mile stone (s) as per table given below: -	

TABLE OF MILE STONE(S)

S. NO.	DESCRIPTION OF MILESTONE (PHYSICAL)	TIME ALLOWED IN DAYS (FROM THE DATE OF START)	AMOUNT TO BE WITH-HELD IN CASE OF NON- ACHIEVEMENT OF MILESTONE.
1	On submission of required TDS and drawings of all the E&M works as per NIT and approval from engineer in charge	20 Days	1.25 % of the accepted tendered value (E&M)
2	On supply of Fire Fighting pumps & panels, FAPA panel, fitting, pole Cable, OFC cable, Fire cable, pumps, DWC pipe, Fire Fighting pipes etc. material required at site.	1 Months	1.25 % of the accepted tendered value (E&M)
3	On installation of all the major E&M materials as per NIT	2.0 Months	1.25 % of the accepted tendered value (E&M)
4	On Testing, commissioning and handing over of E&M works to end user as per NIT	3.0 Months	1.25 % of the accepted tendered value (E&M)

However, activity wise Bar Chart shall be submitted by the contractor for monitoring the progress of work after award of work.

The withheld amount due to non-achievement of mile stone may be released if the subsequent mile stone is achieved in the specified time.

PROFORMA OF SCHEDULES

Authority to Decide:

- | | |
|---|--------------------------|
| i). Extension of time | As per civil work Part-A |
| ii) Rescheduling of milestones
Competent authority | As per civil work Part-A |
| iii) Shifting of date of start in case of delay in
Handing over of site. | As per civil work Part-A |

Clause-6	Mode of measurement	As per civil work Part-A
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Clause 7	Gross work to be done together with net payment/adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment.	Rs. 100 Lakh
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Clause 7 A

	Whether Clause 7A shall be applicable	Yes, Applicable
Clause 8A	Authority to decide compensation on account if contractor fails to submit completion plans	Engineer-in-charge (Penalty @ 0.1% of Tendered Amount or Rs. 25,000/- whichever is more shall be levied for non-compliance).
Clause 10A	List of testing equipment to be provided by contractor at site lab	Multi-meter, screw gauge, micrometer, Tong tester, earth tester, Luxmeter, Megger, and all other T&P as and when required at site
Clause10B (ii)	Whether clause 10-B (ii) shall be applicable	Applicable

Clause 10C	Whether clause 10C shall be Applicable	Applicable
Clause 10CC	Whether clause 10CC shall be Applicable	Not Applicable
Clause 11	Specifications to be followed For execution of work	CPWD General specifications for Electrical Works, Part-I: Internal, 2023, Part-II: External, 2023, Part -V: Wet Riser & Sprinkler System 2020, General Specifications for Heating, Ventilation & Air conditioning (HVAC) – 2024, Electrical Works Part VI Fire Detection and Alarm System 2018, General Specifications for Electrical Works (Part-III-LITS & Escalators) - 2003. ECBC 2017, NBC 2016 and other IS codes as applicable with correction slips amended up to last date of submission of tender
		Original Work (Construction Work).
Clause 12	Type of Work	As per civil work Part-A
	Authority to decide deviation upto 1.5 time of tendered amount	
12.2(c)	Deviation limit beyond which clauses 12.2(c) shall apply for E & M work	100%
Clause 16	Competent Authority for deciding Reduced rates.	As per civil work Part-A
Clause 18	Clause 25	List of mandatory machinery, tools & plants to be deployed by the contractor at site
Clause 19C		Authority to decide penalty for each
Clause 19D		default Authority to decide penalty for
Clause 19G		each default Authority to decide penalty
Clause 19K		for each default

Authority As per requirements of work at site
to decide EE (Elect.)
penalty for Dehradun Central Elect.
each Division, CPWD, Dehradun
default
For all
claims in As per Civil Part-A
dispute

Clause 32: Requirement of Technical Representative (S) and Recover Rate for each for E&M components -

SI. No.	Minimum Qualification Of Technical Representative	Discipline	Designation	Minimum Experience	Number	Rate at which recovery shall be made from contractor in the event of non-deployment	
						Figures	Words
1.	Graduate Engineer or Diploma Engineer	Elect.	Project manager/Planning quality/Site/billing/Engineer	2 or 5 respectively	1+1	Rs.15000/- per month	Rs. Fifteen Thousand only per month

- Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers.
- Diploma holder with minimum 10 years' relevant experience with a reputed construction co. 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.

SPECIAL CONDITIONS FOR ALL SPECIALIZED/ E & M COMPONENTS

1. The applicant should either himself meet the eligibility conditions for the respective E&M components or otherwise he will have to associate with agencies, fulfilling the eligibility requirements and hence consent letter from at least **One** eligible Associate Agency of the respective components of E&M work shall also be submitted as per attached **Proforma as per Form “HH”**.

In case the main contractor is himself eligible (as per eligibility criteria) for executing any specific minor component and intends doing the job himself, he may not be required to associate with another agency for that minor component of work. In such cases the main contractor also has to submit the documents as per eligibility criteria mentioned for associated agency of individual E&M component.

However, the Composite category contractor shall also be eligible to carry out himself any or all of these works without associating any specialized agency provided:

(a) He fulfils the prescribed eligibility criteria respectively for these work(s)

Or

(b) He directly procures the equipment of approved make from manufacturer and gets it installed from authorized agency/service provider of the manufacturer/ specialized agency, all as per the eligibility criteria mentioned in NIT. (Only for components mentioned in eligibility table)

2. The main tenderer has to submit the following documents for association of contractor within 20 days of award of work.

In support of the eligibility conditions of the proposed Associated Contractor, copy of their registration documents, Electrical License, GST Documents duly attested by the applicants (Main Contractor) shall be submitted to the AEE(E) who will submit these documents to the **EE & SM (C)S-1, IIM Sirmaur Project Civil Division, CPWD, Sirmaur (H.P.)**, for deciding the eligibility. Each such Associated Contractor will certify that they are not debarred as on the day of application for sale of tender. Proposal for associating agency for minor components of work shall be submitted in **Form- “GG”** of this tender document from each associate independently for all electrical and mechanical components.

(i) The main contractor will submit an Affidavit of MOU signed with eligible associated contractor. The Affidavit of MOU in the enclosed Form ‘II’ shall be signed by both the parties’ main contractor i.e.as 1st party and associated contractor as 2nd party. Independently for all electrical and mechanical components.

3. In the event of the concerned E&M agency not performing satisfactorily or failure of associate contractor to complete the E&M work, the main contractor on written directions of the department, shall remove the Associate contractor deployed on the work and shall submit name of new associate who fulfil the conditions mentioned in NIT to execute the

left-over work without any loss of time or variation in cost to the department. **Such associates shall also give an undertaking along with the main tenderer but both of them together will stand guarantee for the equipment's already supplied for which payment has been released by the department in part.** If any equipment supplied for the work, during the currency of the earlier Associate contractor and paid partly by the Dept., becomes redundant /not in a position to be installed and commissioned and put to beneficial use due to change in agency for execution of E&M work, the main contractor shall be liable for replacement of the equipment(s) at no cost to Department. No change of Associated Contractor will be allowed without prior approval of the Engineer-in-charge of the work.

4. Executive Engineer (Electrical), shall be the Engineer-in-charge as far as E & M works are concerned. Separate tender schedule abbreviated CPWD-7 and Special Conditions for E & M Work are appended with this tender. It will be obligatory on the part of the contractor/tenderer to sign the tender documents for all the component parts.
5. The main contractor shall be responsible and liable for proper and complete execution of the E & M work and ensure coordination and completion of both civil and E & M work.
6. The main contractor has to enter into agreement with contractor associated by him for execution of minor component. Copy of such agreement shall be submitted to Executive Engineer (E) in charge of minor component as well as E.E. in charge of major component.
7. The associate contractor shall attend the inspection of the work by the Engineer-in-Charge of E&M works as and when required.
8. The agency shall stand guarantee for at least 5 years of all the LED fittings and provide Certificate from the manufacturer to attend the complaints for repairing/replacement directly to the client of all LED fittings on the basis of complaints of defective LED fittings.
9. **Defect Liability Period:** All the installation other than LED fittings shall be guaranteed for a period of 24 months from the date of completion. **LED fittings shall be guaranteed for at least 5 years.**
10. **Guarantee period for LED fittings.** All the LED Bulbs/LED fittings / Lighting control shall be guaranteed for a period of 5 years from the date of completion.
50% of the Performance Guarantee of tendered amount (electrical work) shall be refunded to the contractor soon after the completion of the work and recording of the completion certificate.
50% of the performance Guarantee of tendered amount (electrical work) shall be retained as Security Deposit and will be released after expiry of 5 years guarantee of LED Bulbs/LED fittings / Fans/ Lighting control.

THE MINIMUM ELIGIBILITY CRITERIA FOR E&M COMPONENTS AND SPECIALIZED WORKS WHEREVER APPLICABLE

Note: 1) 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 last date of submission of tender. For other conditions, refer special conditions specified in Part B.

- (i) The applicant shall either himself meet the eligibility conditions for the respective E&M packages or otherwise, he will have to associate an agency meeting the eligibility requirements as given in this tender document and submit the details as per **Form “GG” given** in Part B of this tender document within 20 days of award of work OR before start of minor component of work whichever is earlier.

S. No.	Component of E&M works	Estimated cost in Rs. (In Crores)	Eligibility
1.	SITC of internal & external electrical installations including wiring, earthing, cabling, LPS etc.	Rs. 87,79,303/-	If the main contractor does not have valid Electrical license for executing the work then, he shall associate eligible class registered contractor, possessing valid Electrical Contractor License.
2.	SITC of Fire alarm.	Rs. 1,17,83,324/-	The main contractor shall have to associate with agency fulfilling the following eligibility criteria having successfully completed during last seven years ending up to previous day of last date of submission of tender as given below with completion certificate issued by an officer not below the rank of Executive Engineer or equivalent duly attested. 3 similar Works each of value not less than 40% of Estimated cost of component OR 2 similar Works each of value not less than 60% of Estimated cost of component OR 1 similar Works each of value not less

			<p>than 80% of Estimated cost of component Similar work shall mean "SITC of Fire alarm and PA Systems."</p> <p>However, the Composite category contractor shall also be eligible to carry out himself without associating any specialized agency provided:</p> <p>(a) He fulfils the prescribed eligibility criteria respectively for this work</p> <p>Or</p> <p>(b) He directly procures the equipment of approved make from manufacturer and gets it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned as above.</p>
3.	SITC of Firefighting system	Rs. 33,05,366/-	<p>The main contractor shall have to associate with agency fulfilling the following eligibility criteria having successfully completed during last seven years ending up to previous day of last date of submission of tender as given below with completion certificate issued by an officer not below the rank of Executive Engineer or equivalent duly attested.</p> <p>3 similar Works each of value not less than 40% of Estimated cost of component OR 2 similar Works each of value not less than 60% of Estimated cost of component OR 1 similar Works each of value not less than 80% of Estimated cost of component</p> <p>Similar work shall mean " SITC of Firefighting & sprinkler system."</p> <p>However, the Composite category contractor shall also be eligible to carry out himself without associating any specialized agency provided:</p> <p>(a) He fulfils the prescribed eligibility criteria respectively for this work</p> <p>Or</p> <p>(b) He directly procures the equipment of approved make from manufacturer and gets it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned as above.</p>
4.	SITC of HVAC.	Rs. 30,80,750/-	<p>The main contractor shall have to associate with agency fulfilling the following eligibility criteria having successfully completed during last seven years ending up to previous day of last date of submission of tender as given below with completion certificate issued by an</p>

			<p>officer not below the rank of Executive Engineer or equivalent duly attested.</p> <p>3 similar Works each of value not less than 40% of Estimated cost of component OR 2 similar Works each of value not less than 60% of Estimated cost of component OR 1 similar Works each of value not less than 80% of Estimated cost of component</p> <p>Similar work shall mean "SITC of VRV/VRF type Air-Conditioning/ Precision AC Systems."</p> <p>However, the Composite category contractor shall also be eligible to carry out himself without associating any specialized agency provided:</p> <p>(a) He fulfils the prescribed eligibility criteria respectively for this work</p> <p>Or</p> <p>(b) He directly procures the equipment of approved make from manufacturer and gets it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned as above.</p>
7.	SITC of Lift and Escalator	Rs. 7,71,296/-	The main contractor shall have to associate OEM of OTIC make lift/dumbwaiter.

The applicant/ main contractor has to submit consent letters as per **Form "HH"**, given in Part B of this tender document from at least one eligible associate agency of the respective component of E&M work for each of the component of E& M works by clearly indicating the component of work within 20 days of award of work OR before start of minor component of work whichever is earlier. The main contractor will submit Affidavit of MOU signed with eligible associated contractor. The Affidavit of MOU in the enclosed **Form "II"** shall be signed by both contractors, Main contractor as 1st party and associated contractor as 2nd party, independently for **Name of work:- "Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I". (SH:- Balance work)** specified as above.

If the main contractor fails to associate agency for execution of minor components of work within 20 days of award of work OR before start of minor component of work whichever is earlier or furnishes incomplete details or furnishes details of ineligible agencies even after the tenderer is given due opportunity, the entire scope of such component of work shall be withdrawn from the tender and the same shall be got executed by the Engineer-in-Charge at the risk and cost of the main contractor.

Verifiable completion certificates of the work, registration/approval documents, Valid Electrical license, self-attested GST registration documents in respect of the associated agencies as the case may be, duly attested by the applicant shall be submitted within 20 days of award of work OR before start of minor component of work whichever is earlier.

EE(Elect.)

FORM –GG
PROPOSAL FOR ELIGIBLE ASSOCIATING AGENCIES FOR MINOR COMPONENTS OF WORK

I/we hereby propose the following agencies as per mentioned against each for executing corresponding minor components of work. Their consent letters are also attached.

Sl.No	Name of Associated Contractor	Category and Class of registration	Enlistment copy/completion Certificates attached	Monetary Limit of work	Validity of registration	Consent letter attached (Yes/No)
Internal electrical installations including wiring, earthing, cabling, LPS etc.						
Firefighting and sprinkler system						
Fire alarm and PA system						
HVAC System						
Lift and Escalator						

Note: Self Attested by Main agency & associate agency photocopies of work experience certificates of each agency for each component of E&M work shall be submitted.

Signature of contractor

FORM –HH
CONSENT LETTER FROM ELIGIBLE ASSOCIATE AGENCY OF MINOR
COMPONENT OF WORK

Name of work:- “Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Residence, internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I”. (SH:- Balance work)

I / We hereby give my consent to associate with M/s, for executing the minor component of work of..... (Mention category).

1. I / We will execute the work as per specifications and conditions of the agreement and as per directions of the Engineer –in-Charge for the corresponding minor work till the completion of the work.
2. I / We will be responsible for necessary action to handover the installations and for rectification of defects and repair during the maintenance / warranty period.
3. Also, I / We will employ full time technically qualified Engineer / supervisor for the minor component of the work as required for the work. I / We will attend inspection of officers of the department as and when required.

Date:

Signature with date of Major component
Contractor

Signature with date of Associate/ Minor Component
Contractor

Address

Address

Witness with address
(From major component contractor side)

Witness with address
(From minor component contractor side)

FORM-“II”

AFFIDAVIT OF MEMORANDUM OF UNDERSTANDING (MOU)

(to be submitted for each and every E&M component)

1. M/s. (Name of the firm with full address)
Enlistment Status
Valid Up to:
(Henceforth called the main Contractor)
2. M/s. (Name of the firm with full address)
Enlistment Status
Valid Up to:
(Henceforth called Associated Contractor)

For the execution of E & M Work

Name of work:- “Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Residence, internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I”. (SH:- Balance work)

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

We have agreed as under:

1. The Associated Contractor will execute all E & M works in the wholesome manner as per terms and conditions of the agreement.
2. The Associated Contractor shall be liable for disciplinary action if he fails to discharge the action(s) and other legal action as per agreement.
3. All the machinery and equipment, tools and tackles required for execution of the E & M works, as per agreement, shall be the responsibility of the Associated Contractor.
4. The site staff required for the E & M work shall be arranged by the Associated Contractor as per terms and conditions of the agreement.
5. Site order book maintained for the said work shall be signed by the main contractor as well as by the Engineer of the Associated Contractor and by Associated Contractor himself.
6. All the correspondence regarding execution of the E & M work shall be done by the department with the Associated Contractor with a copy to the main contractor. In case of non-compliance of the provisions of agreement, the main contractor, as well as the associated contractor shall be responsible. The action under clauses 2 and 3 shall be initiated and taken against the main contractor.

SIGNATURE OF MAIN CONTRACTOR

SIGNATURE OF ASSOCIATED CONTRACTOR

Date:

Date

Place:

Place:

1. Witness with address

2. Witness with address

(From major component contractor side)

(From minor component contractor side)

OTE: Affidavit to be furnished on a 'non-judicial' stamp paper worth Rs.100/-

GENERAL TERMS AND CONDITIONS APPLICABLE FOR ALL E&M COMPONENTS

E&M Scope of Work:

The scope of work includes execution all E&M components. The complete scope of work wherever necessary & required as per the directions of Engineer in Charge. Nothing extra shall be paid other than BOQ items.

1 GENERAL

1.1 The work shall be generally carried out in accordance with tender/bid specifications and the following specifications / rules with Up-to-date amendments.

- a) CPWD General Specifications for Electrical work Part I Internal – 2023, as amended Up to date
- b) CPWD General Specifications for Electrical work Part II External-2023, as amended up-to-date
- c) CPWD General Specifications for Electrical work Part III (Lifts) -2003 as amended Up to date.
- d) CPWD General Specifications for Electrical work Part V (Wet Riser & Sprinkler System) 2020 as amended Up to date.
- e) CPWD General Specifications Part-VI: Fire Alarm System 2018 as amended Up to date.
- f) CPWD General Specifications -2024 for HVAC Works as amended Up to date.
- g) Additional conditions for this work.
- h) The Indian Electricity Act, 2003, as amended Up to date.
- i) Indian Electricity Rules 1956 amended Up to date., NBC 2016, ECBC 2017 and any other IS & internal national codes as applicable
- j) NBC 2016 & ECBC 2017, Central Electricity Authority rules.

1.2 Order of Preference:

Should there be any difference or discrepancy between the description of items as given in the Schedule of Quantities, technical specifications for individual items of work (including additional and commercial conditions) and IS Codes etc., the following order of preference shall be followed:

- a) Description of Schedule of quantities.
- b) Commercial and Additional conditions, specifications of this agreement.
- c) Drawings.
- d) CPWD General Specifications of that particular work.
- e) Relevant IS or any other international code in case IS code is not available.

Commercial and Additional conditions of that particular work are to be read in conjunction with above and in case of variations, specifications given in these additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications and conditions, as the same are to be read along with schedule of quantities for the work.

- 1.3 The scope of work includes designing of all E&M components, preparation of Good for construction AutoCAD drawings with sound engineering practices, submission and getting the approval from the Engineer in Charge in time as specified in the tender document.
- 1.4 This specification covers manufacture, testing as may be necessary before dispatch, delivery at site, all preparatory work, assembly and installation, commissioning putting into operation of equipment of all E&M components of the tender.
- 1.5 The tenderer should in his own interest visit the site and get familiarize with the site conditions before tendering.
- 1.6 No T&P shall be issued by the Department and nothing extra shall be paid on account of this.
- 1.7 In the event of the concerned E&M agency not performing satisfactorily or failure of associate contractor to complete the E&M work, the main contractor on written directions of the department, shall remove the associate contractor deployed on the work and shall submit name of new associate agency who fulfil the conditions mentioned in the NIT to execute the left over work without any loss of time or variation in cost to the department. Such associates shall also give an undertaking along with the main tenderer but both together shall stand guarantee for the equipment already supplied for which payment has been released by the department in part. If any equipment supplied for the work, during the currency of the earlier Associate contractor and paid partly by the Dept., becomes redundant /not in a position to be installed and commissioned and put to beneficial use due to change in agency for execution of E&M work, the main contractor shall be liable for replacement of the equipment(s) at no cost to Department. No change of Associated Contractor will be allowed without prior approval of the Engineer-in-charge of the work.
- 1.8 In respect of all works the materials shall be procured only from the original equipment manufacturers/authorized dealers of OEM. The contractor shall submit all documentary details in fulfilment of this conditions regarding procurement of materials including relevant test certificates.
- 1.9 The work shall be executed as per Schedule of Quantities, approved design and drawings, particular specifications for each Sub Head, CPWD specifications, special conditions, Specifications of Bureau of Indian Standards and Specifications of International Bodies in that order. Where the aforesaid provisions and conditions are silent, relevant specialized literature and manufacturer's specification shall be followed for execution of work. Where there is ambiguity amongst the above referred documents / sources, the decision of the Engineer-in-charge is final and binding.
- 1.10 It shall be deemed that the contractor has satisfied himself as to the nature and location of the work, transport facilities, availability of land for setting up of camp, etc. the department will bear no responsibility for lack of such knowledge & the consequences thereof.
- 1.11 The contractor shall have to make approaches to site, if so required, and keep them in good condition for transportation of labor and materials as well as inspection of works by the Engineer-in-charge. Nothing extra shall be paid on this account.

- 1.12 The contractor shall carry out true and proper setting out of the work in co-ordination with the Engineer-in-charge or his authorized representatives and shall be responsible for the correctness of the positions, levels, dimensions and alignments of all parts of the structure. If at any time, during the progress of the work, any error appears or arises in the position, level, dimensions or alignment of any part of the work, the contractor on being asked to do so by the Engineer-in-charge, shall rectify such error to the entire satisfaction of Engineer-in-charge. The checking by the Engineer-in-charge or his authorized representatives shall not relieve the contractor of his responsibility for the correctness of any setting out of any line or level. The contractor shall carefully protect and preserve all benchmarks, pegs and pillars provided for the setting out of works.
- 1.13 In case the department decides to engage the third-party quality assurance system, the contractor shall render the necessary arrangements for the inspection of work by the quality assurance team similar to the respective clauses of the agreement.
- 1.14 The Contractor shall at his own cost submit samples of all materials sufficiently in advance and obtain approval of Engineer-in-charge. Subsequently the materials to be used in the actual execution of the work shall strictly conform to the quality of samples approved by the Engineer-in-charge and nothing extra shall be paid on this account. The acceptance of any sample or material on inspection shall not be a bar to its subsequent rejection, if found defective.
- 1.15 The contractor shall at his cost, make all arrangements and shall provide necessary facilities as the Engineer-in-charge may require for collecting, preparing, packing, forwarding and transportation of the required number of samples for tests & for analysis at such time and to such places as directed by the Engineer - in-charge. Nothing extra shall be paid for the above operations including the cost of materials required for tests & analysis. Testing charges, if any, will be borne by the agency whether the test is successful or not successful. In case it fails, the whole batch of materials forthwith removed from site.
- 1.16 The necessary tests shall be conducted in the laboratory approved by the Engineer-in-charge. The samples for carrying out all or any of the tests shall be collected by Engineer-in-charge or on his behalf by any other officer of CPWD. The contractor or his authorized representative shall associate himself in collection, preparation, packing and forwarding, including sealing if so required, of such samples for the prescribed tests and analysis. In case the contractor or his authorized representative is not present or does not associate himself in the aforesaid operation the results of such tests and consequences thereon shall be binding on the contractor.
- 1.17 Materials used on work without prior approval and testing (where testing is necessary) by the Engineer-in-charge are liable to be considered unauthorized, and are not acceptable. The Engineer-in-charge shall have full powers for removal of any or all the materials brought to site by contractor which are not in accordance with the contract specifications or do not conform, in character or quality to the samples approved by the Engineer-in-charge. In case of default on the part of the contractor in removing rejected materials, the Engineer-in-charge shall be at liberty to have them removed at the risk and cost of the contractor.

- 1.18 The contractor shall make his own arrangement of water required for execution of work and get the water tested with regard to its suitability for use in the works and get written approval from the Engineer-in-charge before he proceeds with the use of same for execution of work.
- 1.19 The work shall be carried out in such a manner so as not to interfere or adversely disturb other works executed / being executed by other agencies, if any.
- 1.20 Any damage done by the contractor to any existing work or work executed / being executed by other agencies shall be made good by him at his own cost.
- 1.21 The work shall be carried out in the manner complying in all respect with the requirement of relevant rules and regulations of the local bodies under the jurisdiction of which the work is to be executed and nothing extra shall be paid on this account.
- 1.22 For completing the work in time, the contractor may have to work in two or more shifts and no claims whatsoever shall be entertained on this account, not with-standing the fact that the contractor will have to pay extra amount if any to the laborers and other staff engaged directly or indirectly on the work according to the provisions of the labor regulations and the agreement entered upon.
- 1.23 The contractor will have to make his own arrangement for obtaining electric connection from the local Electrical Power Supply Distribution Company and make necessary payment directly to the department concerned and / or install generators at the site of work, if required including getting the Roof top solar approval from the BESCOM authorities from the and nothing extra whatsoever will be payable on this account.
- 1.24 The contractor shall maintain in good condition all work executed till the completion of entire work entrusted to the contract under this contract.
- 1.25 No payment shall be made to the contractor for damage caused by rain, flood and other natural calamities whatsoever during the execution of works and any damage to the work on this account shall have to be made good by the contractor at his own cost.
- 1.26 The rates for all items of work, unless clearly specified otherwise, shall include the cost of all labour materials, de – watering required, if any, and other inputs involved in the execution of the items.
- 1.27 Unless otherwise provided in the schedule of quantities, the rates tendered by the contractor shall be all inclusive and shall apply to all heights, depths, leads and lifts, except for additional height in centering and shuttering over a height of 4.5m.
- 1.28 No claim whatsoever for idle labour, additional establishments, costs of hire and labour charges for tools and plants etc., would be entertained under any circumstances.
- 1.29 The contractor shall take all precautions to avoid all accidents by exhibiting necessary caution boards and by providing red flags, red lights and barriers. The contractor shall be responsible for any accident at the site of work and consequences thereof. For the safety of all labour directly or indirectly employed in the work for the performance of the contractor's part of this agreement, the contractors shall, in addition to the provision of CPWD safety code and directions of the Engineer-in-charge, make all arrangements to provide facility as per the provision of Indian Standard Specifications (Codes) listed below & nothing extra shall be paid on this account.

1. IS 3696 Part I Safety Code for scaffolds & ladders
2. IS 3696 Part II Safety Code for scaffolds and ladders Part II
3. IS 764 Safety Code for excavation work.

4. IS 4138 Safety Code for working in compressed air.
 5. IS 7293 Safety Code for working with construction machinery.
 6. IS 7969 Safety Code for storage and handling of building materials.
- 1.30 Royalty if any payable and all other incidental expenditure shall have to be paid by the contractor on all the boulders, metal shingle, earth, sand bajri, etc. collected by him for the execution of the work, direct to the concerned Revenue Authority of the State or Central Govt. and the amount paid shall not be reimbursed in any form whatsoever.
- 1.31 Other agencies working at site will also simultaneously execute the works entrusted to them and to facilitate their working, the contractor shall make necessary provisions e.g. holes, openings, etc. for laying / burying pipes, cables, conduits, clamps, hooks for the execution of other agencies smoothly. The final finishing of the work is to be executed in co-ordination with other agencies as directed by the Engineer-in-charge.
- 1.32 Submission of Progress Report: The contractor shall submit monthly progress report of the work in a computerized form. The progress report shall contain the following and shall be given for work of each associated agency as well as for the overall work:
- a) Project information, giving the broad features of the contract.
 - b) Introduction, giving a brief scope of the work under the contract, and the broad structural or other details.
 - c) Construction schedule of the various components of the work through a bar chart for the next three quarters (or as may be specified), showing the milestones, targeted tasks and up to date progress.
 - d) Progress chart of the various components of the work that are planned and achieved, for the month as well as cumulative Up to the month, with reasons for deviations, if any, in a tabular format.
 - e) Plant and machinery statement, indicating those deployed in the work, and their working status, as required.
 - f) Man-power statement, indicating individually the names of all the staff deployed in the work, along with their designations.
 - g) Financial statement, indicating the broad details of all the running account payments received up to date, such as gross value of work done, advances taken, recoveries effected, amounts withheld, net payments, details of cheque payments received, etc.
 - h) A statement showing the extra and substituted items submitted by the contractor, and the payments received against them, items pending for sanction/decision by the Department, broad details of the bank Guarantees, indicating clearly their validity periods, broad details of the insurance policies taken by the contractor, if any, the advances received and adjusted.
 - i) progress photographs, in colour, of the various items/components of the work done up to date, to indicate visually the actual progress of the work.
 - j) Quality assurance and quality control tests conducted during the month, with the results thereof.
- 1.33 During the project, the contractor shall maintain a document showing the “history” of the project progress along with photographs and write-up on the work carried out, challenges faced, specific issues etc. This shall be updated monthly. This document shall be submitted in both soft copy and hard copy. The document shall include the physical progress, financial progress, photos, videos (in soft copy only) etc. At the closure of the work, 10 (Ten) sets of the complete document, apart from the soft copy, shall be submitted to the

- department.
- 1.34 Stacking of materials and excavated earth shall be done as per the directions of the Engineer-in-charge. Double handling of materials or excavated earth if required shall have to be done by the contractor at his own cost.
- 1.35 Unless otherwise specified in the schedule of quantities the rates for all items of work shall be considered as inclusive of working in or under water and / or liquid mud and/ or foul conditions including pumping or bailing out liquid mud or water accumulated in excavations during the progress of the work from springs, tidal or river seepage, rain, broken water mains or drains and seepage from subsoil aquifer.
- 1.36 Some restrictions may be imposed by the State Government on quarrying of sand, stones etc. from certain areas. For timely completion of work, the contractor shall have to bring such materials from other quarries located elsewhere.
- 1.37 In case of any difference in the Hindi version and English version in any of the condition of contract, English version shall prevail.
- 1.38 It is the responsibility of the contractor to obtain necessary no objection certificate, wherever required for approval of drawings, clearance from fire department etc. from Central Govt. / State Govt. / Development Authority / Municipal corporation / Zilla Parishath / Local Bodies / Village Panchayat any other organization as the case maybe. Nothing extra shall be paid to the contractor to such sanctions / approval / Clearance from the above Bodies. However, necessary requisition and letters required in this regard, if necessary, shall be given by the Department for submission to the respective authorities. The required fees and other statutory deposits as may be prescribed by the above bodies shall be borne by the Department.
- 1.39 Contractor shall be responsible for the watch and ward of the materials lying at site/building in all respect till the handing over of building.
- a) All specifications and parameters of the various E&M services being provided under this work shall either match or be superior to (with integration) the specifications and parameters of services.

2 RATES TAXES AND DUTIES

The C/D forms for concession of CST will not be issued to firms for procurement of materials. All Statutory deductions like GST on works contract, Building and other construction workers welfare cess recovery, income tax etc. at applicable rates will be made from the Contractors bills.

3 COMMERCIAL CONDITIONS

Type of Contract: The work to be awarded by this tender shall be treated as indivisible works contract. Income tax, GST, labor cess & other statutory deductions etc. shall be made at source as per the prevalent laws. The deductions of Security Deposit, Income-Tax etc. shall be done as applicable on the gross payments and net payment shall be paid accordingly.

4 RATES

The rates quoted by the tenderer, shall be firm and inclusive of all taxes (including GST, labour cess etc.), and all charges for packing forwarding, insurance, freight and delivery, installation, testing, commissioning etc. at site including temporary construction of storage, risks, overhead charges, general liabilities/ obligations.

5 In case of Specialized E&M original Works and other original E&M Works, wherever required, that the lowest tenderer should submit the following documents along with the performance guarantee after the acceptance of tender, an undertaking from the OEM for the particular minor component

- a) Authorization certificate.
- b) The OEM is unconditionally supporting the lowest tenderer technically throughout the execution of contract as well as for Maintenance/Comprehensive Maintenance Contract for the useful life of the system, and
- c) OEM is providing all the spares required for healthy functioning of the equipment for at least seven years from the date of supply of equipment.

6 In case the same item appears more than once in the schedule of work under the same sub head or among the different subhead of works, the lowest rate quoted for that item elsewhere shall be considered for other items also during evaluation of tender.

7 COMPLETENESS OF TENDER

All sundry equipment, fittings, unit assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections, and all other items which are useful and necessary for efficient assembly and installation of equipment and components of the work shall be deemed to have been included in the tender irrespective of the fact whether such items are specifically mentioned in the tender documents or not.

8 STORAGE AND CUSTODY OF MATERIALS

The agency has to make his own arrangements. No storage accommodation shall be provided by the department. Watch and ward of the stores and their safe custody shall be the responsibility of the contractor till the final taking over of the installation by the department/client.

9 CARE OF THE BUILDING:

Care shall be taken by the contractor while handling and installing the various equipment and components of the work to avoid damage to the building. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of the installation from the site of work.

10 **COMPLETION PERIOD**

The completion period indicated in the tender documents is for the entire work of planning, designing, approval of drawings etc., arrangement of materials & equipment, delivery at site including transportation, installation, testing, commissioning and handing over of the entire system to the satisfaction of the Engineer-in-charge.

11 **Defect Liability Period**

All the equipments except **LED fittings** shall be guaranteed for a period of 12 months from the date of completion against unsatisfactory performance and / or break down due to defective design, workmanship of material. The equipments or components, or any part thereof, so found defective during guarantee period shall be forthwith repaired or replaced free of cost, to the satisfaction of the Engineer-in-Charge. In case it is felt by the department that undue delay is being caused by the contractor in doing this, the same will be got done by the department at the risk and cost of the contractor. The decision of the Engineer-in-Charge in this regard shall be final.

Guarantee period for LED fittings. All the LED Bulbs/LED fittings / Lighting control shall be guaranteed for a period of 5 years from the date of completion.

50% of the Performance Guarantee of tendered amount (electrical work) shall be refunded to the contractor soon after the completion of the work and recording of the completion certificate.

50% of the performance Guarantee of tendered amount (electrical work) shall be retained as Security Deposit and will be released after expiry of 5 years guarantee of LED Bulbs/LED fittings / Fans/ Lighting control.

2.5% Security Deposit already deducted from running bills shall be refunded after completion of defect liability period.

The tender shall guarantee among other things, the following:

- a. Quality, strength and performance of the materials used as per manufacturers standards.
- b. Safe mechanical and electrical stress on all parts under all specified conditions of operation. Satisfactory operation during the maintenance period.

12 **POWER SUPPLY:**

The contractor has to make its own arrangement for power supply required for execution of the work. **Contractor will take due care to ensure safety of electrical installation during execution of work.**

13 **WATER SUPPLY:**

The contractor has to make its own arrangement for water supply required for execution of the work.

14 **ACCEPTABLE MAKES OF VARIOUS EQUIPMENTS:**

The acceptable makes of various equipment/components/accessories have been indicated in “Acceptable Makes” appended with the tender documents. The tenderer shall work out the cost of the offer on this basis. Alternate makes are not acceptable.

15 DATA MANUAL AND DRAWINGS TO BE FURNISHED BY THE TENDERER:

After award of work

The successful tenderer would be required to submit the following drawings after award of work for approval as per mile stones of tender.

- a) General arrangement drawing, including detailed shop drawings of required E&M components i.e route layout, Panel Drawing, Fire alarm, Firefighting Layout and other drawings of all E&M components shall be prepared in AUTOCAD or equivalent software and submitted by the agency well in advance to get the approval from the AE(E)/EE (E).
- b) Any other drawings necessary for the job.

The successful tenderer should furnish well in advance of start of work, three copies of detailed instructions and manufacturer's manuals of all equipment regarding installation, operation and maintenance, preventive maintenance & trouble shooting with all the relevant data sheets, spare parts catalogue, etc. as applicable.

16 EXTENT OF WORK

- 16.1 The work shall comprise of entire labour including supervision, all materials necessary to make a complete installation, tests and adjustments and commissioning, as may be required by the department. The term complete installation shall not only mean major items of the plant and equipment covered by specifications but all incidental sundry components necessary for complete execution and satisfactory performance of installation with all layout charts whether or not been mentioned in details.
- 16.2 The cables and all other items shall be brought to site only after taking correct measurements as per actual requirement of work. Excess quantities shall not be accepted and paid. i.e., Quantity of item brought to site and used in work as per actual requirement shall only be measured and paid irrespective of quantities of BOQ / work schedule. **The item brought at site and paid, if not used in the project have to be taken back by the contractor and deductions in the payment shall be adjusted in subsequent bills.** The decision of the Engineer-in-charge in this regard shall be final & binding on the contractor.
- 16.3 In addition to supply, installation, testing and commissioning, of all E&M equipment, following works shall be deemed to be included within the scope of work to be executed by the tenderer.
 - a) Minor building works necessary for installation of equipment, foundation, making of opening in walls or in floors and restoring them to their original condition finish and necessary grouting etc. as required.

- b) All necessary supports may be arranged.
- c) Testing of PTs/CTs for metering & protection purpose & relay calibration & setting.
- d) All E&M equipment/materials shall be tested from the 3rd party laboratories as per the guidelines of **Quality Assurance Policy & Check List of E & M Services 2016**. The laboratories test shall be preferably carried out at Government Labs/ Government autonomous bodies or as approved by the competent authority.
- e) All the necessary work requires to clear the bushes, grass, malba, excess earth, big stones etc. shall be done to lay the cables along the compound and wherever required.

18 INSPECTION AND TESTING

The Engineer-in-charge or his representative may witness testing of equipment at the manufacturer's works before dispatch testing. The cost of the Engineer's visit to the factory will be borne by the Department. Equipment's will be inspected at the manufacturer/ Authorized Dealers premises, before dispatch to the site by the contractor if so desired by the Engineer-in-charge. Engineer-in-charge at his discretion may waive off inspection at factory /at the manufacturer's works before dispatch.

Copies of all documents of routine and type test certificates of the equipment, carried out at the Manufacture's premises shall be furnished to the Engineer-in-charge. The decision of the Engineer-in-charge in this regard shall be final & binding on the contractor.

After completion of the work in all respects the contractor shall offer the installation for testing and operation. The contractor should submit all the related documents of completed E&M equipment to the department for further handing over to client department.

19 COMPLIANCE WITH REGULATIONS AND INDIAN STANDARDS

All works shall be carried out in accordance with relevant regulation, both statutory and those specified by the Indian Standards related to the works covered by this specification. In particular, the equipment and installation will comply with the following as applicable.

- a) Factories Act.
- b) Indian Electricity Rules.
- c) B.I.S. & other standards as applicable.
- d) Workmen's compensation Act.
- e) Statutory norms prescribed by local bodies like CEA, Power Supply Co., Fire authorities, etc.

After completion of the installation, the same shall be offered for inspection by the representatives of the local fire authority. The contractor will extend all help including test facilities to the representatives of Local fire authority. The observations of Local fire authority will be attended to by the contractor. The installation will be commissioned only after getting clearance from Local fire authority. Contractor should get inspection done & obtain approval from local fire authority.

The scope of work includes getting all the necessary statutory approvals from the local authorities as and where applicable before and after completion of the work. Nothing extra shall be paid on this account.

20 INDEMNITY:

The successful tenderer shall at all times indemnify the department. Consequent on this works contract, the successful tenderer shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising there during the period of erection, construction and putting into operation the equipment and ancillary equipment under the supervision of the successful tenderer to the extent the latter is responsible. The successful tenderer shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the successful tenderer on account of the above.

21 ERECTION TOOLS:

No tools and tackles either for unloading or for shifting the equipment for erection purposes would be made available by the department. The successful tenderer shall make his own arrangement for all these facilities.

22 COOPERATION WITH OTHER AGENCIES:

The successful tenderer shall co-ordinate with other contractors and agencies engaged in the construction of buildings, if any, and exchange freely all technical information so as to make the execution of this work/contract smooth. No remuneration should be claimed from the department for such technical cooperation. If any unreasonable hindrance is caused to other agencies and any completed portion of the work has to be dismantled and re-done for want of cooperation and coordination by the tenderer during the course of work, such expenditure incurred will be recovered from the successful tenderer if the restoration work to the original condition or specification of the dismantled portion of the work was not undertaken by the tenderer himself.

The work will be carried out with least disturbance during shifting & shut down taken in consultation with the client department.

23 **INSURANCE AND STORAGE:**

All consignments are to be duly insured Up to the destination from warehouse at the cost of the contractor. The insurance covers shall be valid till the equipment is handed over duly installed, tested and commissioned.

24 **VERIFICATION OF CORRECTNESS OF EQUIPMENT AT DESTINATION:**

The contractor shall have to produce all the relevant records to certify that the genuine equipment from the manufacturers has been supplied and erected to the satisfaction of the Engineer-in-charge.

25 **PAINTING:**

This shall include cost of painting of the entire exposed iron work in the installation. The agency shall be required to do only touching to the damages caused to the painting during transportation, handling & installation at site, if there is no major damage to the painting. However, hangers, supports etc. of cable tray, MS pipe **exposed MS conduit** etc. shall be painted with required shade including painting with two coats of anticorrosive primer paint at site.

26 **TRAINING:**

The scope of works includes the on job technical training of two persons of Department at site as decided by Engineer – in - charge. Nothing extra shall be payable on this account.

27 **SAFETY CODES & STATUTORY REGULATIONS:**

- a) Nothing in this specification shall be construed to relieve the successful tenderer of his responsibility for the design, manufacture and installation of the equipment with all accessories in accordance with currently applicable statutory regulations and safety codes.
- b) Successful tenderer shall arrange for compliance with statutory provisions of safety regulations and departmental requirements of safety codes in respect of labour employed on the work by the tenderer. Failure to provide such safety requirement would make the tenderer liable for penalty of Rs.1000/- for each default. In addition, the department will be at liberty to make arrangement for the safety requirements at the cost of tenderer and recover the cost thereof from him.

28 PAYMENT TERMS FOR E&M PACKAGES: The following percentage of contract rates shall be payable against the stages of work shown herein:

Stage	Items	On initial inspection of materials and delivery at site in good condition on pro-rata basis	On completion of pro-rata installation	On completion of testing and commissioning	Handing over and submission of As built drawings.
S.No.	Percentage of Rate on pro rate basis				
1	Electrical Installation	70	15	10	5
2	Fire Detection and Alarm System	70	15	10	5
3	Fire Fighting Works	70	15	10	5
4	HVAC	70	15	10	5
7	Lift and Escalator	70	15	10	5
10	All other Items	70	15	10	5

EE(Elect.)

SH: I

Internal Electrical Installations

ADDITIONAL, COMMERCIAL & TECHNICAL CONDITIONS **FOR INTERNAL ELECTRICAL INSTALLATIONS**

1. General:

The work shall be generally carried out in accordance with schedule of quantities and following specifications and conditions:-

- a) CPWD General Specifications for Electrical work Part II External – 2023, as amended up to date.
- b) CPWD General Specifications for Electrical work Part I Internal – 2023, as amended up to date.
- e) Additional conditions for this work.
- e) The Indian Electricity Act, 2003 as amended up to date.
- f) Indian Electricity Rules 1956 amended up to date.
- g) NBC 2016

2. Extent of work:

The work shall comprise of entire labour including supervision and all materials necessary to make a complete installation and such tests and adjustments and commissioning as may be required by the department.

Minor building works necessary like making of opening in walls or in floors and restoring to their original condition, finish and necessary grouting etc. as required to be undertaken.

- 3. The main contractor shall also enter into an Affidavit of ‘Memorandum of understanding’ with the approved associated contractor on Non-Judicial Stamp Paper as per the enclosed proforma and submit this ‘MOU’ duly completed (duly signed by him and the associated Contractor) before commencement of work.
- 4. EE & SM(C)S-1 shall be the Engineer-in-Charge as far as E & M works are concerned. Separate tender form for E & M component is appended with this tender. It will be obligatory on part of the main contractor to sign the tender documents for all the components.
- 5. The main agency shall be responsible for all acts of omissions and submissions of the Associated Contractor engaged by him, even with approval of department.
- 6. Approval of the Engineer-in-charge shall be taken well in advance for all the materials to be supplied and used in all the works by the contractor.
- 7. The contractor has to make his own arrangements for stores and watch and ward and no extra claim for this will be entertained.
- 8. The main contractor shall be responsible for coordinating the activities of all works and will ensure progress of works as per laid down Programmed.
- 9. The main contractor and / or his Associated Contractor or his representative is bound to sign the site order book as and when required by the Engineer-in-charge and will comply with the remarks therein.

10. The contractor shall make his own arrangement at his own cost for electrical / General Tools and plants required for the work.
11. The connections, inter-connections, earthing and loop earthing shall be done by the contractor wherever required to be done for energization of the installation and nothing extra shall be paid on this account.
12. The contractor must be able to work on concrete slabs / walls as and when required and in complete coordination with the civil works. Cutting of chases in the plastered wall shall in no case be allowed. The contractor shall fix conduits and boxes in the walls soon after the brick work is completed and finish the chase to rough surface with proper cement sand mixture. Only in exceptional cases e.g., where cutting of plastered surface cannot be avoided it will be contractor's responsibility to ensure that plastering is done to match the original finish at no extra cost.
13. The contractor shall remove all the debris due to the E & M works from the site as soon as the work is completed.
14. The rupturing capacity of the MCBs shall be 10 KA minimum. The MCBs shall have ISI mark. Quantities of MCBs of different rating of 6 amps to 32 amps shall be brought in consultation with the Engineer-in-Charge or his representative.
15. The copper wire to be used on this work shall be FRLS type and ISI marked.
16.
 - a. The make of switch boxes shall be the same as that of switches. Only the required knockouts of the switch boxes are to be removed for terminating the conduit pipes with PVC glands / check nuts.
 - b. Make of MCB/MCCB shall be the same as the make of MCB DB. All Horizontal TPN MCB DBs shall have a provision for income slot for accommodating 4 P MCB and 4 P RCCB.
 - c. All the switch boxes, MCBDBs are to be covered with plastic sheet / petroleum jelly when installed in brick work till the plastering / painting is done to avoid sticking of cement

plaster/ splashes of the paint. Cement plaster / paint is to be cleaned immediately after plaster to avoid rusting of switch boxes and MCB DBs. The plastic sheet is to be removed at the time of handing over.

d. If two module sockets are used, one blanking plate is to be fixed by the side of socket to avoid interference of larger size plug to PS. Nothing will be paid extra for blanking plate.

17. The E & M works shall be carried out by the contractor, along with the progress of the civil works.
18. The Contractor shall furnish documentary proof like delivery challans of purchasing Wires, Modular switches & accessories, MCBs, MCBDB, Fittings, accessories and other items from the manufacturers or their authorized dealers to the satisfaction of the Engineer-in-charge.
19. All PVC conduits accessories shall be of the same make as conduits. The Conduits shall be terminated at switch boxes/metallic junction boxes with suitable PVC glands/check nuts.
20. Cutting of brick walls shall be with chase cutting machine only. All repairs and patch works shall be neatly carried out to match the original finish and to the entire satisfaction of the Engineer in Charge.
21. All the sub main and circuit wiring includes loose wire for connections inside switch boxes and MCBDBs. No payment for these loose wires shall be made. However, wires within the cubicle panel will be measured and paid under relevant item of work.
22. All the circuits / sub-main wiring are to be suitably numbered with stickers / marker pen at LT panel, MCBDBs, switch boards (on backside of cover plate) for ease of maintenance. Nothing shall be paid extra on this account.
23. To facilitate drawing of wires, 18 SWG GI fish wire shall be provided along with laying of recessed conduit/existing conduit for which no extra payment shall be made. Conduits laid for other services, like fire alarm, PA etc., where wiring is not done along with IEI works, fish wire shall be invariably drawn failing which recovery will be made @ 12/- per mtr for not providing fish wire in the conduit.
24. The connection between incoming switch / isolator and bus bar shall be made with suitable size of thimble and cable at no extra cost.
25. Copper conductor of insulated cables of size 1.5 Sq.mm and above shall be stranded and terminals provided with crimped lugs.
26. All MS junction box cover should be of phenolic laminated / good quality plastic sheet of thickness not less than 3mm and for which nothing extra shall be paid on the account.
27. All sub-main wiring shall be terminated in the main board with suitable copper lugs and thimbles for which nothing extra will be paid on this account.
28. All hardware items such as screws, thimbles, GI wire etc. which are essentially required for completing an item as per specifications will be deemed to be included in the item even when the same have not been specifically mentioned.

29. All hardware items such as nuts/ bolts/ screws/ washers etc. to be used in work shall be zinc/ cadmium plated iron.
30. Any conduit which is not be wired by the contractor shall be provided with GI fish wire for wiring by some other agency subsequently. Nothing extra shall be paid for the same.
31. While laying conduit, suitable size junction boxes shall be provided for pulling the wire as per the decision of the E-in-C.
32. The make of the materials has been indicated in the list of acceptable makes. No other makes will be acceptable. The materials to be used in the work shall be got approved by the Engineer in Charge / his representative before its use at site. The E-in-C shall reserve the right to instruct the contractor to remove the material which, in his opinion, is not acceptable.
33. Where switches/ sockets/ regulator/ telephone/ TV / internet outlets including metal boxes are to be provided, the same shall be of only one make.
34. While laying conduits for fire alarm system, sufficient junction outlets are to be provided as per the direction of the Engineer-in-Charge for detectors as required, for which no extra payment shall be made.
35. Wherever light fittings are proposed to be provided on the false ceiling, the respective light / fan point wiring will have to be brought Up to the terminal of the light fittings / fans by the contractor. Flexible metal conduits shall be used for drawing wires from PVC conduits on ceiling to fittings on false ceiling The switch boards are to be fixed at heights in all locations in accordance with CPWD specifications / as per the directions given by Engineer-in-charge.
36. L 70, LM 79 & LM 80 reports shall be provided for all the LED fittings along with Annexure X as specified.

ANNEXURE – X

UNDERTAKING LETTER FROM MANUFACTURERS OF LED FITTINGS

We hereby agree that

- a)** All the LED fittings supplied by us are guaranteed for five years including drivers from the date of handing over.
- b)** In case of discontinuation of model and non-availability of spares, we will replace the fittings with equivalent/ high end model in case of manufacturing defect during the warranty period of 5 years.

For M/S.....,

.....

Invoice no. & Date.....

(Authorized signatory of manufacturer of LED luminaries not below the rank of regional manager)

**Counter Signature, Major
contractor**

SH: II

Fire Detection and Alarm System

SPECIAL CONDITIONS FOR FIRE ALARM

INTELLIGENT ADDRESSABLE FIRE ALARM AND DIGITAL EVACUATION SYSTEM

1.1 GENERAL DESCRIPTION

Approval from CFO: - The Contractor shall be required to obtain NOC from Chief Fire Officer, and work shall be deemed to be completed only after receiving NOC from CFO & rectification if any. Statutory fee if any shall be paid by department. However all liasoning work / arranging inspection of CFO shall be the responsibility of contractor.

- A. The fire alarm system shall comply with requirements of NFPA Standard 72 or EN54 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- B. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.
- C. The system shall support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.
- D. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a communication network.

1.3 DRAWINGS & TECHNICAL SUBMITTALS

1.3.1 General

Before commencement of the work, the Contractor shall **inspect and verify the existing installations, site conditions, available drawings and all relevant electrical, structural and architectural provisions** and shall prepare and submit all drawings, details and documents necessary for carrying out the work.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

1.3.2 Shop Drawings

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

Show annunciator layout, configurations, and terminations.

1.3.3 Manuals

Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.3.4 Software Modifications

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

1.3.5 Certifications

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.5 APPLICABLE STANDARDS AND SPECIFICATIONS

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable. National Fire Protection Association (NFPA) - USA

NFPA 12	Extinguishing Systems (low and high)
NFPA 12A	Halon 1301 Extinguishing Systems
NFPA 13	Sprinkler Systems
NFPA 15	Water Spray Systems
NFPA 16	Foam / Water Deluge and Spray Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 17A	Wet Chemical Extinguishing Systems
NFPA 2001	Clean Agent Extinguishing Systems
NFPA 70	National Electric Code
NFPA 90A	Air Conditioning Systems

NFPA 92A	Smoke Control Systems
NFPA 92B	Smoke Management Systems in Malls, Atria, Large Areas
NFPA 72	National Fire Alarm Code
NFPA 101	Life Safety Code

Underwriters Laboratories Inc. (UL) - USA:

UL 268	Smoke Detectors for Fire Protective Signaling Systems
UL 864	Control Units for Fire Protective Signaling Systems
UL 2572	Mass Notification Systems
UL 217	Smoke Detectors, Single and Multiple Station
UL 228	Door Closers - Holders for Fire Protective Signaling Systems
UL 268A	Smoke Detectors for Duct Applications
UL 521	Heat Detectors for Fire Protective Signaling Systems
UL 464	Audible Signaling Appliances
UL 38	Manually Actuated Signaling Boxes
UL 1481	Power Supplies for Fire Protective Signaling Systems
UL 346	Waterflow Indicators for Fire Protective Signaling Systems
UL 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems
UL 1971	Visual Notification Appliances
UL 2017	Standard for General-Purpose Signaling Devices and Systems
UL60950	Safety of Information Technology Equipment

Factory Mutual – USA

Local and State Building Codes.

All requirements of the Authority Having Jurisdiction (AHJ).

The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of low pressure CO2.

The system shall be certified for seismic applications in accordance with the International Building Code (IBC). The basis for qualification of seismic approval shall be via shake table testing.

1.6 DESIGN INTENT

Main fire alarm panel with digital voice command system, Fire fighters telephone, amplifier, zone selector keypad/ Qwerty and announcement console – Ground floor – As per Drawing.

Active repeater panels at Project Main security cabin

All fire alarm panels connected as pier to pier.

Class - A cabling to loop all detectors, devices & MCP's to control panel.

Emergency communication system, integral with the Main FACP, including voice alarm system components, microphones, amplifiers, zone selector keypads/ Qwerty and tone generators

Audible Alarm Notifications

Fire fighters telephone system as part of main fire alarm system which is two-way, supervised voice communication proposed to link between the MFACP and remote fire fighters' telephone stations throughout the building (at all staircases at all levels)

1.7 DETAILED DESCRIPTION OF THE SYSTEM COMPONENTS:

1.7.1 BASIS OF DESIGN

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

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

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.

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.

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.

Provide local numeric point address and LED display of device and current condition of the point.

Each detector shall use state-of-the-art Microprocessor Circuitry with error, detector self-diagnostics and supervision programs.

The detection of the fire shall be taken at the detector level.

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

The System Alarm LED on the main fire alarm control panel shall flash.

A local sounder shall be sounded.

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.

Printing and history storage equipment shall log the information associated with the Fire Alarm Control Panel condition, along with the time and date of occurrence.

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.

1.8 SYSTEM COMPONENTS AND DEVICES:

1.8.1 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:

Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, annunciators, and other system controlled devices.

In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for

normal, trouble and alarm conditions.

Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.

Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.

1.8.2 System Capacity and General Operation

The control panel shall be capable of expansion via up to 8 SLC loops. Each module shall support up to 240 analog/addressable devices for a maximum system capacity of 1920 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 600character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric QWERTY / keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either come owner or installing company.

All programming or editing of timing or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

1.9 The FACP shall be able to provide the following software and hardware features:

Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.

Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.

Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.

Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.

The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.

Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.

NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.

Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.

On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.

History Events: The panel shall maintain a history file of atleast last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.

Smoke Control Modes: The system shall provide means to perform Fire Smoke Control Station mode. This mode controls all dampers, smoke extraction fan, fresh air supply fans, etc. during Fire condition. Smoke

Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.

The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.

Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.

Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions

Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.

Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.

Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.

Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.

Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.

Multi-Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses in cooperative multi-detector sensing. The detector shall take feedback from the other two adjacent detectors to take fast and genuine alarm decision mitigating the risk of false alarm. There shall be no requirement for mandatory sequential address setting in the detectors to achieve this function. Multicooperative detection shall be a built-in intelligence in the system to take fast & reliable decision on genuine alarm triggering. The alarm event shall be a result of all cooperating detector chamber readings considered as a consolidated alarm signal.

ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.

NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.

Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.

Security Monitor Points: The system shall provide means to monitor any point as a type security.

One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming

will react to input stimuli such as Control By Event and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

Control by Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.

Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.

1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.

1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.

100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.

Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.

Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.

Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period.

Secure/Access Operation: The system shall have the capability of configuring input modules to monitor status of door contact or other security type sensors. These input modules shall be able to be commanded from the normally 'Secure' state to an 'Access' state. While in the secure state, the module will transmit alarm conditions to the controller, which shall be annunciated on the LCD and LED displays. The modules shall be placed into the Access state either through the LCD display or through predefined operator keys. While in the Access state, all alarms from the module will be shunted. Placing the module into the access state shall cause a discrete LED associated with input point to flash, but no other trouble or disable condition will be annunciated. Change from Secure to Access and reverse shall be transmitted to the central monitoring station on a per zone basis. Systems that cause or indicate a trouble or disable condition are unacceptable.

1.10 The FACP shall be capable of communicating with a Distributed Control System

Central Processing Unit

The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.

The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies

fail.

The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.

The CPU shall provide an RS-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.

The CPU shall provide two RS-485 ports for the serial connection to annunciation and control subsystem components.

The RS-232 serial output circuit shall be optically isolated to assure protection from earth ground.

In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Systems not offering degrade mode shall offer Redundant CPU. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

1.11 Loop (Signaling Line Circuit) Control Module:

The control panel shall be capable of expansion via up to 8 SLC loops. Each module shall support up to 240 analog/addressable devices for a maximum system capacity of 1920 points.

The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.

Each loop shall maintain 20% spare capacity for future expansion.

Each Loop shall be capable of operating as a NFPA Class B circuit in case of single open circuit fault in existing SLC Circuit Fault isolation modules shall be installed between each addressable SLC device per the manufacturer's installation instructions. Systems which cannot provide full loop loading in Style 7 configurations are not acceptable.

The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

1.12 Network Communication

The FACP shall communicate over a peer-to-peer communication network, inherently over a regenerative communication format and protocol. The network shall support communication speed up to 100 Mbps and support up to 200 Control Panels / Network Nodes, over a single medium (copper conductor / fiber optic), redundant ring, and communication channel for fire alarm, voice evacuation and telephone talk-back system. The system shall support up to 200 such networks in a single system.

The network card shall have inbuilt Fiber port for terminating Fiber Optic Cable without any third party converters.

1.12.1 Digital Voice Command Center

The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.

Function: The Voice Command Center equipment shall perform the following functions:

Operate as a supervised multi-channel emergency voice communication system.

Operate as a two-way emergency telephone system control center.

Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency

telephone circuit.

Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.

Provide all-call Emergency Paging activities through activation of a single control switch.

As required, provide vectored paging control to specific audio zones via dedicated control switches.

Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.

Provide a software utility capable of off-line programming for the DVC operation and the audio message files.

This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.

Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire listed analog audio amplifiers and SLC controlled switching.

The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.

The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

Fire, Voice & Telephone data shall flow through single network cable.

Voice Evacuation System be capable of establishing communication between the master voice controller and amplifier over fiber optic cable network without using any third party media converter.

Failure of Fire Panel CPU shall not affect the operation of DVC. In case DVC / Amplifiers are controlled by Fire Panel CPU, a separate panel with dedicated CPU shall be considered for each DVC & Amplifier.

1.13 Power Supply

The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.

The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.

The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.

The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

The Main Power Supply shall be power-limited per UL864 requirements.

The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunciated and logged to the system alarm history log.

The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means. Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.

The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.

The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.

The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be

programmable.

The addressable power supply mounts in either the FACP backbox or its own dedicated surface mounted backbox with cover.

Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.

The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.

When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.

When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.

addressable power supply interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.

An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

1.14 Controls with associated LED Indicators

Speaker Switches/Indicators

The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.

speaker circuit control panel include switches to manually activate or deactivate each speaker circuit in the system.

Emergency Two-Way Telephone Control Switches/Indicators

The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.

The telephone circuit control panel shall include switches to manually activate or deactivate telephone circuit in the system.

1.15 Field Programming

The system shall be programmable, configurable and expandable in the field without the need for special tools. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.

It shall be possible to program through the standard FACP keyboard all system functions. All field defined programs shall be stored in non-volatile memory. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password. The system programming shall be "backed" up via an upload/download program, and stored on compatible removable media. A system back-up disk shall be completed and given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.

The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time equations, etc. This test shall be performed on an IBM-compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

1.16 Specific System Operations :

Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

1.17 System Point Operations :

Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or Graphics User Interface.

System output points shall be capable of being turned on or off from the system keypad or the video terminal.

Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

Device Status.

DeviceType. Custom Device Label.

Software Zone Label.

Device Zone Assignments.

Analog Detector Sensitivity.

All Program Parameters.

System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.

The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.

Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.

If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

System Maintenance Analysis and Reporting

The system shall automatically track NFPA 72 installation and testing requirements for all addressable devices to ensure that every device is functionally tested upon installation and then periodically as required by the Code.

If after twelve months any device has not been functionally tested a led shall illuminate on the CPU or Network annunciator indicating the device that needs testing.

The system shall automatically track device testing to ensure that a visual inspection is performed at least semi-annually.

If after six months a device has not been indicated as "visually inspected" a led shall illuminate on the CPU or Network annunciator indicating the device that needs testing.

A hand-held IR tool may be used to interact with each SLC device to indicate that a visual inspection has been performed. The IR device will explicitly identify the device by loop and address to ensure the correct visual inspection has been performed.

A comprehensive report shall be available from the laptop programmer which shows a predictive report of all

devices that have upcoming testing requirements. These reports shall be configurable as either 30, 60 or 90 day predictive, current status, and "all database."

Systems that do not automatically track the individual testing requirements of the field devices will not be accepted.

1.18 SYSTEM COMPONENTS

1.18.1 Network Control Annunciator

A network control annunciator shall be provided to display all system intelligent points. The NCA shall be capable of displaying all information for 200,000 points on the network. Network display devices, which are only capable of displaying a subset of network points, shall not be suitable substitutes.

The NCA shall include a minimum of 600 characters, backlit by a long life, solid state LCD display. It shall also include a full QWERTY style keypad with tactile feel. Additionally, the network display shall include ten soft-keys for screen navigation and the ability to scroll events by type. i.e. Fire Alarm, Supervisory Alarm, Trouble, etc.

The network control annunciator shall have the ability to display up to eight events in order of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.

The NCA shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use and shall connect to the network over either a wire or fiber interface.

The network control annunciator shall have an event history buffer capable of storing a minimum of 1000 events in non-volatile memory. Additionally, the NCA shall have a fire alarm history buffer capable of storing a minimum of 200 events in non-volatile memory. Systems that do not protect fire alarm events from being overwritten by other events are not suitable substitutes.

The NCA shall include two optically isolated, 9600 baud, industry standard RS-232 ports for UL864 listed printers and CRT's. These peripheral devices shall print or display network activity.

The network control annunciator shall include control switches for system wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test. A mechanical means by which the controls switches are "locked out", such as a key, shall be available.

The NCA shall include long life LEDs to display Power, Fire Alarm, Pre-Alarm, Security Alarm, System Trouble, Supervisory, Signals Silenced, Disabled Points, Other (non-fire) Events, and CPU Failure.

The network control annunciator shall include a Master password and up to nine User passwords. Each password shall be up to eight alpha-numeric characters in length. The Master password shall be authorized to access the programming and alter status menus. Each User password may have different levels of authorization assigned by the Master password.

The NCA shall allow editing of labels for all points within the network; control on/off of outputs; enable/disable of all network points; alter detector sensitivity; clear detector verification counters for any analog addressable detector within the network; clear any history log within the network; change the Time/Date settings; initiate a Walk Test.

The network control annunciator shall support an optional Windows™ based program utility. This utility shall allow the user create an NCA database, upload/download an NCA database, and download an upgrade to the NCA executive. To ensure program validity, this utility shall check stored databases for errors. A compare function shall be included to identify differences between databases.

For time keeping purposes the NCA shall include a time of day clock.

1.18.2 Network Control Station / Graphics User Interface

The NCS shall utilize a Microsoft(™) operating system. Each Network Control Station shall be capable of graphically annunciating and controlling all network activity and at least 2,50,000 network points. Network display devices that are only capable of displaying a subset of network points shall not be suitable substitutes. The NCS shall be an IBM (or compatible) personal computer with the following minimum requirements: Intel

Pentium II(™)-processor, operating at a minimum of 400 Mhz, 128Mbytes of RAM, 8 Mbytes Video RAM,

1.44

Mbyte floppy drive, 3.2 Gbyte hard disk, mouse, 32X CD-ROM, 3PCI / 1 ISA expansion slots, internal 3.2 Gbyte tape drive, sound card, 200 watt power supply, and SVGA graphics with a screen resolution of 1024 x 768. The network control station shall include a 19-inch monitor.

The NCS shall be capable of storing over 100,000 network events in a history file. Events shall be stored on hard disk and shall be capable of back-up storage to a tape drive. The history buffer allows the operator to view events in a chronological order. A filter shall be available for displaying chronological events by operator, date, time, fire alarms, troubles (including security, supervisory and system/device), disabled points/zones, system programming, operator response and operator log in/log out. The ability to print NCS history files shall also be available.

The NCS shall use a Windows(tm) dialog box technology to address, interrogate, control, and/or modify intelligent points on each fire alarm node. This shall include, and not be limited to: Activating outputs, enabling or disabling points, adding or removing intelligent points, viewing intelligent detector sensitivity levels and modifying point information (custom messages, detector type, verification, day/night selection etc.)

The NCS shall include the ability to display system information in a graphical (floor plan) form. Each view, created using standard Windows bitmap files, shall include icons created for intelligent devices. These icons shall blink and change to the appropriate programmed icon when an event occurs. When the device has been acknowledged, the icon shall become steady. Once the point has returned to normal, the normal icon is displayed. In addition to the graphical representation of the device, the user shall be able to link pictures, documents and sound files to the device. The NCS shall also provide the ability to auto-vector to the floor plan (screen) of the device that is active. By selecting a device in the graphic presentation, the operator of the NCS shall have the ability to log onto the corresponding node and interrogate the associated intelligent point. The NCS shall have the ability to provide the following information through a Windows(tm) pull down menu: An Event Counter that contains the number of new and total events on the network. The information that is displayed shall consist of Fire Alarms, Pre-Alarms, Security Alarms, Supervisory Alarms, and Troubles. A Detailed Event window that contains all Off-Normal events, both unacknowledged and acknowledged that are present in the system. It shall contain two views, Fire events and Non-fire events that shall be user selectable. A Current Event window that shall contain all network and local events as well as system messages with a maximum of 1,000 events displayed. A Disabled Device window that shall contain all disabled devices in the system.

The NCS shall have the option, from a Windows pull down menu, to connect to a third party paging service that allows the NCS to automatically send text-based messages regarding system status to a typical text pager.

The NCS shall include help screens, available to aid the user without leaving the selected application screen.

The NCS shall be UL-Listed for fire protection (UL864) and burglary (UL1076).

The NCS shall interface with other panels as a node in the peer to peer network.

The operator shall be able to monitor the FFT system from GUI software and shall be able to monitor and control Integrated Voice Evacuation System.

The NCS shall have a flexible way of assigning operator passwords. There shall be an unlimited number of possible operators, each with specific levels of control. Each operator shall have his/her own password. Operator password and control selection shall be available to a high level "administrator" who shall have complete control over levels of control. If no action has taken place on the NCS after 10 minutes, the current operator shall be logged out and require a new log-in.

The NCS shall include an industry-standard RS-232 port for a UL864 listed printer.

The NCS shall be a table top hardware configuration.

1.18.3 Interactive Firefighters' Touchscreen Display

The network will interface and report the individually monitored system's alarm status via a user-friendly Graphical User Interface (GUI) based software.

The software shall operate under Microsoft® Windows® XP Embedded platform as manufactured by Microsoft Corporation.

The GUI based software must be capable of graphically representing the facility being monitored with floor plans and icons depicting the actual locations of the fire alarm device locations. It shall be capable of mapping at least 2,50,000 network points

The software shall use a 1280 pixel x 1024 pixel GUI display capable of showing a large primary floor plan display, a site plan representative of an aerial view of the facility, the first active fire alarm on the system.

The software shall permit automatic navigation to the screen containing an icon that represents the first fire alarm device in alarm in the event of an off-normal condition.

The fire alarm device icon shall be visible only when it is in an alarm (or active) condition.

The software shall display the activated smoke detectors in a time sequence to track smoke progression.

The software shall allow the importation of externally developed floor plans in Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format.

The software shall provide a intuitive and easy way to navigate to different screens representing floors and areas within a facility.

The system shall provide for continuous monitoring of all fire alarm conditions regardless of the current activity displayed on the screen.

The software shall display “YOU ARE HERE” along with icons representing standard building objects (stairs, elevators, etc) to be shown on the floor plan.

The software shall allow icons that represent hazardous materials stored in a facility.

The software shall provide a screen that displays preprogrammed building contact information.

The software shall provide a screen the displays building occupancy and other general building information.

The software shall allow a site plan to be imported that shows an aerial view of the facility.

The software shall display all active fire, supervisory, and security events within an event list.

1.20 GATEWAY AND WEB SERVERS

BACnet Interface Gateway: The system shall be capable of being interfaced with BACNet compliant. A BACnet interface supporting BACnet/IP communication shall be available from the fire alarm control panel manufacturer. BACnet shall support 14000 data points. BACnet gateway shall communicate with all the panels in a peer to peer network.

MODbus Interface Gateway: The system shall be capable of being interfaced with MODbus compliant. A MODbus interface supporting MODbus/TCP communication shall be available from the fire alarm control panel manufacturer. MODbus shall support 22500 data points. MODbus gateway shall communicate with all the panels in a peer to peer network.

Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.

Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager Utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

1.21 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

1.21.1 Addressable Devices – General

Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.

Addressable devices shall use simple to install and maintain decade, decimal address switches.

Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.

Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

Addressable smoke and thermal detectors shall provide dual alarm and power/polling bi-colour LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular

communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.

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

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).

Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

1.21.2 Addressable Manual Call Point (Break Glass / Pull Down Type)

Addressable manual call point shall send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual fire alarm boxes shall be constructed of Lexan / ABS Plastic with clearly visible operating instructions provided on the cover. The word FIRE / Fire Sign shall appear on the front of the stations.

1.21.3 Intelligent Multi Criteria Detector

The intelligent multi-criteria detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings for early detection and reduction in false alarm. The detector design shall allow a wide sensitivity window, 0.5 to 2.5% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).

The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database

of actual fire and deceptive phenomena.

1.21.4 Intelligent Thermal Detectors

The intelligent thermal detectors shall be addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit (87.8 degrees Celsius) shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

1.21.6 Addressable Dry Contact Monitor Module

Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.

The IDC zone shall be suitable for Class A or Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

1.21.7 Two Wire Detector Monitor Module

Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device)

The IDC zone may be wired for Class A or B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

1.21.8 Addressable Control Module

Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances

The control module NAC may be wired for Class A/B with a current rating of 2 Amps

Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.

1.21.11 Addressable Relay Module

Addressable Relay Modules shall be available for HVAC control and other network building functions

The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.

The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires;

For multiple relay control a module shall be available that provides 6 programmable Form-C relays.

1.21.17 Addressable Two-In / Two-Out Monitor/Relay Module

An addressable Two-In / Two-Out module shall be available.

The two-in/two-out module shall provide two Class B/Style B dry-contact input circuits and two independent Form-C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.

1.21.12 Isolator Module

Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and

shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

1.21.14 Speakers

The Speaker appliance shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dualvoltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.

A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.

Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.

The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.

All notification appliances shall be backward compatible.

1.21.15 Addressable Portable Emergency Telephone Handset Jack

Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on plans. Handset jacks shall be approved for emergency telephone system application.

Insertion of a remote handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a ring indication in the handset.

The two-way emergency telephone system shall support thirty five (35) handsets on line without degradation of the signal.

Remote Telephone Handset shall be capable of making paging announcement across all the zones in the system.

1.21.16 Addressable Fixed Emergency Telephone Handset

The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.

The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.

The two-way emergency telephone system shall support thirty five (35) handsets on line (off hook) without degradation of the signal.

Remote Telephone Handset shall be capable of making paging announcement across all the zones in the system.

1.21.17 Batteries

The battery shall have sufficient capacity to power the fire alarm system for not less than 48 hours in standby plus 2 hours of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

If necessary to meet standby requirements, external battery and charger systems may be used.

1.22 EXECUTION

1.22.1 INSTALLATION

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

1.22.2 CAUSE & EFFECT LOGIC

System shall be programmed as per the approved cause & effect logic.

1.22.3 TESTING

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all waterflow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short notification appliance circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

Each of the alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

1.22.4 FINAL INSPECTION

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.

1.22.5 INSTRUCTION & TRAINING

Instruction 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.

The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

2.11 Remote Paging Microphone

Digital voice evacuation system remote paging microphone.

Each microphone of 8 zone capacity.

Zone expansion by connection with expansion unit. iv. System indicators of AC, DC, fault, Mic status and test.

6 inputs & mic/line selection buttons.

8 zone selection buttons with three-colored indicators

Reset/Cancel, All Call & Call buttons.

Two RJ45 ports for input and link output.

CAT5 or CAT6 cable communication up to 600 meters.

AC 230V and DC24V battery inputs.

Built-in monitor speaker.
 Voice Alarm Controller (VCA)
 Digital voice evacuation system all in one amplifier.
 Specifications meet the standards of BS EN54-32 & EN608409.
 EN54-16 standards certificate is under taken.
 Built-in 240W & 500 8 zone class-D amplifier.
 Integration of EVAC system, paging system, PA system & BGM system together.
 Built-in two separate players for EVAC and alert voice message by SD card.
 Built-in 8 zone AB speaker line low impedance supervision.
 Built-in amplifier auto changeover into standby when fault.
 With external amplifier input to expansion the power.
 Capacity of connection 8 unit's remote microphone.
 Red button EVAC message push to activate with priority except fireman mic.
 8 zone speaker outputs with separate zone volume control.
 8 zone separate indicator for EVAC, fault, music/paging & select.
 System indicators of AC, DC, fault and indicators for EVAC, alert & fireman mic.
 Zone capacity of 96 zones by cascaded 11 unit's router.
 With 8 programmable control inputs and 8 programmable control outputs for voice evacuation system.
 With Fault, EVAC outputs and Reset input for third party system integration.
 With fireman microphone of highest priority.
 Priority level: fireman mic, EVAC, input 1, remote microphone, timer & BGM.
 Two combo inputs for mic/line, 4 line inputs and one REC output.
 Two RJ45 for cascade router, two RJ45 for remote microphone input and two RJ45 for LAN/WAN/Internet network.
 IP network module for optional to buy. The IP network
 AC 230V and DC24V battery input. Auto switch into the battery backup when AC fails.

Description	8 Zone Voice Evacuation Amplifier
Rated Power Output	240W
Fireman Microphone	5Mv, 600Ω
Line 1-2 Inputs	385mV, 10kΩbalanced Combo
Line 3-6 Inputs	350mV, 10kΩ, RCA
Frequency Response	80Hz~20kHz
THD	<1% at RMS,1KHz
S/N Ratio	>70dB

Technical Specification:

Speaker Output	100V AB 8 zone speaker outputs
REC Output	200mV

Control Input & Output	<p>8 programmable control inputs: Max 3.3V (voltage mode) or 0V closed contact</p> <p>8 programmable control outputs: 0V closed contact</p> <p>Control output for fault & EVAC: 0V closed contact</p> <p>Reset control input: 0V closed contact</p>
Voice Message	MP3 or WMA format, two separate players of SD card with protection cover, programmable voice message up to 255, 10 years valid
Event Record	HEX format, Hard Flash memory, events up to 1000 records, 10 years valid
Operation Environment	<p>Operation Temp: +5 ~ +40</p> <p>Store Temp: -20 ~ +70</p> <p>Operation Humidity: <95%</p>
Power Consumption	600W
Power Supply	AC230V or 115V & DC24V battery inputs, 50-60HZ

3.0 SAFETY MATERIALS

3.1 DESCRIPTION OF WORK

- A. Insulation Mats
- B. First Aid charts and First Aid Box
- C. Danger Plate
- D. Fire Extinguishers
- E. Fire Buckets
- F. Tool Box
- G. Caution Board

3.2 APPLICABLE CODES & STANDARDS

- A. IS : 15652 Insulation mats
- B. IS : 2878 Portable CO₂ Fire Extinguisher
- C. IS : 2546 : Fire Buckets

D. ANSI/NFPA 70 - National Electrical Code.

3.2 SUBMITTALS

Product Catalogues.

3.3 SPECIFICATION

3.3.1-INSULATION MATS

Insulation mats conforming to IS: 15652 shall be provided in front of main switch boards and other control equipment as specified. .

3.3.2 FIRST AID CHART AND FIRST AID BOX

Charts (one in English, one in Hindi, one in Regional Language), displaying methods of giving artificial respiration to a recipient of electrical shock shall be prominently provided at appropriate places. Standard First Aid Boxes containing materials as prescribed by St. John Ambulance brigade or Indian Red Cross should be provided in sub-station.

3.3.3 DANGER PLATE

Danger plates shall be provided on HV and LV equipments. LV danger notice plate shall be 200 mm x 200 mm made of mild steel atleast 2 mm thick vitreous enamelled white on both sides and with inscriptions in signal red colour on front side as required.

Size of the HV Danger Notice plate shall be 250 mm x 200 mm and 2 mm thick.

3.3.4 FIRE EXTINGUISHERS

Portable CO2 conforming to IS: 2878-1976 dry chemical (conforming to IS 2171-1976) extinguishers shall be installed in the sub-station at suitable places (like HT/LT panel rooms) as specified.

Foam type fire extinguisher shall be installed in Transformer Room.

3.3.5 FIRE BUCKETS

Fire buckets conforming to IS: 2546-1974 shall be installed with the suitable stand for storage of water and sand.

3.3.6 TOOL BOX

A standard tool box containing necessary tools required for operation and maintenance shall be provided in sub-station.

3.3.7 CAUTION BOARD

Necessary number of caution boards such as "Man on Line" "Don't switch on" etc. shall be available in the sub-station.

The Caution Board shall be of size 300 mm x 200mm made of mild steel, 2mm thick, vitreous enamelled white on both sides and with inscriptions in original red colour on front side as required.

MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN

- 1) M/S [Name of the firm with full address] Enlistment Status

Valid Up to:

[Henceforth called the main contractor] And

- 2) M/S [Name of the firm with full address] Enlistment Status

Valid Up to:

[Henceforth, called Associated Electrical Contractor or Electrical Contractor]

For the execution of Fire Detection and Alarm System Work at Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I.

(SH:- Balance work)

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

We have agreed as under:

1. The electrical contractor will execute all electrical works in the wholesome manner as per terms and conditions of the agreement. Payment of the associated electrical contractor shall be governed vide para 19.1.11 & 19.1.12 of CPWD-6 & clause 7 of GCC-2023.
2. The electrical contractor shall be liable for disciplinary action if he failed to discharge the action[s] and other legal action as per agreement besides forfeiture of the security deposit.
3. All the machinery and equipment, tools and tackles required for execution of the electrical works, as per agreement, shall be the responsibility of the electrical contractor.
4. The site staff required for the electrical work shall be arranged by the electrical contractor as per terms and conditions of the agreement.
5. Site order book maintained for the said work shall be signed by the main contractor as well as by the Engineer of the Associated Contractor or by Associated Contractor himself.
6. All the correspondence regarding execution of the electrical work shall be done by the Department with the Main Contractor with a copy to the associated contractor. In case of non-compliance of the provisions of agreement, the main contractor, as well as the associated contractor shall be responsible. The action under clauses 2 and 3 shall be initiated and taken against the main contractor.

SIGNATURE OF MAIN CONTRACTOR

SIGNATURE OF ASSOCIATED

Date:

Place

COUNTERSIGNED

EE(Elect.)

Date

Place:

WILLINGNESS CERTIFICATE

For the execution of Fire Detection and Alarm System Work

Name of work:- Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I. (SH:- Balance work)

I hereby give my willingness to work as **Fire detection and alarm system contractor** for the above-mentioned work.

I will execute the work as per specifications and conditions for the agreement and as per direction of the Engineer-in-Charge. Also, I will engage full time technically qualified supervisor/engineer for the works. I will attend inspection of officers of the department as and when required.

Dated:

Signature of the Contractor

SH: III

Fire Fighting System

TECHNICAL SPECIFICATIONS OF FIRE FIGHTING SYSTEM

FIRE FIGHTING SYSTEM (WATER BASED)

1. LOCATION

The work is to be executed at Construction of IIM Sirmaur, Himachal Pradesh.

The Contractor is advised to visit the site before submission of their tender and ensure that equipment being offered by them shall be accommodated in the spaces available.

2. ACCEPTABLE MAKES

The acceptable make of various equipment is indicated in the list attached. Alternative or equivalent make will not be accepted.

3. TIME OF COMPLETION

The entire work shall be completed within stipulated time of completion. The time when the materials are to be supplied is given in the mile stones/ Annexure.

4. QUALITY OF MATERIALS AND WORKMENSHP

- i) The components of installation shall be of such design so as to satisfactorily function under all conditions of operation.
- ii) The entire work of manufacture/ fabrication, assembly and installation shall confirm to sound Engineering practice.
- iii) All equipment and materials to be used in work shall be manufactured in factories of good repute having excellent track record of equality, manufacturing, performance and proper after sales service.

The BOQ is comprised of all the items necessary for making provisions of above mentioned firefighting installations as per the provisions laid in NBC – 2016. However any discrepancy in the BOQ / Specifications noted by the participating bidder shall be brought into the notice of the Department during pre-bid conference otherwise it is construed that tender BOQ/Specifications are acceptable in toto to the participating bidder.

The contractor will make his own arrangements for transportation of his materials Up to the site of work, the security and watch and ward of the materials brought at site and the electrical installation executed by him shall be his responsibility till the work as a whole is completed and handed over to the department.

Any damage done to the building or installation during the execution of work shall be made good by the contractor free of cost. In the event of his failure to do so, the same shall be got rectified through another agency at his risk and cost.

The contractor or his authorized representative will have to sign site order book to acknowledge the instruction issued by Engineer-in-Charge or his authorized representative for all matters relating to the execution of work. The instructions noted in the site order book shall have to be complied within reasonable time as decided by the Engineer-in-Charge.

5. INTENT OF SPECIFICATIONS

The work shall be carried out in accordance with the following relevant & applicable codes amended up to date, and to the best available standards of engineering practice, design & workmanship.

- a) Items of BOQ & Technical Specifications of the Agreement,
- b) CPWD General Specifications for Electrical Works: Part V Wet Riser & Sprinkler Systems – 2020
- c) Indian Standards Specifications by BIS, IS Code
- d) National Building Code 2016
- e) Indian Electricity Rules & Statutory Regulations.
- f) TAC Regulations
- g) Local Fire Authority Regulations.

Nothing extra shall be paid for executing the work as per these specifications/ codes. The material having ISI mark shall have precedence over the one confirming to IS Specifications. In case of any discrepancy in the description of any item in the schedule of quantities and the specifications/ code, or if the specifications of any of the items are not available, the decision of the Engineering-Charge or his authorized representative shall be final and binding and work shall be executed in the manner as may be prescribed by him.

6. EXECUTION

The contractor shall depute well experienced / skilled Engineer / Supervisor / Foreman & licensed wireman / electrician for execution of work. The Engineer-in-Charge reserves the right to reject/remove any person which is not suitable/ fit in his opinion.

The work shall be executed in well planned & engineered like manner. Poor/Bad workmanship shall not be accepted. The same shall be redone as per the directions of the Engineer-in-Charge, for which no extra payment shall be made.

The Sub-Standard work, if any, shall not be accepted & measured unless approved by the competent authority.

The rates of any Extra/Substituted/Deviated Items of work shall be derived by the Department as per the provisions in the agreement or as decided by the Engineer-in-Charge, and the same shall be binding & acceptable to the contractor.

The Engineer-in-Charge reserves the right to recover any part/item not executed, due to site requirements etc. The rates of such items shall be derived by the Department as per the provisions in the agreement or decided by the Engineer-in-Charge, and shall be binding & acceptable to the contractor.

7. COMPLETION & GUARANTEE

The completion of the work shall be certified by the competent authority of the department, the defects if any shall have to be rectified to the entire satisfaction of the competent authority.

The contractor shall stand guarantee/warranty for a period of at least 12 months from the date of completion of work, against any manufacturing defect in material, unsatisfactory performance/ working of system/ installation and / or breakdown due to defective design, workmanship.

The material / equipment / installation so found defective shall be replaced / repaired free of cost to the satisfaction of the Engineer-in-Charge. The delay in rectification/ replacement shall not be accepted. The department reserves the right to get it done at the risk and cost of the contractor. The decision of the Engineer-in-Charge, shall be final & binding to the contractor.

The contractor must carry out routine inspection/ testing as the manufacturer's recommendation or as per decision of the Engineer-in-Charge during the guarantee period and attend to the defects taking place during this period. Sufficient number of trained and experienced staff shall be made available to meet any exigency/ emergency at site of work during the guarantee period.

The contractor shall provide the following drawings(Related to auditorium building) for approval of Engineer-in-Charge before commencement of supply/ fabrication.

a) Schematic Diagram of complete Wet riser and sprinkler system.

8. WORKS TO BE ARRANGED BY THE DEPARTMENT

Unless otherwise specified in the tender document, the following works shall be arranged by the department.

- a) Vacant space for accommodating all the equipment and components involved in the work.
- b) Drain points at suitable location/s.
- c) Terrace tank

9. WORKS TO BE DONE BY THE CONTRACTOR

Unless otherwise mention in the tender document, the following works shall be done by the contractor and therefore their cost shall be deemed to be included in their tendered cost, whether specifically indicated in the schedule of work or not

- a) Foundation for equipment including foundation bolts and vibration isolation spring and pads.
- b) Suspenders, brackets and floor / wall supports for suspending / supporting pipes / cable trays.
- c) Excavation and refilling of trenches in soil wherever the pipes are to be laid directly in ground including a base treatment and supports.
- d) Sealing of all floors / slabs / wall opening provided by the department or made by the contractor for pipes and cables from fire safety point of view, after laying of the same.
- e) Painting of all exposed metal surfaces of equipment and components with appropriate colour.
- f) Making openings in the walls / floors / slabs or modifications in the existing openings wherever provided for carrying pipeline, cables etc.
- g) All electrical works including cables / wires, earthing etc. beyond power supply made available by the department.
- h) Making good all damages caused to the structure during installation and restoring the same to their original finish.
- i) Approval from local bodies / fire authorities as may be required as per local by-laws. (The contractor's responsibility shall be limited to the work executed by him). The Statuary fee of local bodies / fire authorities shall be borne by the department.

10. PROVISIONAL FIRE NOC AND INSPECTION BY CHIEF FIRE OFFICER

After completion of the work to the entire satisfactory of Engineer-in-Charge, the installation shall be offered for inspection by Local Fire Officer or his representative. Testing as desired by the Fire Officer shall be carried out. The contractor will extend all help including man power during testing. The observations of Local Fire Officer in the executed part of works of the agreement under the contract shall be attended by the contractor without any extra cost. Nothing extra is to be paid for testing as above. It shall be the responsibility of the Contractor to get the System / Installations approved / cleared by Local Fire Authority and obtain Occupancy certificate before finalizing the bills.

PIPE WORK: -

General: -

The system shall comprise of Mild Steel or galvanized iron pipe work with MS/GI fittings as specified in the BOQ. Use of GI fittings in GI pipe work also is acceptable and indicated as an alternate with adjustment rate. The system will remain pressurized during operation.

Where screwed joints are permitted, they shall be taper-threaded Joint sheets shall be suitable for high-pressure work. Packing sheets shall withstand at least the test pressure requirements for the pipe, which shall be taken as one and half times the operating pressure.

Pipe work installation shall cover all clamps, supports, anchors, etc. Spacing between vertical supports shall not ordinarily exceed 1.5metres. Necessary anchors shall be provided as approved at location of bends or tees etc. as required.

T-joints for hydrant shall be either welded construction or with specials.

The pipe works shall be electrically earthed at the pump house by suitable clamps etc. by loop earthing to the earth system.

Jointing Technique: -

Electric welding joints shall be provided in the pipe works, flanged joints shall be provided for connection to valves, pumps, Air Vessels, etc. and also on straight lengths at suitable points to facilitate erection and maintenance.

SPRINKLER SYSTEM

The Sprinkler system shall be designed and executed according to the following codes

- i) IS: 15105: - Design and Installation of fixed Automatic Sprinkler, Fire Extinguisher Systems - Code of Practice.
- ii) IS: 9972: - Specification for Automatic Sprinkler Heads for Fire Protection Service.

Installation of Sprinkler system

The installation shall be carried out as per the detailed specification for wet riser and sprinkler system. However, the following additional points are to be taken care for sprinkler installations.

For fixing sprinkler heads, 15mm. Dia M.S. Socket to be welded to range pipes at the locations as per drawings. Dead plug shall be fixed in the socket.

If sprinkler head is to be provided away from range pipe, M.S. Pipe nipple of suitable size be used to extend the sprinkler head and socket is welded at desired location.

After completion of work in sections, pressure testing at 8.0kg/cm² pressure shall be carried out for 24 hrs.

After completion of the entire work, pressure testing of entire pipe work shall be carried out for 24 hrs. at a pressure of 8.0kg/cm².

The lines shall be flushed before completion of building work so that any foreign matter which might have entered the system is taken out. The pressurization pump (jockey Pump) be operated and valves opened at different locations.

During occupation of the building, sprinkler heads shall be provided in place of dead plugs. Teflon tape shall be used on threaded portion. The sprinkler heads shall be properly tightened in the socket.

When all sprinklers' heads are installed, pressure is built up in the system by pressurization pump slowly and in case on leak is found, desired pressure is developed and maintained. In case any leak is detected, the same shall be attended before pressurizing the system further.

COMMISSIONNING

As soon as the work is complete, the system shall be commissioned and made available for use in accordance with Para below.

Testing of the system:

After installing, the entire piping shall be flushed to remove any foreign matters which might have entered during the installation. The pipes shall be slowly charged with water so that the air is expelled from the pipes. The pipes shall be allowed to stand full of water for a period of not less than 24 hours and then tested under pressure. The test pressure shall be at least 10 Kg/ cm². The test pressure shall be applied by means of manually operated test pump or by a power driven test pump to be provided by the contractor. In either case precaution shall be taken to ensure that the required pressure is not exceeded.

- The open end of the piping shall be temporarily closed for testing.
- Test shall be conducted on each pump set after completion of the Installation with respect of delivery head, flow and pressure. The test shall be carried out by the contractor at his own cost.
- All leaks and defects in different joints noticed during the testing and before commissioning shall be rectified to the satisfaction of Engineer-in-charge.

11. APPROVAL BY LOCAL BODIES

It shall be the responsibility of the contractor to obtain the approval of drawings and to get the installation inspected and obtain NOC (No Objection Certificate) from the local fire authorities as may be necessary. Any License fee, if required, shall be paid by the department as per actual.

MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN

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

Valid Upto:
[Henceforth called the main contractor]

And

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

Valid Upto:
[Henceforth, called Associated Electrical Contractor or Electrical Contractor]

For the execution of Fire Fighting System Work: Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I. (SH:- Balance work)

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

We have agreed as under:

1. The electrical contractor will execute all electrical works in the wholesome manner as per terms and conditions of the agreement. Payment of the associated electrical contractor shall be governed vide para 19.1.11&19.1.12 of CPWD-6 & clause 7 of GCC-2023.
2. The electrical contractor shall be liable for disciplinary action if he failed to discharge the action[s] and other legal action as per agreement besides forfeiture of the security deposit.
3. All the machinery and equipments, tools and tackles required for execution of the electrical works, as per agreement, shall be the responsibility of the electrical contractor.
4. The site staff required for the electrical work shall be arranged by the electrical contractor as per terms and conditions of the agreement.
5. Site order book maintained for the said work shall be signed by the main contractor as well as by the Engineer of the Associated Contractor or by Associated Contractor himself.
6. All the correspondence regarding execution of the electrical work shall be done by the Department with the Main Contractor with a copy to the associated contractor. In case of non-compliance of the provisions of agreement, the main contractor, as well as the associated contractor shall be responsible. The action under clauses 2 and 3 shall be initiated and taken against the main contractor.

SIGNATURE OF MAIN CONTRACTOR

Date:

Place

COUNTERSIGNED

EE(Elect.)

SIGNATURE OF ASSOCIATED
ELECTRICAL CONTRACTOR.

Date

Place:

WILLINGNESS CERTIFICATE

For the execution of Fire Fighting System Work

Name of work: Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I. **(SH:- Balance work)**

I hereby give my willingness to work as **Fire Fighting System contractor** for the above-mentioned work.

I will execute the work as per specifications and conditions for the agreement and as per direction of the Engineer-in-Charge. Also, I will engage full time technically qualified supervisor/engineer for the works. I will attend inspection of officers of the department as and when required.

Dated:

Signature of the Electrical Contractor

SH: IV

HVAC

HVAC SYSTEM

COMMERCIAL AND ADDITIONAL CONDITIONS FOR VRV/VRF SYSTEM

GENERAL

The work shall be executed as per CPWD General Specifications for HVAC works & other CPWD Specifications amended to date and as per relevant BIS and as per directions of Engineer-in-charge. 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 work. In case of presidency of documents shall be as per the following sequence.

BOQ, List of Approved Makes, Technical Specifications, CPWD General Specifications, Various BIS / IEC codes.

The tenderer should in his own interest visit the site and familiarizes himself with the site conditions before tendering.

No T&P shall be issued by the department and nothing extra shall be paid on account of this.

SCOPE OF WORK

The scope of work shall include auditorium **HVAC works** required for making the system complete, functional, tested and operational, including but not limited to the following:

1. Completion of balance **ducting works**, including fabrication, installation, supports, joints and associated accessories.
2. Providing and fixing of **grilles, diffusers and other air distribution components** as required.
3. Completion of **thermal insulation and cladding** of ducting and associated services.
4. Providing, installing and connecting **fire dampers**, including necessary associated works and integration with the existing HVAC system.
5. Providing and connecting **chilled water supply and return lines** to the existing AHUs and/or other HVAC units, including valves, fittings, supports, insulation, testing and commissioning, wherever required.
6. Providing and connecting **condensate/drainage lines** from existing AHUs and/or other HVAC units to the designated drain points, including all necessary fittings, supports and associated works.
7. **Automation and integration of tertiary chilled-water pumps, AHUs and other associated HVAC equipment**, including necessary controls, sensors, actuators, panels, cabling, interconnections and software/configuration required for proper operation of the system.
8. Completion of all other **balance, connecting, integration and associated HVAC works** required at site for proper functioning of the complete HVAC system.
9. The above works shall be executed **as per actual site conditions, latest approved drawings/specifications, applicable standards and codes, and as per the directions of the Engineer-in-Charge.**

The above list is **indicative and not exhaustive**. The Contractor shall execute all incidental, ancillary and connecting works necessary to make the HVAC system complete, functional and operational, even if such works are not specifically mentioned above but are reasonably required for completion of the intended scope.

2.0 GENERAL

The equipment and installation covered by these specifications and drawings shall conform to codes of practice and highest standards of workmanship and materials. This work shall be done in accordance with the provisions as also any state or local Act in force and latest Indian Standard.

The Electrical wiring shall strictly comply with IS:732 and the entire installation shall be in accordance with the Indian Electricity Act 2003 and Indian Electricity Rules 1956 as amended to- date. The electrical works shall also conform to CPWD General Specifications for Electrical works Part - I (Internal) 2023 and Part – II (External) 2023 as amended up to date wherever relevant.

The Contractor shall follow all statutory requirements as well as best trade practices in the manufacture & installation of elevators. The Contractor shall arrange to obtain the approval of the Inspectorate of Lifts for commissioning of the Elevators and handover for operation after satisfactory tests.

3.0 DRAWINGS

Before commencement of the work, the Contractor shall **inspect and verify the existing installations, site conditions, available drawings and all relevant electrical, structural and architectural provisions** and shall prepare and submit all drawings, details and documents necessary for carrying out the work.

Completion Drawings

Three sets of the following laminated drawings and one soft copy of AutoCAD Drawing (especially for auditorium building) shall be submitted by the contractor while handing over the installation to the Department-

AC system drawings giving complete details of all the equipments, including their foundation.

Line diagram and layout of all electrical control panels giving switchgear ratings and their disposition cable feeder sizes and their layout.

Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.

Isometric drawings for the entire piping including the pipe connection to the various equipments and insulation details wherever required.

After Sales Services.

The Firm shall ensure adequate and prompt after sales service in the form of maintenance, spares and personnel are available at site of work during the guarantee period to minimize the breakdown period.

Storage and Custody of materials:

Whatever space available at site for storage of sundry materials and erection equipments will be made available otherwise the agency has to make his own arrangement. No separate storage accommodation shall be provided by the department. Watch and ward of the stores and their safe custody shall be the responsibility of the contractor till the final taking over of the installation by the department.

Insurance and Storage

All consignments are to be duly insured upto the destination from warehouse to works at the cost of the supplier. The insurance covers shall be valid till the equipment is handed over duly installed, tested and commissioned.

Painting

This shall include cost of painting of entire exposed iron work complete in the installation. All equipments works shall be painted at the works before dispatch to the site.

MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN

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

Enlistment Status

Valid Up to:

[Henceforth called the main contractor]

And

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

Status

Valid Up to:

[Henceforth, called Associated Electrical Contractor or Electrical Contractor]

For the execution of HVAC Systems Work Name of work:- Development of Permanent Campus of IIM Sirmaur at Dhaura Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I. (SH:- Balance work)

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

We have agreed as under:

1. The electrical contractor will execute all electrical works in the wholesome manner as per terms and conditions of the agreement. Payment of the associated electrical contractor shall be governed vide para 19.1.11&19.1.12 of CPWD-6 & clause 7 of GCC-2023.

1. The electrical contractor shall be liable for disciplinary action if he failed to discharge the action[s] and other legal action as per agreement besides forfeiture of the security deposit.
2. All the machinery and equipment, tools and tackles required for execution of the electrical works, as per agreement, shall be the responsibility of the electrical contractor.
3. The site staff required for the electrical work shall be arranged by the electrical contractor as per terms and conditions of the agreement.
4. Site order book maintained for the said work shall be signed by the main contractor as well as by the Engineer of the Associated Contractor or by Associated Contractor himself.
5. All the correspondence regarding execution of the electrical work shall be done by the Department with the Main Contractor with a copy to the associated contractor. In case of non-compliance of the provisions of agreement, the main contractor, as well as the associated contractor shall be responsible. The action under clauses 2 and 3 shall be initiated and taken against the main contractor.

SIGNATURE OF MAIN CONTRACTOR

SIGNATURE OF ASSOCIATED
ELECTRICAL CONTRACTOR.

COUNTERSIGNED

EE(Elect.)

DATE:

PLACE:

WILLINGNESS CERTIFICATE

For the execution of HVAC Systems Work

Name of work:- Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Centre, Director Rding internal sanitary, plumbing and electrical installations, development and external services work like water supply line, sewerage, fire-fighting electrical line, road work etc. in all over phase-I. (SH:- Balance work)

I hereby give my willingness to work as **HVAC contractor** for the above-mentioned work. I will execute the work as per specifications and conditions for the agreement and as per direction of the Engineer-in-Charge. Also, I will engage full time technically qualified supervisor/engineer for the works. I will attend inspection of officers of the department as and when required.

Dated:

Signature of the Electrical Contractor

SH: VII

LIFTS/DUMBWAITER

SCOPE OF WORK

These specifications cover the **testing, commissioning, handing over in complete working condition and defect liability of 2 Nos. lifts installed by M/s OTIS**, including all necessary testing, commissioning, adjustment, rectification of defects and allied works required for making the lifts fully operational.

The scope shall also include the **installation, testing, commissioning and handing over in complete working condition of the OTIS make dumbwaiter**, for which the lift material shall be provided by the Department. The agency shall carry out all necessary installation, erection, testing, commissioning, adjustment and associated works required for satisfactory operation of the Dumbwaiter Lift.

The work shall include all **labour, tools, tackles, testing instruments, consumables, minor materials and other incidental requirements** necessary for completion of the works, whether specifically mentioned or not, as required for proper functioning of the lifts.

The agency shall be responsible for **rectification of all defects, deficiencies and operational issues** arising during the **Defect Liability Period of 12 months** from the date of completion and handing over of the works.

The entire work shall be executed **as per the relevant Codes, Standards, manufacturers' recommendations, statutory requirements and directions of the Engineer-in-Charge**, and shall be completed to the satisfaction of the Engineer-in-Charge.

2.0 GENERAL

The equipment and installation covered by these specifications and drawings shall conform to codes of practice and highest standards of workmanship and materials. This work shall be done in accordance with the provisions of the Lifts Act, and subsequent provisions, as also any state or local Act in force and latest Indian Standard 14665, 15330.

The Electrical wiring shall strictly comply with IS:732 and the entire installation shall be in accordance with the Indian Electricity Act 2003 and Indian Electricity Rules 1956 as amended to- date. The electrical works shall also conform to CPWD General Specifications for Electrical works Part - I (Internal) 2023 and Part – II (External) 2023 as amended up to date wherever relevant.

The Contractor shall follow all statutory requirements as well as best trade practices in the manufacture & installation of elevators. The Contractor shall arrange to obtain the approval of the Inspectorate of Lifts for commissioning of the Elevators and handover for operation after satisfactory tests.

3.0 DRAWINGS

Before commencement of the work, the Contractor shall **inspect and verify the existing lift installations, site conditions, available drawings and all relevant electrical, structural and architectural provisions** and shall prepare and submit all drawings, details and documents necessary for carrying out the work.

CONTRACTOR'S RESPONSIBILITIES: Ancillary Works

All cabling and wiring from the main switches in machine room to Elevator equipment and from battery supply to car lights, fans, alarm and intercom system i/c supplying of backup battery and switchgear.

All machine bases, pedestals, and structural steel supports and brackets for the installation, to suit the sizes of the hoist ways.

Sill tracks including supports if required.

Screen guards and other protection for installation.

All chasing and cutting of pockets and making good. (All cutting and chasing shall be as approved by Engineer-in-Charge).

Ensuring safety against accidents including barricading all openings and caution signs.

Scaffolding for installation.

All other items necessary for satisfactory execution & completion of works, whether specified or not.

4.0 SOUND REDUCTION

The Elevator Contractor shall provide necessary sound reduction materials, such as rubber pads of suitable density to effectively isolate the machine from the machine beams and/or flooring.

Noise level inside cars and in the machine room shall be maintained at minimum levels and in any case not more than specified under PERFORMANCE PARAMETERS.

The scope shall include, but shall not be limited to, the following:

1. **Detailed inspection and testing** of all existing lift equipment and associated installations, including traction machine, motor, VVVF drive, controller, ropes, guide rails, car frame, counterweight, buffers, governor, safety gear, landing doors, car doors, door operators, landing and car operating panels and associated electrical/control equipment.
2. Testing and verification of all **electrical and safety circuits**, including no-load, full-load and 1¼-load current and voltage readings, overload protection, stalling protection, emergency operation, manual operation, buffer operation and other tests as required under the applicable specifications.
3. Testing and commissioning of all **safety devices and emergency features**, including emergency stop switches, overload indicator, door interlocking, safety gear, overspeed governor, emergency lighting, emergency alarm, manual rescue/cranking facility and automatic rescue device (ARD).
4. Testing and commissioning of **Fireman's Switch/Fireman operation**, home landing facility, selective floor service, anti-nuisance operation, load non-stop operation, door failure operation, nudging operation, auto fan-off and other programmed functions provided in the lifts.
5. Testing and commissioning of **intercom/two-way communication system**, including communication between lift car, machine room, Fire Control Room, Reception/Facility Manager, along with associated power backup, wherever applicable.
6. Testing and commissioning of the **emergency power supply arrangements**, including operation of lifts from essential/standby power supply and associated UPS/battery backup for lift car light, fan, alarm and intercom systems, as applicable.
7. For the **Dumbwaiter Lift**, complete installation shall include all necessary erection, fixing, alignment, wiring/cabling, control panel, operating stations, door/landing arrangements, safety devices, limit switches, interlocks and other accessories required for complete and safe operation, using Department-supplied materials.
8. The Contractor shall arrange and carry out all **testing and commissioning in the presence of the Engineer-in-Charge** and shall demonstrate satisfactory operation of all lifts under no-load, full-load and applicable test conditions.
9. The Contractor shall obtain all necessary **statutory inspection/approval from the Inspectorate of Lifts and other competent authorities**, wherever applicable, and shall provide all assistance, documentation, test certificates and compliance documents required for commissioning and operation of the lifts. The original specification requires statutory approvals before commissioning and handing over.
10. The Contractor shall provide all necessary **labour, tools, tackles, testing instruments, scaffolding, safety arrangements, consumables, minor materials, cables/wiring, supports, brackets, machine-room ancillary works and other incidental items** required for satisfactory completion of the work. The source specification similarly places ancillary installation responsibilities, safety barricading and incidental requirements on the contractor.
11. The Contractor shall carry out all necessary **rectification, adjustment and replacement of defective minor components/parts** required to make the lifts fully operational, as directed by the Engineer-in-Charge, within the scope of the work.
12. The Contractor shall conduct final performance tests and demonstrate achievement of the specified **levelling accuracy of ± 3 mm**, along with other applicable performance parameters specified in the CPWD specifications and relevant Indian Standards.
13. On completion, the Contractor shall submit **test reports, statutory approval/inspection certificates, commissioning certificates, warranty certificates, operation and maintenance manuals, as-fitted**

drawings, detailed wiring/control diagrams, equipment manuals and other relevant documents. The source specification requires detailed wiring diagrams, as-fitted drawings and maintenance manuals at completion.

14. The Contractor shall provide **training to the Department's designated personnel** regarding normal operation, emergency operation, manual rescue, ARD, fireman operation and basic maintenance of the lifts.
15. The Contractor shall be responsible for **defect rectification and satisfactory functioning of the lifts during a Defect Liability Period of 12 months** from the date of completion and handing over of the entire work. All defects attributable to workmanship, installation, commissioning or supplied/installed components shall be attended to promptly by the Contractor at no additional cost to the Department, except where specifically excluded by the contract.
16. The Contractor shall maintain the lifts in proper working condition during the Defect Liability Period and shall attend to complaints/breakdowns within the response time stipulated by the Engineer-in-Charge.
17. All works shall be executed in accordance with the **relevant provisions of the Lifts Act, applicable statutory requirements, latest applicable Indian Standards including IS 14665 and IS 15330, CPWD Specifications, manufacturers' recommendations and directions of the Engineer-in-Charge.** The uploaded specification specifically requires compliance with these standards and applicable statutory provisions.

The work shall be completed in all respects, including testing, commissioning, statutory inspection/approval, demonstration and handing over in safe and satisfactory working condition, to the entire satisfaction of the Engineer-in-Charge.

Note: The Department shall provide the material for the Dumbwaiter Lift. The Contractor shall be responsible for its complete installation, testing, commissioning and handing over, including all necessary incidental works and accessories required for satisfactory and safe operation.

5.0 PAINTING

All exposed metal work furnished in these specification, except as otherwise specified shall be given one shop coat of anti-corrosive primer after approved surface treatment of metal surfaces and two coats of approved enamel paint of approved shade.

TESTS AT SITE

The following tests, in addition to those mentioned in the CPWD specifications, shall be carried out to the satisfaction of the Engineer-In-Charge.

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.

The following items shall be tested :

No load current and voltage readings both on 'Up' and 'Down' Circuits.

Full load current and voltage readings both on 'Up' and 'Down' Circuits.

One and quarter load current and voltage readings both on 'Up' and 'Down' Circuits.

Stalling current and voltage and time taken to operate overload.

Overload protection.

Car and counterweight buffers with contract load and contract speed.

Manual operation of elevator at mid-way travel.

Emergency operation.

Tests on completion shall also be performed to the satisfaction of Inspector of Lifts.

6.0 STATUTORY APPROVALS

All statutory approvals from commencement to commissioning of elevators shall be obtained by the Contractor from the Inspector of Lifts, Chief Fire Officer and other authorities. However, the Department shall provide all necessary assistance for providing documents, drawings and certificates pertaining to other contractors, as may be required. The Department shall reimburse the statutory fees paid in connection with the approval of installation of elevators.

LIST OF PREFERRED MAKES FOR E&M WORKS

Name of work: Development of Permanent Campus of IIM at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel (Girls + FPM), Connecting Corridor Hostel, Student Mess, Student Activity Center, Virtual Learning Center + Health Center+ Student Canteen+ Satellite Shopping Complex, Director Residence, Professor Residence-Type 6, Associate Professor-Type 5 & Type 4 Special, Staff Residence Type-1, 2, 3, 4, Community Center, Class Room Complex-01, 02, Faculty Building, MDP Class Room Complex, Library cum Computer Center, Auditorium and Incubation Center, Administrative Block, Guest House, Meditation Center, ESS-1, 2 & 3, AC Plant Room, Bus Stop & Gate Way Complex i/c all Internal and External Civil, MEP, Hard Landscape work etc.

ELECTRICAL WORKS				
1.	MCCBS BREAKER (MODEL SHALL BE AS PER TENDER SPECIFICATION & BOQ)	SCHNEIDER (CVS)	L&T (D-Sine)	ABB (T-Max)
		SIEMENS (3VA)		
2.	SFU / FSU / HRC/ HBC FUSES & BASES	L&T	SIEMENS	SCHNEIDER
		ABB		
3.	MCB/ ELCB/ RCCB/ RCBOS/ DISTRIBUTION BOARDS (DOUBLE DOOR IP43 DBs)	LEGRAND EKINOXE3	HAGER NOVELLO	SIEMENS (BETA GUARD)
		SCHNEIDER ACTI-9	ABB	
4.	FR/ FRLS/ XLPE LT CABLES & WIRES – ROHS COMPLIANCE (ARMOURED OR OTHERWISE)	POLYCAB	FINOLEX	HAVELLS
5.	MODULAR PLATE SWITCHES AND SOCKETS	LEGRAND (Arteor)	SCHNEIDER (OPAL)	MK (Blenz)
		WIPRO (North west)		
6.	PVC CONDUIT/ FLEXIBLE CONDUIT & ACCESSORIES (ISI MARKED)	BEC	AKG	POLYCAB
		EAE Turkey	SUPERBAR	
7.	FR/ FRLS/ XLPE HT CABLES – ROHS COMPLIANCE (ARMOURED OR OTHERWISE)	POLYCAB	FINOLEX	HAVELLS
8.	BAKELITE SHEET	HYLAM	FORMICA	GREENLAM
		KIRLOSKAR	ABB	SCHNEIDER

9.	CABLE GLANDS (DOUBLE COMPRESSION WITH EARTHING LINKS)	DOWELLS	COMET	GRIPWELL
10.	BI-METALLIC CABLES LUGS/ PVC GLANDS	DOWELLS	ACTION	JAINSONS
		KABEL		
11.	CABLE JOINTING KITS	RAYCHEM	JAINSONS	3M
		DENSONS		
12.	CABLE TRAYS (FACTORY FABRICATED) / RACEWAYS (G.I.)	INDIANA	CTM ENGINEERS	MEM
		KAMBOJ ELECTRO CONTROL		
13.	BATTERY (SEALED MAINTENANCE FREE)	AMCO	EXIDE	AMARA RAJA
14.	BATTERY CHARGER	AMARA RAJA	CHHABI ELECTRIC	CROMPTON GREAVES
15.	SINGLE PHASING DEVICE	L&T	SIEMENS	MINILEC
16.	PUSH BUTTONS	L&T	SIEMENS	SCHNEIDER
		ABB		
17.	TIME RELAY DEVICE	L&T	SIEMENS	SCHNEIDER
		ABB		
18.	SELECTOR SWITCHES & ROTARY SWITCHES	L&T	SIEMENS	SCHNEIDER
		ABB		
19.	INDICATING LIGHTS	L&T	SIEMENS	SCHNEIDER
		ABB		
20.	TERMINALS	ELMEX	ESSEN	DEINKI
		WAGO		
21.	MOTORS	ABB	CROMPTON	SIEMENS
		KIRLOSKAR	BHARAT BIJLI	
22.	MULTI-METER & MEGGARS	ESCROP	MOTWANI OR EQUIVALENT	
23.	PROGRAMMABLE LOGIC CONTROLLER	SIEMENS	WOODWARD	ALLEN BRADLEY

24.	EARTHING / LIGHTNING PROTECTION UNIT	JMV	ERICO	LPI
25.	UPS	SCHNEIDER (Existing make)		
26.	FIRE ALARM SYSTEM (All COMPONENTS SHALL BE UL LISTED & CONFIRM TO NFPA STANDARD)	NOTIFIER (Existing make)		
27.	PA SYSTEM	NOTIFIER (Existing make)		
28.	PUMPS	WILLO	KIRLOSKAR	KSB
		XYLLUM		
29.	M.S. PIPE	TATA	JINDAL HISSAR	SAIL
		PRAKSH SURYA		
30.	BUTTERFLY / BALANCING VALVE	ZOOTO	AUDCO	SANT
		DRP		
31.	POT STRAINER / Y STRAINER	ZOOTO	EMERALD	SANT
		DRP		
32.	VIBRATOR ELIMINATOR	KANWAL	RESISTROFLEX	D'WREN
33.	INSULATION	UP TWIGA	KIMCO	LLYOD
34.	WELD ELECTRODES	ADVANI	ESAB	L&T
		VICTOR		
35.	DWC HDPE PIPE	FINOLEX	ASTRAL	ASHIRVAD
		SUPREME		
36.	LIGHT FIXTURES	LEGERO	PHILIPS	HAVELLS
37.	EXTERNAL LIGHTING POLE	VALMONT	NERI	GLOWMAG
38.	LANDSCAPE / FACADE AREA LIGHT	As per schedule of work		
39.	STREET LIGHT			
40.	HENSEL BOX	HEPER	ES SYSTEM	LITOLUX
41.	MC4 CONNECTOR	SYNERGY	SETLLAR	SCHNEIDER
42.	ELEVATORS	OTIS		
43.	HDMI PATCH CABLES	AMX	CRESTRON	EXTRON
44.		KREMER		
45.	DIGITAL VIDEO CABLE NON-PLENUM	AMX	CRESTRON	EXTRON
		KREMER		

46.	CONTROL CABLE	BELDEN	CRESTRON	EXTRON
47.	MICROPHONE CABLE	AMX	CRESTRON	EXTRON
		KRYSTAL	BELDEN	
48.	SHIELED CHIELDED CAT 6A / FIBRE CABLE	CISCO	D-LINK	NETGEAR
	HVAC SYSTEM WORKS			
1.	Air Cooled Hi-wall / Cassette Unit	Daikin	Hitachi	Carrier
2.	Expansion Tank	Xylem-ITT	Armstrong	Grundfos
		Anergy	Edgetech	
3.	Acoustically Insulated Box Type Inline Fans	Ostberg	Kruger	Wolter
		Airflow		
4.	Axial Fan / Centrifugal Fan (AMCA Certified for Sound & Performance)	Greenheck	Airflow	Kruger
		Wolter		
5.	Three phase motors	ABB	CG	Siemens
		Marathon		
6.	Three phase motors (250°C for 2 Hours)	Marathon	Havells-Lafert	Baldor
7.	Water Piping Upto150mmdia	Tata	SAIL	Jindal Hissar
		Prakash Surya		
8.	Water Piping Above 150mmdia	Tata	MSL	Jindal
		Prakash Surya		
9.	Y-strainer / Pot – strainer	Emerald	Sant	Rapid Cool
		Zoloto		
10.	Butterfly Valve (Manual & Motorized)	Advance	DRP	Zoloto
		Leader		
11.	Actuator for Motorised Butterfly Valve	Belimo	Siemens	Danfoss
		Honeywell		
12.	Manual Balancing	Advance	Zoloto	Leader

	Valve			
13.	Dual Plate Check Valve	Advance	Zoloto	Leader
14.	FCU Valve Station	Calefi	CNM	ATS
15.	Pressure Independant Control cum	DANFOSS	JOHNSON CONTROL	SIEMENS
		ANERGY		
16.	Thermostat / Humidistat	DANFOSS	JOHNSON CONTROL	SIEMENS
		ANERGY		
17.	Globe / Ball Valve (With or Without Strainer)	Advance	AIP	Zoloto
		Leader		
18.	Auto Air Vent Valve	Calefi	Spirotech	Anergy
19.	Pressure Gauges	Feibig	Emerald	H Guru
		Taylor		
20.	Industrial Type Thermometer (Alcohol filled V form)	Feibig	Emerald	H Guru
		Taylor		
21.	GSS Sheet	Sail	Tata	Jindal
22.	Factory Fabricated Duct	Zeco	Ductofab	Waves
		Projtech		
23.	Aluminium Sheet	Hindalco	Balco	Nalco
24.	Vibration Isolation Spring & Flexible Pipe Connector	Easyflex	Resistoflex	Dunlop
		Kanwal		
25.	Fire & Smoke Damper	System Air	Cynor	Glenstrom
		Titus		
26.	Fire Damper Actuator	Belimo	Siemens	Honeywell
27.	Extruded aluminum grills / Diffusers	System Air	Cynor	Glenstrom
		Titus		
28.	Pre Filters, Fine Filters & Hepa Filters	Thermodyne	Spectrum	Mechmark
29.	Closed Cell Fire Retardant XPE (For Duct Insulation)	Paramount	Supreme	Trocyllene
30.	Nitrile Rubber For Pipe / Duct Insulation (With Mechanical & UV Protection)	Armacell	Supreme	Kflex
		ALP Aeroflex		
31.	V Belt	Dunlop	Fenner	Hilton

32.	Paints	ICI	Asian	Berger
		Nerolac		
33.	Tar felt / CPRX compound	Shalimar tar product		
34.	Dash Fasteners	Fisher	Hilti	Bosch
	Balancing Valves / High Rangeability Valve			
35.	Welding Rods	Advani	L&T	Esab
36.	Insulated Flexible Duct	Atco	Caryaire	Cynor
37.	Duct / Pipe Support	Easyflex	Gripple	Resistoflex
		Hilti		
38.	Copper Refrigerant Piping	Mandev	Rajco	Shree Shyam
		Mexflow		
39.	Copper Refrigerant Pipe Insulation	Armacell	ALP Aeroflex	Kflex
		Supreme		
40.	Duct Mounted Bio-polar Ionization System	Ruks	Trimed	Plasma Air
41.	Return Air Temperature Sensor	Honeywell	ALC	ABB
		Omicron		
42.	Network / Remote Operator Terminal	Honeywell	ALC	ABB
43.	Smoke Sensor	Honeywell	ALC	ABB
		Omicron		
44.	Temperature plus RH Sensor	Honeywell	ALC	ABB
		Omicron		
45.	Differential Pressure Switch-Air	Honeywell	ALC	ABB
		Omicron		
46.	Differential Pressure Switch-Water	Honeywell	ALC	ABB
		Omicron		
47.	CO2 Sensor	Honeywell	Omicron	Vishala
48.	CO Sensor (Electro	Honeywell	Omicron	Vishala

	Chemical Gel Based)			
49.	Level Switch	Honeywell	Omicron	Vishala
50.	Differential Pressure Transmitter-Air	Honeywell	ALC	ABB
		Omicron		
51.	Pressure TransmitterWater	Honeywell	ALC	ABB
		Omicron		
52.	Digital Thermostat / Humidistat	Honeywell	ALC	ABB
		Omicron		

Note:

- (i) The guarantee/ warrantee of products shall be in the name of IIM Sirmaur and shall be handed over to them after successful installation, commissioning and completion of work.
- (ii) Batch test certificate of Paints and Primer shall be supplied along with each lot.
- (iii) The SE cum PD, Sirmour CPWD, Sirmour reserves the right to add or delete any materials and brands in the list of preferred materials/ brands.

EE (Elect.),
Dehradun Central Elect. Division,
CPWD, Dehradun

SCHEDULE OF QUANTITY (E&M)

Name of Work: Development of Permanent Campus of IIM Sirmaur at Dhaula Kuan, District Sirmaur, Himachal Pradesh. SH: C/o Student Hostel-Type A, B, C, Married Hostel, Connecting Corridor Hostels, Student Mess, Student Activity Center, Virtual Learning Center, Director Residence, Professor Residence-Type VI, Associate Professor Residence Type V & Assistant Professor Residence Type IV Special, Staff Residence Type-1 to 4 (1, 2, 3 & 4), Community Center, Class Room Complex- 01 & 02, Faculty Building, MDP Class Room Complex, Library cum Computer Center, Auditorium and Incubation Center, Administrative Block, Guest House & MDP Accommodation, Meditation Center, ESS-1, 2 & 3, AC Plant Room, Bus Stop & Gate Way Complex i/c all Internal and External Civil, MEP, Hard Landscape, irrigation work etc. (SH: Balance work)

S. No.	DESCRIPTION OF ITEMS	QTY	UNIT	RATE	AMOUNT
	SH-1 Internal Electrical Installations				
1	Supplying and drawing following sizes of FRLS/HFFR PVC insulated copper conductor single core cable in in existing surface / recessed steel/PVC conduit as required.				
i)	2 X 1.5 sq. mm	500.00	Meter	77.00	38,500.00
ii)	3 X 1.5 sq. mm	500.00	Meter	104.00	52,000.00
2	Supply, Installation, testing and commissioning of Surface Mounted Round 12W, diecast aluminium body & CRCA, PMMA diffuser in opal finish with integral electronic driver ,IP-20, CCT-3000K/4000K/6000K, PF>0.95, THD<10%, rated life of L-70@ 50,000 hours 840 lmwith CRI >80 , Dia-160mm,H-43mm. Equivalent : Legero, Wipro, Havells	15.00	Each	715.00	10,725.00
3	Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray (Galvanisation thickness not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with two numbers GI Suspenders i/c base of suitable size GI angle, GI bolts & nuts, fastener etc as required.	-			

i)	100 mm width X 50 mm depth X 1.6 mm thickness	300.00	Meter	754.00	2,26,200.00
ii)	150 mm width X 50 mm depth X 1.6 mm thickness	500.00	Meter	803.00	4,01,500.00
iii)	300 mm width X 50 mm depth X 1.6 mm thickness	50.00	Meter	1,062.00	53,100.00
iv)	450 mm width X 50 mm depth X 2.0 mm thickness	50.00	Meter	1,439.00	71,950.00
4	Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "bends" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with two numbers GI Suspenders i/c base of suitable size GI angle, GI bolts & nuts, fastener etc as required.	-			-
i)	100 mm width X 50 mm depth X 1.6 mm thickness	10.00	Each	1,252.00	12,520.00
ii)	150 mm width X 50 mm depth X 1.6 mm thickness	10.00	Each	1,368.00	13,680.00
iii)	300 mm width X 50 mm depth X 1.6 mm thickness	4.00	Each	1,977.00	7,908.00
iv)	450 mm width X 50 mm depth X 2.0 mm thickness	4.00	Each	2,844.00	11,376.00
5	Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "Tee" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with two numbers GI Suspenders i/c base of suitable size GI angle, GI bolts & nuts, fastener etc as required.	-			
i)	100 mm width X 50 mm depth X 1.6 mm thickness	10.00	Each	1,427.00	14,270.00
ii)	150 mm width X 50 mm depth X 1.6 mm thickness	10.00	Each	1,486.00	14,860.00
iii)	300 mm width X 50 mm depth X 1.6 mm thickness Meter	4.00	Each	2,294.00	9,176.00
iv)	450 mm width X 50 mm depth X 2.0 mm thickness	4.00	Each	3,324.00	13,296.00

6	Providing and fixing of lightning conductor finial, made of 25 mm dia 300 mm long, G.I. tube, having single prong at top, with 85 mm dia 6 mm thick G.I. base plate including holes etc. complete as required.	4.00		609.00	2,436.00
7	Fixing of lightning conductor finial(single prong) with base plate including holes etc. Complete as required.	4.00	Each	422.00	1,688.00
8	Jointing copper / G.I. tape (with another copper/ G I tape, base of the finial or any other metallic object) by riveting / nut bolting/ sweating and soldering etc as required.	4.00	Each	139.00	556.00
9	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required.(For horizontal run)	100.00	Meter	148.00	14,800.00
10	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required.(For vertical run)	100.00	Meter	238.00	23,800.00
11	Providing and fixing testing joint, made of 20 mm X 3 mm thick G.I. strip, 125 mm long, with 4 nos. of G.I. bolts, nuts, chuck nuts and spring washers etc. complete as required.	4.00	Each	140.00	560.00
12	Providing and laying G.I. tape 32 mm X 6 mm from earth electrode directly in ground as required.	50.00	Meter	221.00	11,050.00
13	Providing and fixing of GI Flexible Pipe 25 mm /1inch dia. for holding/connection of existing wire including connector, thimble connection, glands/coupler etc. above the false ceiling for existing light fixtures etc. complete as required.	800.00	Meter	48.00	38,400.00
	UPS	-			

14	Replacement of EPO (Emergency Power Off) Card in existing Schneider make UPS of 15 kVA / 15 kW capacity, Model: E2UPS15KH, including dismantling of existing/defective EPO card, supply and installation of new OEM/compatible EPO card, all necessary labour, testing, functional checking, commissioning and submission of testing/service report after completion of the work, complete in all respects.	1.00	JOB	79,596.00	79,596.00
15	Supply, Installation, Testing and Commissioning (SITC) of Schneider Electric Easy UPS 3S, 15 kVA, 400 V, 3:3 phase UPS, Model: E3SUPS15KH, suitable for operation with the existing installed system, including shifting/positioning, installation, integration with existing electrical/UPS system, necessary interconnections, configuration, functional testing, testing of UPS performance and protection functions, commissioning and submission of test/commissioning report, complete in all respects as required for satisfactory operation of the system.	1.00	JOB	2,87,929.00	2,87,929.00
	SAFETY EQUIPMENT	-			
16	Providing of set of 4 Nos. 9.5 Litre capacity GI bucket painted in post office red colour with prior coat of red - oxide paint and written with white paint 'Fire' and mounted on MS angle iron frame with bracket of appropriate size and capacity including filling sand etc.	3.00	Set	2,029.00	6,087.00
17	Providing and fixing M.V. danger notice plate of 200 mm X 150 mm, made of mild steel, at least 2 mm thick, and vitreous enamelled white on both sides, and with inscription in single red colour on front side as required.	50.00	Each	315.00	15,750.00

	FIRE FIGHTING				
18	<p>(a) Supplying, installation, testing and commissioning of electric driven terrace pump conforming to IS 12469: 2019 suitable for automatic operation and consisting of following, complete in all respects, as required: (Terrace Pump)</p> <p>(b) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical seal as required.</p> <p>(c) Suitable HP squirrel cage induction motor TEFC type suitable for operation on 415 volts, 3 phase, 50 Hz, AC supply with IP55 class of protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-12615: 2018.</p> <p>(d) M.S. fabricated common base plate, coupling, coupling guard, foundation bolts etc.as required.</p> <p>(e) Suitable cement concrete foundation duly plastered and with anti vibration pads.</p>				
(i)	450 lpm at 35 m Head	1.00	Each	91,384.00	91,384.00
19	Design, manufacture, supplying, fixing in position, testing and commissioning of the following front operated cubicle type, front access 2mm thick mild steel sheet, free standing, dust and vermin proof, switchboard with IP42 protection with hinged and lockable doors complete with interconnections, tinned copper crimping lugs, bonding to earth and painting, suitable for use at 415 volts, 3				

	phase 4 wire 50 Hz system and suitable for a fault level of 25 MVA symmetrical at 415 volts.				
i)	MCC for Fire Fighting Pumps at Terrace				
	<p>INCOMING:</p> <p>a) One 100 amp. TP +NL M.C.C.B. with rotary handle of breaking capacity 25 KA</p> <p>b) One-Volt Meter (0-500 V) with selector switch</p> <p>c) One Set indicating lamps BUS BARS OUTGOING</p> <p>a) 100 Amp TPN BUS BAR (Aluminium).</p> <p>b) One - 63 Amp.TP +NL M.C.C.B. with rotary handle of breaking capacity 35KA</p> <p>c) One Fully Automatic D.O.L Starter suitable for Jockey Pump Motor 15 KW with over load relay, timer push buttons and Auto/Manual selector switch</p> <p>d) One panel type Amp. meters one for each motor with ASS. CTS etc.</p> <p>e) One sets of On/Off - neon indicating lamp.</p> <p>i) All interconnecting power & control wires/cables suitable size within the panel and from panel to motors , pressure switches, level switches, cable Tray, pipes etc. including brass glands termination within fire pump house and earthing as per specifications.</p>	2.00	Set	1,63,850.00	3,27,700.00

20	Providing, laying, testing & commissioning of 'C' class heavy duty MS pipe conforming to IS 1239/Class -II of IS: 3589 including Welding, fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required.				
(i)	25 mm dia	216.00	Meter	920.00	1,98,720.00
(ii)	40 mm dia	81.00	Meter	1,259.00	1,01,979.00
(iii)	50 mm dia	36.00	Meter	1,557.00	56,052.00
(iv)	65 mm dia	63.00	Meter	1,955.00	1,23,165.00
(v)	80 mm dia	63.00	Meter	2,277.00	1,43,451.00
(vi)	100 mm dia	50.00	Meter	3,077.00	1,53,850.00
(vii)	150 mm dia	60.00	Meter	4,299.00	2,57,940.00
21	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required.	-			-
(i)	65 mm dia	7.00	Each	4,712.00	32,984.00
(ii)	80 mm dia	10.00	Each	5,406.00	54,060.00
(iii)	100 mm dia	10.00	Each	7,271.00	72,710.00
(iv)	150 mm dia	8.00	Each	9,737.00	77,896.00
22	Providing, installation, testing and commissioning of non-return valve of following sizes confirming to IS: 5312 complete with rubber gasket, GI bolts, nuts, washers etc.as required.				

(i)	100 mm dia	2.00	Each	11,853.00	23,706.00
(ii)	150 mm dia	6.00	Each	18,884.00	1,13,304.00
23	Supplying and fixing air vessel made of 250 mm dia, 8 mm thick MS sheet, 1200 mm in height with air release valve on top and flanged connection to riser, drain arrangement with 25 mm dia gun metal wheel valve with required accessories, pressure gauge and painting with synthetic enamel paint of approved shade as required.	2.00	Each	19,402.00	38,804.00
24	Providing, fixing, testing & commissioning of 15mm dia quartzoid bulb type sprinklers of rating 68 °C with required accessories.	-			-
(i)	Pendent Sprinkler	60.00	Each	599.00	35,940.00
(ii)	Upright Sprinkler	60.00	Each	599.00	35,940.00
25	Providing & fixing flow switch in following sizes M.S. pipe including connection etc as required.	-			-
(i)	150mm dia	4.00	Each	9,644.00	38,576.00
26	Supplying, installation, testing & commissioning of sprinkler flexible pipe (UL Listed) of stainless steel complete with 15 NPT on reducer thread with maximum working pressure of 175 PSI test pressure of 875 PSI (Burst) with branch line (Inlet) 25mm NPT male thread to sprinkler head (Outlet) 15mm NPT female thread with reducer, nipple, 2 side brackets, center bracket, stockbar of following sizes complete as required.	-			-
(i)	700 MM	60.00	Each	1,495.00	89,700.00
27	Providing, installation, testing & commissioning of adjustable rosette plate for 15mm dia in white finish UL Listed or FM approved complete as	60.00	Each	264.00	15,840.00

	required.				
28	Supplying and fixing orifice plate made out of 6 mm thick stainless steel (Grade 304) with orifice of required size to be fitted between flange& landing valve of external and internal hydrants to reduce pressure at the outlet to the level of 3.5 kg/cm2 complete as required.	16.00	Each	1,424.00	22,784.00
29	Supplying and fixing single headed internal hydrant valve with instantaneous Gunmetal/Stainless Steel coupling of 63 mm dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank Gunmetal/Stainless Steel cap and chain as required :				
(i)	Single headed Stainless steel	5.00	Each	6,632.00	33,160.00
30	Supplying and fixing 63 mm dia, 15 m long RRL hose pipe with 63 mm dia male and female couplings duly bound with GI wire, rivets etc. conforming to IS 636 (type-A) as required :				
(i)	Stainless Steel (Grade 304)	91.00	Each	4,667.00	4,24,697.00
31	Supplying and fixing first-aid Hose Reel with MS construction spray painted in post office red, conforming to IS 884 complete with the following as required. (a) 20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 12585 (b) 20 mm nominal internal dia gun metal globe valve & nozzle. (c) Drum and brackets for fixing the equipment's on wall. (d) Connections from riser with 25 mm dia stop gun metal valve & M.S. Pipe and socket.				
(i)	40 m	10.00	Each	11,086.00	1,10,860.00

32	Supplying & fixing 63 mm dia gun metal short branch pipe with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required:	-			-
(i)	Stainless Steel (Grade 304)	102.00	Each	1,756.00	1,79,112.00
33	Supplying and fixing of fire brigade connection of cast iron body with gun metal male instantaneous inlet couplings complete with cap and chain as reqd. for suitable dia MS pipe connection conforming to IS 904 as required:				
i)	2 way-100 mm dia M.S. Pipe	1.00	Each	7,262.00	7,262.00
ii)	4 way - 150 mm dia M.S. Pipe	1.00	Each	14,820.00	14,820.00
34	Supply and fixing of 25mm dia gun metal globe valve & nozzle in existing RR Hose pipe.	51.00	Each	1,048.00	53,448.00
35	Providing and fixing 4.5 Kg Capacity carbon-di-oxide type fire extinguishers M.S. cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube 30 cms long high pressure discharge hose, discharge nozzle, suspension bracket conforming to IS:15683 finished externally with red enamel paint and fixed to wall with brackets complete with internal charge.				
a)	providing above item including accessories as required in complete .	37.00	Each	5,925.00	2,19,225.00
b)	Fixing of above item as required in complete.	37.00	Each	183.00	6,771.00

36	Providing and fixing 6 Kg Capacity ABC Powder type fire extinguishers consisting of M.S. cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube 30 cms long high pressure discharge hose, discharge nozzle, suspension bracket conforming to IS:15683 finished externally with red enamel paint and fixed to wall with brackets complete with internal charge.				
a)	providing above item including accessories as required in complete .	39.00	Each	3,651.00	1,42,389.00
b)	Fixing of above item as required in complete.	39.00	Each	183.00	7,137.00
	HVAC				
37	Supplying, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports, bends, transitions, reducers, end caps, collars etc as required complete in all respect in confirmation with IS : 655 and approved drawings and specifications of following sheet thickness complete as required.				
(i)	Site fabricated GSS sheet metal rectangular ducting as per IS 655-2006 for 0.63 mm thick	30.00	SQM	1,213.00	36,390.00
(ii)	Site fabricated GSS sheet metal rectangular ducting as per IS 655-2006 for 0.8. mm thick	72.00	SQM	1,415.00	1,01,880.00
38	Supplying, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc in confirmation to SMACNA/IS and as per specifications complete etc. as required.	14.00	Each	7,580.00	1,06,120.00

39	Supplying, Fixing, testing and commissioning of fire dampers of minimum 90 minutes fire rated in supply air duct/main branch and return air path as and where required of required sizes i/c control wiring, the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed in the event of fire signal and, in confirmation to IS and as per specifications complete etc. as required..	-			-
(i)	Fire damper	6.00	Each	11,355.00	68,130.00
(ii)	Actuator	6.00	Each	9,793.00	58,758.00
40	Supplying, Fixing, installation, testing and commissioning of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers in confirmation to SMACNA/IS and as per specifications complete etc. as required.	20.00	SQM	9,623.00	1,92,460.00
41	Supplying & fixing of powder coated extruded aluminium Return Air Grills with louvers but without volume control dampers complete in confirmation to SMACNA/IS and as per specifications complete etc. as required.	20.00	SQM	6,285.00	1,25,700.00
42	Supplying and fixing of acoustic lining of supply air duct and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m ³ , with 25 mm X 25 mm GI section of 1.25 mm thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminium sheet fixed to inside surface of ducts with	30.00	SQM	890.00	26,700.00

	cadmium plated nuts,				
43	Supplying, fixing acoustic lining on wall and ceiling of AHU rooms with 50mm thick, density 32 kg/cu.m resin bonded glass fiber insulation friction fixed in 610mm x 610 mm frame work made of 25X50X50X50X25 mm made out of 0.6mm thick GI sheet U shaped channel and covered with reinforced fiber glass tissue and finished with 0.80 mm perforated aluminium sheet etc. complete as required and as per specifications.	375.00	SQM	1,057.00	3,96,375.00
44	Supplying, laying, fixing, testing and commissioning of following thickness closed cell electrometric nitrile rubber of class 'O' applied\ by adhesive confirming to standard specifications, as per specifications and as required complete in all respect.				
(i)	Insulation with nitrile rubber of thickness 32mm on existing pipe	48.00	SQM	1,203.00	57,744.00
(ii)	Insulation with nitrile rubber of thickness 19mm on existing pipe	36.00	SQM	724.00	26,064.00
(iii)	Insulation with nitrile rubber of thickness 13mm on existing pipe	100.00	SQM	589.00	58,900.00
45	Supplying and fixing of following thickness duly laminated aluminium foil of mat finish closed cell Nitrile rubber (Class "O") insulation on existing duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.	-			-

(i)	Nitrile rubber Insulation - 19 mm	40.00	SQM	810.00	32,400.00
(ii)	Nitrile rubber Insulation - 25 mm	30.00	SQM	1,033.00	30,990.00
46	Supplying, installing, testing and commissioning of ceiling mounted type chilled water 4way cassette unit each complete with minimum 2 row deep of coil of copper tubes aluminium fins, centrifugal fan. 3 speed motor, filters insulated drain pan with drain connection, high performance drain pump, water piping connections, decorative panel, electrical wiring for 220v 1ph, required as per specification & drawings with the following capacities:-	-			-
(i)	1.5 TR nominal capacity with 600 CFM air quantity.	2.00	Each	14,411.00	28,822.00
47	Providing & fixing BUTTERFLY VALVE with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water circulation as specified.	-			-
(i)	100 mm	4.00	Each	7,482.00	29,928.00
(ii)	65 mm dia	2.00	Each	5,086.00	10,172.00
(iii)	50mm dia	2.00	Each	4,627.00	9,254.00
48	Providing & fixing in position industrial type mercury thermometers complete etc. as required.	4.00	Each	1,132.00	4,528.00
49	Providing and fixing in position industrial type pressure gauges with gun metal / brass valves complete etc. as required	8.00	Each	1,491.00	11,928.00
50	Providing & fixing Y - STRAINER of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation including insulation as specified.	-			-
(i)	100 mm	2.00	Each	15,798.00	31,596.00

51	NON - RETURN VALVE with dual plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified.	-			-
(i)	100 mm dia	2.00	Each	6,945.00	13,890.00
52	Providing and fixing of following sizes UPVC drain pipe of complete with necessary fittings, supports, etc. complete as required.	-			-
(i)	25 mm dia.	50.00	Meter	49.00	2,450.00
(ii)	32 mm dia	75.00	Meter	65.00	4,875.00
53	For Automation of Air Handling Units.				
(a)	Field Devices				
	Supply Installation Testing Commissioning of following Field Devices including connection etc. as required				
(i)	Air Differential Pressure Switch for Fan Run Status.	5.00	Nos.	2928.00	14,640.00
54	For Automation of Tertiary Pumps.				
(i)	Supplying and fixing suitable heavy duty MS Sockets for fixing of Water Differential pressure transducer in the existing MS Chiller Water pipe lines complete with cutting, drilling, welding (i/c insulation & cladding if required) complete etc. as required. (15MM NB Heavy Duty MS Nipple 100mm Long + Socket)	80.00	Nos.	180.00	14,400.00
(ii)	Supply Installation Testing Commissioning of following Field Devices including connection etc. as required				
(a)	Water Differential Pressure (DP) Switch for Pump Status.	40.00	Nos.	9690.00	3,87,600.00

(iii)	Supply, Installation, Programming, Testing & Commissioning of The Universal controller is intended for heating, air conditioning, ventilation and refrigeration in comfort control applications. Siemens - RWD62U or equivalent in any other reputed brand in a suitable IP -65 Metal Enclosure for main loop control applications are designed for temperature, static pressure, humidity, air pressure, fluid pressure, refrigeration, air quality and air fluid velocity control etc. with 24V AC control Transformer/ power supply, suitable MCB/fuse protection, 2-pole 2-position selector switch and including Terminal blocks, DIN rail, etc. as required.	21.00	Nos.	15456.00	3,24,576.00
55	Supplying & Drawing / Laying Cu PVC Insulated Control armoured Cables of following sizes complete with laying on open masonry duct / cable alley of panels, on existing wall surface / cable tray complete etc. as required.				
i)	2 X1.5 Sq.mm	3,000.00	Meter	262.00	7,86,000.00
56	Integration of existing VFDs with field devices including required programming of the VFD and associated equipments completed with testing commissioning etc. as reqd.	45.00	Jobs	1944.00	87,480.00
	FIRE ALARM				
57	SITC of Addressable Multi criteria (Smoke + Heat + CO + IR) Detector. The detector shall have four sensing elements viz. Photo electric smoke, Heat, Carbon Monoxide & Infra Red Flame detection combined in a single detector. The detector shall have twin bi-colour LED for 360 deg. viewing. Addressing shall be with user friendly rotary decimal switches. The internal CO Sensor should be replaceable upon EOL. It				

	should be possible to generate 2 distinctive tones if the CO concentration reaches 2 definite user defined levels.				
a)	providing above item including all accessories complete as required.	65.00	Each	2,551.00	1,65,815.00
b)	ITC of above item complete as required.	65.00	Each	73.00	1,314.00
58	Supplying, installation, testing & commissioning of response indicator with all connections etc as required.	18.00	Each	306.00	5,508.00
59	SITC of Addressable type fault for isolating shorted, desired and loose circuits between two successive fault isolators with automatic resetting arrangement (base Model/ Standard Module). The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. (UL LISTED & FM APPROVED OR EN-54)	24.00	Each	3,434.00	82,416.00
60	Supplying, installation, testing & commissioning of Addressable monitor modules for Sprinkler Flow Switch and Door Holders. The monitor module shall provide DPDT contact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. (UL LISTED & FM APPROVED OR EN-54)				

a)	providing above item including all accessories complete as required.	18.00	Each	3,165.00	56,970.00
b)	ITC of above item complete as required.	18.00	Each	238.00	4,284.00
61	Supplying, installation, testing & commissioning of Addressable control modules for Hooters / Sounders etc. The control module shall provide DPDT contact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. (UL LISTED & FM APPROVED OR EN-54)				
a)	providing above item including all accessories complete as required.	20.00	Each	3,779.00	75,580.00
b)	ITC of above item complete as required.	20.00	Each	238.00	4,760.00
62	Supplying, installation, testing & commissioning of Addressable control relay modules for AHU, Access control Integration & stairs Pressurization Fan. The relay module shall provide DPDT contact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. (UL LISTED & FM APPROVED OR EN-54)				
a)	providing above item including all accessories complete as required.	35.00	Each	3,831.00	1,34,085.00
b)	ITC of above item complete as required.	35.00	Each	238.00	8,330.00

63	Supplying, installation, testing & commissioning of Addressable Telephone Module for interfacing with Telephone Jack for Fire Fighters Telephone Communication application. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the health status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance.				
a)	providing above item including all accessories complete as required.	69.00	Each	3,779.00	2,60,751.00
b)	ITC of above item complete as required.	69.00	Each	238.00	16,422.00
64	Supplying, installation, testing & commissioning of addressable manual call point complete as required.	20.00	Each	4,063.00	81,260.00
65	Supplying, installation, testing & commissioning of addressable horn cum strobe complete as required.	17.00	Each	3,682.00	62,594.00
66	Supplying, installation, testing & commissioning of fire fighter telephone handset complete as required.	14.00	Each	6,016.00	84,224.00
67	Supplying, installation, testing & commissioning of fire fighter phone jack complete as required.	45.00	Each	1,689.00	76,005.00
68	Supplying, installation, testing & commissioning of 1.5/3/6 W ceiling speaker complete as required.	30.00	Each	1,025.00	30,750.00

69	Supplying, installation, testing & commissioning of high efficient power/booster amplifier provides audio signal amplification for public address and voice alarm system with following specification: (i) Main Power Supply : 180-250V AC, 50 Hz (ii) Power Requirement : 700 VA (iii) Amplifier Topology : Class-D, >90% efficiency (iv) Frequency Response : 70 Hz to 20 Khz (v) THD+N@ 1 KHz : 0.1% (vi) Single Input/Output : Ballance Line In (RJ 45)- Line out/100V Singal Output - Pheonix (vii) SNR (dB) : 102 (viii) Dynamic Range : 93 dB (ix) Power Output : 500 Watts/1100Volts Speaker Output - Pheonix Connector (x) Protection : Output Short Circuit/Thermal Shut Down.				
a)	providing above item including all accessories complete as required.	4.00	Each	74,949.00	2,99,796.00
b)	ITC of above item complete as required.	4.00	Each	3,665.00	14,660.00

70	<p>Supplying, installation, testing & commissioning of Networked Fire Fighters 22 inch Touch screen Graphical Display Panel (Incident Commander) at main entry to map 2,50,000 network points. It shall inform & guide Fire Fighters for carrying out Fire fighting operations.</p> <p>a. The software shall display "YOU ARE HERE" along with icons representing standard building objects (stairs, elevators, etc) to be shown on the floor plan</p> <p>b. The software shall allow icons that represent hazardous materials stored in a facility. screen that displays pre-programmed building contact information, building occupancy and other general building information, display all active fire, supervisory, and security events within an event list. The screen shall also provide the arial view of entire building via touch screen navigation.</p> <p>c. The equipment shall allow the importation of externally developed floor plans in Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format. The Incident Commander shall act as an independent node communicating on the peer to peernetwork and shall not be dependent on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of Incident Commander etc complete as required.</p>				
a)	Providing above item including original software, programming, and hardware complete with all accessories as required.	1.00	Each	34,57,598.00	34,57,598.00
b)	ITC of above item complete as required.	1.00	Each	73,977.00	73,977.00

71	Supplying, installation, testing & commissioning of Remote Paging Station for Zone selection & paging to selected area in case of emergency etc complete as required.				
a)	providing above item including all accessories complete as required.	1.00	Each	1,09,541.00	1,09,541.00
b)	ITC of above item complete as required.	1.00	Each	7,777.00	-
72	Supplying, installation, testing & commissioning of Network Repeater Panel with 10" Colour Touch Screen display, mapping minimum 2,00,000 points on network. The NRP shall act as an independent node communicating on the peer to peer network and shall not be dependent on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of NRP operation. (UL LISTED & FM APPROVED OR EN-54)				
a)	providing above item including all accessories complete as required.	1.00	Each	2,82,501.00	2,82,501.00
b)	ITC of above item complete as required.	1.00	Each	7,777.00	7,777.00
73	Supplying, installation, testing and commissioning of following accessories of "Notifier Make" only in the existing panel with synchronization with existing system etc complete as required.				
(i)	Digital voice command (DVC-EM ,DVC-KD) including chassis - Notifier	1.00	Each	2,52,658.00	2,52,658.00
(ii)	Analog output CARD - Notifier	1.00	Each	45,349.00	45,349.00
(iii)	Loop card(LCM 320) - Notifier	1.00	Each	53,771.00	53,771.00
(iv)	Loop card(LEM 320) - Notifier	1.00	Each	34,336.00	34,336.00
(v)	High speed network communication module for connecting nodes with multi mode fiber optic cable-notifier	8.00	Each	2,52,658.00	20,21,264.00
(vi)	12 volts, 26 AH sealed lead acid batteries	6.00	Each	2,471.00	14,826.00

(vii)	Programming and testing of existing notifier make fire alarm panel installed at IIM Sirmaur including required minor parts /items to complete the job.	7.00	Job	2,69,934.00	18,89,538.00
74	SITC of Microprocessor based minimum 2 loop , True Peer to Peer Networkable analogue addressable type fire alarm control panel with 640 character LCD display, The panel should be equipped with sufficient numbers of loop with 20% spare capacity with each loop shall have a capacity of minimum 240 analogue addressable devices in one loop. The panel shall work in degrade mode in case of CPU failure. Four access levels, 5000 event plus 1000 alarm log history events, QWERTY / keypad for programming capable of taking Flash Scan devices, flash EPROM sufficient numbers of programmable relay controls for controlling AHUs, pressurization fans, ventilation fans at fire pump room, monitoring of fire sprinkler and fire hydrant pump, 240 volts AC power supply, automatic battery charger, 24 volts sealed lead acid batteries sufficient for 24 hours normal working and then be capable of operating the system for 2 hours during an emergency conditions as required. The Panel shall have BACKNET CARD for integration. The panel shall be complete with Integrated 8 channel Digital Voice Evacuation System Controller capable of broadcasting Evacuation Messages on same peer-to-peer Network and 2 ways Communication Fire Fighters System capable of supervising all the speaker circuits with adequate zone control and accessories. The system shall be equipped with necessary Digital Audio Amplifier capable of processing one of 8 audio channels				

	<p>and amplifiers as per the speakers requirement at 70.7 VRMS output along with necessary enclosures. The DAA shall be fully monitored for fault and alarm reporting. The proposed Digital Amplifiers shall not be rail mounted / dependant on Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of Amplifier operation. The Digital Amplifier Loop shall have N+1 Redundancy concept to avoid chances of failure. The Fire Fighters Telephone System shall be capable of having minimum 10 Telephones on conference.(UL 9th Edition & FM or EN-54 Approved) The GUI based main network software shall network with other panels on True Peer-to-Peer network. must be capable of graphically representing each facility being monitored with floor plans and icons depicting the actual locations of the various systems; and / or sensors' locations. It shall have the facility to change the sensitivity of any detector. The software shall be capable of monitoring 200 Nodes with 100 MB baud Transmission rate on Fibre Optics Network and 12 MB baud Transmission on cable and 2,50,000 network points. The Graphic workstation shall act as an independent node communicating on the peer to peer network and shall not be dependant on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of GUI. The GUI software shall be located in control room in one of the blocks and shall monitor all the blocks panel connected with each other.</p>				
a)	providing above item including all accessories complete as required.	2.00	Each	7,72,555.00	15,45,110.00
b)	ITC of above item complete as required.	2.00	Each	7,777.00	15,554.00

75	Supplying and drawing following core Fiber Optic Cable having corrugated steel armouring. The Fiber should be SM Fiber Central - loose tube filled with Thixotropic jelly, duly following Standards: ISO 11801, IEC 60793-1/60794-1-2, ITU-T-REC G.652D and Telecordia GR-20-core, High quality Electro Chromium Coated Corrugated Steel tape (ECCS) and HDPE- Sheath, Operating ambient Temperature should be – 5 0C to +50 0C and Storage Temperature shall be – 5 0C to +50 0C, Max Attenuation ± 0.36 (db/ km) at Operational Wavelength 1310 nm and ± 0.22 db / km at Operational Wavelength 1550 nm. type of fiber should be 9/125 / G.652D & Refractive Index should be 1.4670/1.4675. The value for Mode-field, Cladding Diameter $9.2 \pm 0.4 \mu\text{m}$ and $125 \pm 0.7 \mu\text{m}$ correspondingly. The Dispersion value $< 3.5 < 18$ ps/nm-km and PMD value < 0.2 ps/km and Cable Cut off wavelength < 1260 nm i/c splicing & marking etc complete as required.				
(i)	Single Mode 6 Core Optical fiber cable	2,000.00	Meter	64.00	1,28,000.00
76	Supplying & laying of 2 x 1.5 sqmm fire survival armoured cable, 600/1000V rated with annealed copper conductor having glass mica fire barrier tape covered by an extruded layer of Cross Linkable Ethylene Propylene Rubber (EPR) insulation and LSZH inner bedding, steel wire armouring & LSZH outer sheath complete as required.	1,000.00	Meter	386.00	3,86,000.00
	Lift				
77	Installation, testing and commissioning of 500 KG existing Otis make dumbwaiter in the existing shaft including minor works	1.00	JOB	2,74,114.00	2,74,114.00

	complete as required.				
78	Testing and commissioning of existing 14 Passangers,952 KG otis make Lifts i/c complete hand over, minor works as required.	2.00	JOB	2,48,591.00	4,97,182.00
	STP-30KLD				
79	Providing and fixing of Bar Screen Chamber made out of SS-304 grade of suitable for 30 KLD STP, i/c inlet and outlet connections, MS/SS bar screen, supporting frame, access arrangement, grating/cover, necessary brickwork/RCC/plastering, pipe fittings and all associated civil and mechanical works, complete as required.				
a)	providing above item including all accessories complete as required.	1.00	JOB	18,577.00	18,577.00
b)	ITC of above item complete as required.	1.00	JOB	5,497.00	5,497.00
80	Providing, installing, testing and commissioning of 1 HP Screw Pumps suitable for the existing 30 KLD STP, including pump, motor, base/support frame, coupling, inlet/outlet connections, valves, electrical/control connections and all necessary accessories for satisfactory operation, complete.				
a)	providing above item including all accessories complete as required.	1.00	JOB	29,211.00	29,211.00
b)	ITC of above item complete as required.	1.00	JOB	2,749.00	8,247.00
81	Supply, installation, testing and commissioning of Digital Flow Meter suitable for the existing STP flow line, including sensor/meter, display/indicator, necessary flanges/unions, gaskets, fittings, cabling, installation, calibration, testing and commissioning, complete.				
a)	providing above item including all accessories complete as required.	3.00	Each	38,436.00	1,15,308.00

b)	ITC of above item complete as required.	3.00	Each	2,749.00	8,247.00
82	Supply and fixing of 450 mm sweep industrial heavy duty metal Exhaust/Ventilation Fan for STP room/equipment area, including connection, testing and commissioning etc complete as required.				
a)	providing above item including all accessories complete as required.	2.00	Each	4,994.00	9,988.00
b)	ITC of above item complete as required.	2.00	Each	366.00	732.00
	STP-200KLD				
83	Supplying, installation, testing and commissioning of raw water/sewage lifting pump, with capacity Capacity - 20 m ³ /h, 1HP approx, IP 65 Kirloskar make or equivalent approved make, complete with motor, base frame, coupling, suitable delivery connection, valves, strainer, cable termination and all accessories required for satisfactory operation.				
a)	providing above item including all accessories complete as required.	1.00	Each	74,949.00	74,949.00
b)	ITC of above item complete as required.	1.00	Each	2,749.00	2,749.00
84	Supplying, installation, testing and commissioning of FLUSHING pump, ,with capacity Capacity - 12.39m ³ /h, Head - 63 M, Approx , CASING-SS304,IMPELLER-SS304, SS shaft-431,STAGE casing-SS304 connected to TEFC submersible motor for 415 + 10% volts, 3 phase, 50 cycles A.C. power supply with mechanical seal, Kirloskar make or equivalent approved make, complete with motor, base frame, coupling, suitable delivery connection, valves, strainer, cable termination and all accessories required for satisfactory operation.				
a)	providing above item including all accessories complete as required.	1.00	Each	1,36,899.00	1,36,899.00

b)	ITC of above item complete as required.	1.00	Each	2,749.00	2,749.00
85	Supply, installation, testing and commissioning of ozonator system, suitable for the existing water treatment/STP system, including ozone generator, electrical/control panel, ozone injection arrangement, diffuser/injector, tubing/piping, valves, fittings, safety accessories and all necessary accessories for complete and satisfactory operation.				
a)	providing above item including all accessories complete as required.	1.00	Each	1,70,398.00	1,70,398.00
b)	ITC of above item complete as required.	1.00	Each	7,838.00	7,838.00
	Drainage Pump				
86	SITC Drainage Pumps/Dewatering pump ,with capacity Capacity - 14.4m3/h, Head - 15 M,H.P. - 1.5 HP Approx , C.I.body and C.I. two vane enclosed type impeller, SS-304 shaft connected to TEFC submersible motor for 415 + 10% volts, 3 phase, 50 cycles A.C. power supply with mechanical seal, pump connector unit with rubber diaphragm and bend, vertical discharge pipe, guide pipe, cable and chain etc. complete as required.				
a)	providing above item including all accessories complete as required.	5.00	Each	93,716.00	4,68,580.00
b)	ITC of above item complete as required.	5.00	Each	2,749.00	13,745.00
87	SITC of Control panel with float switch-IP 65 suitable for above mentioned drainage pump(1W+1S pump),having MCB,O/L relay, moisture relay, thermister relay, sequence relay, Digital meter, CT 30/5 etc. complete as required.				
a)	providing above item including all accessories complete as required.	2.00	Each	63,419.00	1,26,838.00
b)	ITC of above item complete as required.	2.00	Each	916.00	1,832.00
	EXTERNAL DEVELOPMENT WORK	-			-

88	Erection of suitable size RCC foundation for the installation of existing metallic pole of length between 4.5 to 6.00 Mtr. foundation nut bolt for support of reqd size with cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size) foundation including excavation and refilling etc. as required.	4.00	Each	6,123.00	24,492.00
89	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc.. direct in ground (60 cm below ground level) including excavation and refilling the trench but excluding sand cushioning and protective covering etc., complete as required.	-			-
(i)	120 mm dia (OD-120 mm & ID-103 mm nominal)	1,200.00	Meter	417.00	5,00,400.00
90	Supply and laying of following size of XLPE ARMOURED Cables with COPPER Conductor 650/1100 V. Grade confirming to IS : 7098 (Pt-1) 1988 in the existing RCC/ HUME/ METAL/DWC pipe etc. complete as required.	-			-
(i)	4 core, 10 Sq.mm.	1,500.00	Meter	1,848.00	27,72,000.00
91	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable as required.	1,800.00	Meter	50.00	90,000.00
92	Supplying and making cable route marker with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) of size 60 cm X 60 cm at the bottom and 50 cm X 50 cm at the top with a thickness of 10cm including inscription duly engraved	150.00	Each	683.00	1,02,450.00

	as required.				
93	Supply, Installation, Testing & Commissioning of Hensel Box made of PS (Polystyrene) Suitable for outdoor installation, protected against weather influences. Degree of protection should be IP 55 (ESM) and IP 65 (for cable entry systems LES).It should resistant to occasional cleaning procedures (direct jet) with high pressure cleaner without additives, water pressure: max. 100 bar, water temperature: max. 80° C, distance => 0,15 m, in accordance with the requirements IP 69. Ambient temperature range Maximum value + 40 °C , Minimum value - 25 °C. It should flame-retardant and self-extinguishing. It should have degree of protection against mechanical load upto IK07 (2 Joule) and Location Landscape Area & Street Light.	120.00	Each	2,086.00	2,50,320.00
94	Supply, Installation, Testing & Commissioning of TEEBOX IP68 - 4 ways type "H" shaped IP68 Junction connectors. It should have Junction box for resin filling (without terminal block).It should come With fixing screws on flat surface. It should be corrosion resistance upto Salt mist, 1.000 ore, 5% salt solutions, 35°C EN60068-2-11:2000, Test Ka (168h). Material should be Halogen Free - Silicone Free. Operating temperature range should be -40°C to +125°C and Location Landscape Area & Street Light.	216.00	Each	171.00	36,936.00
95	Supply of following LED light fixture as per existing make and specifications.				

(i)	18 W Extruded Aluminium Powder Coated Wall Light LED Luminaire Down, internal driver, System lumen - 1620 ($\pm 10\%$), 140-280 V, IP-65, Ik-06, 3000 K, PF ≥ 0.95 , THD $\leq 10\%$ (Wipro Make, LW35-191-029-30DNX or equivalent approved in Philips/Regen/Jacquar)	44.00	Each	11,258.00	4,95,352.00
(ii)	15 W Extruded Aluminium Powder Coated Surface LED Downlight Luminaire with toughened glass, internal driver, System lumen - 1350 ($\pm 10\%$), 140-280 V, IP-65, Ik-06, 3000 K, PF ≥ 0.95 , THD $\leq 10\%$ (Wipro Make, LD08-151-060-30-SM or equivalent approved in Philips/Regen/Jacquar)	10.00	Each	8,929.00	89,290.00
(iii)	10 W Extruded Aluminium Powder Coated with internal driver, Spot Light with earth spike in die cast aluminium powder coated, System lumen - 1000 ($\pm 10\%$), 140-280 V, IP-65, Ik-06, 3000 K, PF ≥ 0.95 , THD $\leq 10\%$ (Wipro Make, LF39-131-045-30-XX or equivalent approved in Philips/Regen/Jacquar)	162.00	Each	6,056.00	9,81,072.00
(iv)	7 W Extruded Aluminium Powder Coated with internal driver, Step light, System lumen - 140, 150-280 V, IP-66, Ik-07, 3000 K, PF ≥ 0.90 , THD $\leq 15\%$ at full load & rated voltage (Wipro Make, LF51-750 - XXX-30-XX or equivalent approved in Philips/Regen/Jacquar)	80.00	Each	2,733.00	2,18,640.00
(v)	11 W Extruded Aluminium housing with internal driver, LED Bollard light, System lumen - 800, 140-280 V, IP-65, 3000 K, PF ≥ 0.95 , THD $\leq 10\%$ at full load & rated voltage (Wipro Make, LB15-131-X-30-08IS or equivalent approved in Philips/Regen/Jacquar)	114.00	Each	4,503.00	5,13,342.00

(vi)	350 W Aluminium Pressure Die cast housing with internal driver, LED flood light, System lumen -40500, 140-280 V, IP-66,IK-08, 5700 K, PF≥0.95, THD≤10% at full load & rated voltage (Wipro Make, LF120-4426057G4SPIS or equivalent approved in Philips/Regen/Jacquar)	52.00	Each	15,140.00	7,87,280.00
(vii)	60 W Aluminium housing with internal driver, LED post top light, System lumen-6000, 150-300V, IP-66,IK-07, 4000 K, PF≥0.95, THD≤10% at full load & rated voltage (Wipro Make, LP09S-671XX-40SPIS or equivalent approved in Philips/Regen/Jacquar)	9.00	Each	9,705.00	87,345.00
96	Installation, testing and commissioning of above light fittings as per item no. 95 including wire, thimble, termination and all other necessary material etc. complete as per direction of eng in charge.	471.00	Each	322.00	1,51,662.00
97	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
(i)	4 X 10 sq. mm (25mm), Copper	8.00	Each	325.00	2,600.00
98	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 Meter long etc. with charcoal/ coke and salt as required.	16.00	Each	8,351.00	1,33,616.00

99	Testing of electrical power/control cable insulation resistance by calibrated digital insulation resistance tester (Megger), including isolation of cable from equipment, identification and testing of individual cores/core-to-core and core-to-earth insulation resistance at appropriate test voltage, recording of test results and submission of test report, complete as required.	20.00	Each	238.00	4,760.00
100	Testing of earth electrode/earthing system for earth resistance using calibrated digital earth resistance tester (earth megger), including testing by suitable 3-point/fall-of-potential method, connecting test leads, taking necessary readings, recording the measured earth resistance value and submission of test report, complete as required.	140.00	JOB	198.00	27,720.00
101	Providing and fixing 25 mm X 5 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.	130.00	Meter	755.00	98,150.00
	RO				
102	Installation, testing and commissioning of 50LPH RO/water softner unit ION exchange make with existing tank complete with all sanitary fittings, valves, related accessrioies complete in all respect as required as per site conditions. (Note: The unit will be provided by the department free of cost for installation)	2.00	Each	10,279.00	20,558.00
	TOTAL AMOUNT				2,89,64,818.00

EE (Elect.),
Dehradun Central Elect. Division,
CPWD, Dehradun