PART-C

SCOPE & SPECIFICATIONS OF ELECTRICAL & MECHANICAL WORKS

Eligibility Criteria for Association of specialized firms for E&M Works

1.1 For Each E&M Works, the composite contractor shall have to associate with other agency, who fulfills the following requirements.

Should have satisfactorily completed the works as mentioned below during last 7 years ending previous day of last date of submission of bid: -

(i) Three similar works each of value not less than 40% of component cost.

or

(ii) Two similar works each of value not less than 60% of component cost.

or

(iii) One similar work of value not less than 80% of component cost.

All amounts rounded off to a nearest convenient figure.

Note: Component cost shall be the same as percentage payment of individual subhead mentioned in payment schedule for original works (E&M Works) of NIT

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

The composite category contractor is also eligible to carry out himself/herself any or all of these works without associating any specialized agency provided: -

(a) The firm fulfils the prescribed eligibility criteria respectively for these works as below

Should have satisfactorily completed the works as mentioned below during last 7 years ending previous day of last date of submission of bid: -

(i) Three similar works each of value not less than 40% of component cost.

or

(ii) Two similar works each of value not less than 60% of component cost.

or

(iii) One similar work of value not less than 80% of component cost.

Or

(a) The firm directly procures the equipment of approved make from manufacturer and get it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned in NIT.

The composite contractor and the associated agencies shall give required affidavit to confirm their association. Tender accepting authority may approve change of associate in case it is required during the currency of the contract.

Note: The main contractor/agency has to submit details of such agency to be associated/manufacturer or their authorized service provider to the Engineer-in-charge within prescribed time. The associated agency shall be approved by Engineer-in-charge. In case the main contractor intends to change associated agency/agencies during the operation of the contract, he shall obtain prior approval of Engineer-in-charge. The new agency/agencies shall also have to satisfy the laid down eligibility criteria mentioned above. In case Engineer-in-charge is not satisfied with the performance of any agency, he can direct the main contractor to change the agency executing such items of work and this shall be binding on the contractor.

For SH:1 Internal Electrical Installation & External Electrical Installation

A) CPWD enlisted contractor of appropriate class in composite category having valid electrical license

OR

B)

1. The associate agency having valid electrical license.
2. The associate agency should have successfully completed works, as mentioned under during last 7 years ending previous day of last date of submission of tender.

Three similar works each of value not less than 40% of component cost

OR

Two similar works each of value not less than 60% of component cost

OR

One similar work each of value not less than 80% of component cost

The main agency shall also be eligible to carry the work themselves provided they fulfil any of the criteria either A or B as specified above.

1.3 Approval of the specialized agencies for each specialized work shall be obtained from the Engineer-in-Charge within prescribed time. Even if, such specialized items of work shall be executed by the specialized agencies at later date the work shall be deemed to be executed by the tenderer for all purposes and the responsibility of the quality of items of works executed etc. shall continue to be that of the tenderer only.

1.4 The associate agency shall submit the willingness to get associated with the main contractor for execution of the E&M component of works in wholesome manner and as per the conditions set out in the MOU to be entered into, between the one who is awarded the work and the associate eligible electrical contractor/ manufacturer or their authorized service provider. (Format of willingness and MOU is given below)

1.5 In support of the eligibility conditions of the proposed associated electrical contractor, copy of their registration documents, Electrical Contractor's License, GST documents, eligibility documents duly attested by Main contractor shall be submitted to the

Engineer-in-Charge for deciding the eligibility. Such associate electrical contractor will certify that they are not debarred as on the day of application for sale of tender.

1.6 In the event of the concerned E&M agency not performing satisfactorily or failure of associate/ sub-contractor to complete the E&M work, the main contractor on the written direction of the department, shall remove the Associate/sub-contractor deployed on the work and shall submit name of new associate who fulfils the conditions mentioned in NIT to execute the leftover work without any loss of time or variation in cost to the department in this regard. Such associates shall also enter into Agreement with the main tenderer shall meet all the 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/sub-contractor and paid partly by the department 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 Electrical Contractor will be allowed without prior approval of the Engineer-in-Charge.

1.7 The main contractor shall be responsible and liable for proper and complete execution of the E&M works and ensure coordination and completion of both civil and electrical work.

1.8 The associate agency shall attend the inspection of the work by the Engineer-in-Charge as and when required.

1.9 The agencies executing the electrical work should have valid license for LT/HT as applicable.

MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN

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

Valid upto:

[Henceforth called the main contractor] And

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

Valid upto:

[Henceforth, called Associate eligible electrical contractor/ manufacturer or their authorised service provider]

Name of Work:- **Specify the E&M Services**.

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 of this MOU allows. Both the parties shall be paid consequent to the execution as per agreement to the extent this MOU permits.

We have agreed as under:

1- The associate eligible electrical contractor/ manufacturer or their authorised service provider shall be liable for disciplinary action if he fails to discharge the action(s) and other legal action as per agreement besides forfeiture of the security deposit.
2- All the material, machinery and equipments, tools and tackles required for execution of the electrical works as per agreement shall be the responsibility of the associate eligible electrical contractor/ manufacturer or their authorised service provider.
3- The site staff required for the electrical work shall be arranged by the associated contractor as per terms and conditions of the agreement.

Signature of associate eligible electrical contractor/ manufacturer or their authorised service provider

Date: date:

Place: Place:

Countersigned by executive Engineer

WILLINGNESS CERTIFICATE

Name of Work: **Construction of 58 nos.Type -III & 30 nos. Type-IV Residential Quarters and 28 nos. Guest Rooms including all internal & external Civil, Electrical & Mechanical Services, Development Works etc. for SIB at Mahim, Mumbai.**

I hereby give my willingness to work as associate eligible electrical contractor/ manufacturer or their authorized service provider 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 employee full time technically qualified supervisor for the works. I will attend inspection of officers of the department as and when required.

Date:

Signature of associate eligible electrical contractor/ manufacturer or their authorized service provider

UNDERTAKING FROM OEM/ MANUFACTURER

It is to certify that as OEM/ Manufacturer giving undertaking to support all the spare parts and its allied accessories etc. of **(Name of equipment)----------for useful service span of the equipment as defined in CPWD Specifications/ BIS norms,** on payment basis for the healthy functioning of the equipments apart from the one year unconditional guarantee of the item against any manufacturing defects and malfunctioning under defect liability period from the date of commissioning of equipment.

(Signature of Contractor/Agency) (Signature of OEM/Manufacturer)

Note: This certificate in required for following Sub Head:-

SH No	Sub Head
SH-1	Internal Electrical Installations
SH-2	Solar Power Plant
SH-3	Lifts
SH-4	Uninterruptible Power Supply (UPS) system
SH-5	Firefighting, Sprinkler and Fire Extinguisher system
SH-6	Fire Alarm System, PA system
SH-7	Diesel Engine Driven Generating Set
SH-8	HVAC System
SH-9	CCTV & Intercom System
SH-10	EV charging system

PROFORMA OF SCHEDULES: A TO F
(ELECTRICAL Works)

SCHEDULE 'A'

Financial Quote for quoting combined rates for Civil Works, Electrical works.

SCHEDULE 'B' -NIL-

SCHEDULE 'C' -NIL-

SCHEDULE 'D' -NIL-

SCHEDULE 'E'

Reference to General Conditions of Contract: - **As per Part A of this bid document**

PROJECTS

as amended/modified up to the last date of submission of Bid.

Name of Work: -" **Construction of 58 nos.Type -III & 30 nos. Type-IV Residential Quarters and 28 nos. Guest Rooms including all internal & external Civil, Electrical & Mechanical Services, Development Works etc. for SIB at Mahim, Mumbai.**

	Estimated cost of work	**As per Part A of this bid document**
	Earnest Money	**As per Part A of this bid document**
	Performance Guarantee	**As per Part A of this bid document**
	Security Deposit	**As per Part A of this bid document**

SCHEDULE 'F' (GENERAL RULES & DIRECTIONS)

Officer inviting bid:	As per Part A of this bid document
Applicable mode of contract	As per Part A of this bid document
Type of Building	As per Part A of this bid document
Construction technology	As per Part A of this bid document

Definitions:

	Engineer-in-Charge For Electrical items of work	Executive Engineer& Senior Manager (E)-I, Mumbai Project Circle -II, CPWD, Mumbai. Or His successor thereof.
	Accepting Authority	As per Part A of this bid document
	Percentage on cost of materials and Labour to cover all overheads and profits.	As per Part A of this bid document
	Standard Schedule of Rates Electrical work	← Delhi Schedule of Rate 2025- (E&M) with amendments up to the last date of submission of bid. ← Market Rates
	Department	Central Public Works Department (CPWD)
	Standard CPWD Contract form	As per Part A of this bid document

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.	As per Part A of this bid document
(ii)	Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period provided in (i) above.	As per Part A of this bid document

Clause 2

As per Part A of this bid document

Clause 5

(i)	Time allowed for execution of work	As per Part A of this bid document
(ii)	Number of days from the date of issue of letter of acceptance for reckoning date of start.	As per Part A of this bid document

Table of Milestones: For IEI & external electrical installation

Sl. No.	Description of Mile stone	Time allowed in days (From date of start)	Amount to be withheld in case of Non achievement of each mile stone (% of individual
1	Approval of Associated Agency	As per Part A	As per Part A

Authority to decide:

(i)	Extension of time	As per Part A of this bid document
(ii)	Rescheduling of milestones	As per Part A of this bid document
(iii)	Shifting of date of start in case of delay in handing over of site	As per Part A of this bid document

Clause 5 Schedule of handing over the site:

Part	**Portion of Site**	**Description**	**Time Period forhanding over, reckoned from date of issue of letter of intent.**
Part A	As per Part A of this bid document		
Part B	As per Part A of this bid document		
Part C	As per Part A of this bid document		
PART D	As per Part A of this bid document		
PART E	As per Part A of this bid document		

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 50 Lacs or as mutually agreed upon by both the parties.

Clause 7A

Whether Clause 7A shall be applicable	As per Part A of this bid document

Clause 8

(i)	**Competent Authorities to issue completion certificate**	**As per Part A of this bid document**

Clause 8A

(i)	Authority to decide the compensation on account if the agency fails to submit the completion plans.	As per Part A of this bid document

Clause 10A

(i)	Materials to be provided by	Lux meter, Earth tester, Megger, tong

	the Contractor	tester, thermometer, conduit bending machine, Digital Vernier calipers, Multi meter, CFM meter,digital screw gauges and GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS PART-I INTERNAL TABLE 10 Page 286

Clause 10B (i)

Whether Clause **10B (i)** shall be applicable.....**Yes,** Applicable

Clause 10B (ii)

Whether Clause **10B (ii)** shall be applicable .... **Yes,** Applicable

Clause 10B (iii)

Whether Clause **10B (iii)** shall be applicable.....**Yes,** Applicable

Clause 10CC- Applicable : As per Part A of this bid document

Clause 11: Specifications to be followed for execution of work:

For Electrical items of work	1. CPWD General Specification for Electrical Works Part I -Internal – 2023 with up-to-date corrections slips till the last date of submission of bid. 2. CPWD General Specification for Electrical Works Part II -External – 2023 with up-to-date corrections slips till the last date of submission of bid. 3. CPWD General Specification for Electrical Works Part III-Lift & Escalators – 2003 with up-to-date corrections slips till the last date of submission of bid. 4. CPWD General Specification for Electrical Works Part IV -Substation – 2013 with up-to-date corrections slips till the last date of submission of bid. 5. CPWD General Specification for Electrical Works Part V- Wet riser & sprinkler system – 2020 with

	up-to-date corrections slips till the last date of submission of bid. 6. CPWD General Specification for Electrical Works Part VI- Fire Detection and Alarm System – 2018 with upto-date corrections slips till the last date of submission of bid. 7. CPWD General Specification for Electrical Works Part VII- DG Sets – 2013 with up-to-date corrections slips till the last date of submission of bid. 8. CPWD General Specification for Electrical Works Part VIII -Gas Based Fire Extinguishing System – 2013 with up-to-date corrections slips till the last date of submission of bid. 9. General Specification for Heating Ventilation & Air-Conditioning-2024 with up-to-date corrections slips till the last date of submission of bid. 10. National building Code-2026 Vol1 & Vol2

As per specifications in this bid document, ECBC 2017, NBC 2026 and relevant BIS codes modified and corrected up to last date of submission of the bid shall be referred**.**

(i) **Building Information Model (BIM) Is applicable**	**Yes**

Clause 12- Applicable

12.2 Payment of deviations/variations beyond 0.25% of the accepted tendered amount.	**As per Part A of this bid document**

Clause 16

Competent Authority for deciding reduced rates.	As per Part A of this bid document

Clause 19 C

penalty for each default Rs 5000/-	As per Part A of this bid document

Clause 19 D

penalty for each default Rs 5000/-	As per Part A of this bid document

Clause 19 G

penalty for each default Rs 5000/-	As per Part A of this bid document

Clause 19 K

-Penalty for each default Rs 25000/-. -Enhanced penalty per day for continuous default Rs 5000/-.	As per Part A of this bid document

Clause 25: Settlement of Disputes by Conciliation and Arbitration

Conciliator	As per Part A of this bid document
Arbitrator Appointing Authority	As per Part A of this bid document
Place of Arbitration	As per Part A of this bid document

Clause 32 (i) Requirement of Minimum Technical Representative(s) and Recovery Rates: As per Part A of this bid document

GENERAL CONDITIONS (Electrical & Mechanical Works)

1. **Scope of Electrical & Mechanical Work**

The work is to be executed as per the BOQ item and asper the design submitted by consultant appointed by main contractor and further approved by CPWD . The cost of labour, material, tools and plants and machinery required for execution of the whole project as per Layout plan, detailed design, and drawings/specifications approved by the CPWD based on the specification and BOQ attach in tender documents. The buildings are to be planned, executed and registered/ compliant to meet minimum The campus is targeted for GHAR GREEN PLUS rating. The buildings are to be planned, executed and registered/compliant to meet minimum platinum Rating as per GHAR**.**

Various E&M services to be provided under this contract have been divided into following Sub Heads. The broad scope design concept and specifications of various E&M services to be provided under this contract shall be given in respective sub-heads of Scope, Additional Conditions and Technical Specifications. Irrespective of whatever is specified, it will be the responsibility of contractor and consultant appointed by main contractor to Design, supply, install, execute item as per BOQ, test, commission all the items and any other item required to make the service useful/ compliant to various provisions .

SH No	Sub Head
SH-1	Internal Electrical Installations
SH-2	Solar Power Plant
SH-3	Lifts
SH-4	Uninterruptible Power Supply (UPS) system
SH-5	Firefighting, Sprinkler and Fire Extinguisher system
SH-6	Fire Alarm System, PA system
SH-7	Diesel Engine Driven Generating Set
SH-8	HVAC System
SH-9	CCTV & Intercom System
SH-10	EV charging system

1.1 The scope of works also covers preparation and design of services based on BOQ attected as per the local body requirement and preparation of drawings for E&M

services and approval of the same from Engineer-in-Charge before commencement of work through consultant appointed by main contractor. During execution, if the local bodies etc. require modifications, the same shall be executed without any extra cost. **Finally, after execution, obtaining approvals/ NOCs/ clearances from local bodies shall be the responsibility of the main consultant appointed by the contractor. However agency/ its sub-agancies shall provide assistance /support to the main contractor in getting NOC/local body approval. If any modifications/ extra works required as per local body/ statutory authority shall be carried out by the agency. All statutory fees/ charges required for obtaining clearances from local bodies, CEA shall be paid by the agency and shall be reimbursed by the department on an actual basis.**

1.2 Power supply required for construction shall have to be arranged by the bidder at his own costs including power required for testing & commissioning. Water required for testing of equipment's is also in scope of agency.

1.3 The Quality Assurance policy will be governed by CPWD Handbook on QA and check list of E&M services.

1.4 For the purpose of the interpretation of the specifications in respect of E&M services, the order of preference shall be:

a. Scope of work defined in NIT
b. CPWD General Specifications (up to date) for Electrical Works
c. NBC-2026
d. Relevant BIS (Bureau of Indian standards)
e. Manufacturer's standard practice/ Specifications
f. International Standards
g. Sound Engineering Practice

1.5 Fire Control room/Central Control room

A suitable size air-conditioned Control Rooms at the Basement will include a Central Control Centre of adequate size planned for 24 hours/ day operation & & include: -

i) Control & Response for fire alarm
ii) CCTV monitoring, Control & recording
iii) Control and monitoring of Public Address System

There will be adequate security, control equipment space & Visual screens to efficiency address all of above functions.

Control room work also include Providing, installation, testing & commissioning of required furniture, consoles, combined touch screens and other amenities as per technical specification for master control and command center. All drawings to be provided in B.I.M. (building information modelling format).

1.6 The agency must study various CPWD specifications; get themselves acquainted with site and site conditions, provision for firefighting system and other E&M services for

various building in local byelaws, CPCB norms and additional conditions carefully. The work shall be executed in close co-ordination with the progress of building work.

1.7 All Electrical & Mechanical Installations **shall be executed as per drawings prepared by consultant and approved by CPWD and scheme provided for obtaining GHAR rating.** Equipment capacity/selection and design shall also be made as per good engineering practices, CPWD Specifications, NBC -2026, Local body & Mumbai Fire service rules.

1.8 The design layout plans/ drawings/ other documents pertaining to final execution E & M services shall have to be submitted for approval within the time period as specified in the table of milestones.

a. Procedure **For Approval of Materials, Shop Floor Drawings and Commencement of Work** Within the time specified in table of milestone, the contractor shall submit following documents for approval.

(i) Details of specialized agencies/OEM and their authorized service providers to be engaged along with their credentials.

(ii) List of makes & Model numbers of all items of equipment's and accessories each sub-Head of work. Sample of material wherever desired by Engineer in charge/required.

(iii) Catalogues or type test certificate as per IEC/IS/ISI of the equipment to be provided at the time of TDS and Drawing approval.

(iv) Shop floor drawings of each packages/ Sub work separately for approval.

(v) Prepare LOD 350 drawings for the complete system before start of work.

Agency shall submit 03 set of all types of E&M services design and drawings of Electrical work to the Engineer-in-Charge for necessary scrutiny and getting necessary observations/ corrections/ approval through Collaboration Tool of CPWD ERP. After final approval, these structural design, E&M services design and drawings shall be authenticated as "Good for Construction "by concerned Engineer-in-Charge.

All such "Good for Construction" Drawings/Design/Documents shall have a unique ERP generated identifier number called the ERP Drawing/Document Number or EDN through Collaboration Tool of CPWD ERP. The "Good for Construction" Drawings/ Design/ Documents shall not be considered valid without EDN and without uploading and transmittal on ERP Collaboration Tool. The access shall be given to the agency on the ERP Collaboration Tool of CPWD for needful.

PTZ and Bullet type CCTV cameras for monitoring construction work for tower shall be provided by the agency nothing shall be paid extra The video feed from these cameras shall be available for viewing remotely as per direction of Engineer-in-Charge. Video management system will be installed at Command-and-control center in the Directorate, which will facilitate the EEs, CE/SE, CE cum ED/SE cum PD and SDG/ADG for remote viewing of project. Minimum 2 cameras along with mounting

arrangement, cabling including all necessary hardware and software shall be installed. To enable this remote viewing, the bidder will be required to take internet connection and make necessary payments for the same to the service provider, nothing extra shall be payable.

The Similar Work Experience of E&M Services

1. The similar work experience for determining the eligibility of Associate agencies as prescribed at Bid Documents – "Information and Instructions for Bidders for e-bidding" is as given below:
2. For Each E&M Works, the composite contractor shall have to associate with other agency, who fulfills the following requirements. Joint ventures for associate agencies are not accepted. Should have satisfactorily completed the works as mentioned below during last 7 years ending previous day of last date of submission of bid:

Sl. No.	Components of Specialized Works /package	Approx. Cost & Eligibility Criteria	Definition of similar work
1	Internal Electrical Installation ECPT= Rs. 6,65,66,003/-	CPWD Enlisted Contractor in composite category having valid electric license with the main agency should satisfy the criteria as below 3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar work, each of value not less than @ 80% of ECPT of this Package Or If the main agency is not qualifying for spealized work , he shall associate with an agency having valid electrical contractor license and shall fulfil following criteria. 3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar work, each of value not less than @ 80% of ECPT of this Package	Providing Installation, Testing & Commissioning of Internal Electrical Installation in the buildings.
2	Solar Power Plant ECPT= Rs. 13,57,000/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar works, each of value not less than	Providing, Installation, Testing & Commissioning of Solar Photo Voltaic Power

		@ 80% of ECPT of this Package	Generation system.
3	Lifts ECPT= Rs 2,69,22,984/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar work, each of value not less than @ 80% of ECPT of this Package AND Eligibility criteria for Original Equipment Manufacturer as per Eligibility criteria for Lift Works (Revision-3) as per OM - DG/SE(TAS)/PPP-MII/20 dated 28.09.2020 (enclosed in Lift subhead under part C	Providing, Installation, Testing& Commissioning **of Lifts in building having floors not less than 16 floors in each work.**
4	UPS system ECPT = Rs. 3,41,772/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar works, each of value not less than @ 80% of ECPT of this Package	Providing installation, testing and commissioning of UPS System
5	Firefighting, Sprinkler and Fire Extinguisher system ECPT= Rs. 2,26,00,102/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar work, each of value not less than @ 80% of ECPT of this Package	Providing, Installation, Testing & Commissioning of water based Firefighting system in the buildings. (Agency should have Maharashtra fire licence)
6	Fire Alarm System, PA system and signage ECPT= Rs. 75,82,247/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar work, each of value not less than @ 80% of ECPT of this Package	Providing, Installation, Testing & Commissioning of Manual fire alarm system and public address system. .(Agency should have Maharashtra fire

			licence)
7	Diesel Engine Driven Generating Set ECPT=Rs. 18,71,541/-	3 similar works, each of value not less than @ 40% of ECPT of this Package with 200 KVA of the individual capacity of DG Set. OR 2 similar works, each of value not less than @ 60% of ECPT of this Package with 200 KVA of individual capacity of DG Set. OR 1 similar works, each of value not less than @ 80% of ECPT of this Package with 200 KVA of individual capacity of DG Set.	Providing installation, testing and commissioning of DG set having not less than 200 KVA
8	HVAC System ECPT= Rs. 28,26,180/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar works, each of value not less than @ 80% of ECPT of this Package	Providing, installation, Testing & Commissioning of HVAC System.
9	CCTV & Intercom System ECPT= Rs. 1,21,34,987/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar works, each of value not less than @ 80% of ECPT of this Package	Providing, installation, Testing & Commissioning of CCTV System.
10	EV charging System ECPT= Rs. 92,66,895/-	3 similar works, each of value not less than @ 40% of ECPT of this Package OR 2 similar works, each of value not less than @ 60% of ECPT of this Package OR 1 similar works, each of value not less than @ 80% of ECPT of this Package	Providing, Installation, Testing & Commissioning of EV charging system

3. The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of bid. The composite category contractor is also eligible to carry out himself/herself any or all of these works without associating any specialized agency provided: -

a) The firm fulfils the prescribed eligibility criteria respectively for these work(s).

Or

b) The firm directly procures the equipment of approved make from manufacturer and get it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned in NIT.

The composite contractor and the associated agencies shall give required affidavit to confirm their association. Tender accepting authority may approve change of associate in case it is required during the currency of the contract.

Note: The main contractor/agency has to submit details of such agency to be associated/manufacturer or their authorized service provider to the Engineer-in-charge within prescribed time. The associated agency shall be approved by Engineer-in-charge. In case the main contractor intends to change associated agency/agencies

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

4. Approval of the specialized agencies for each specialized work shall be obtained from the Engineer-in-Charge within prescribed time. Even if, such specialized items of work shall be executed by the specialized agencies at later date the work shall be deemed to be executed by the tenderer for all purposes and the responsibility of the quality of items of works executed etc. shall continue to be that of the tenderer only.

5. The associate agency shall submit the willingness to get associated with the main contractor for execution of the E&M component of works in wholesome manner and as per the conditions set out in the MOU to be entered into, between the one who is awarded the work and the associate eligible electrical contractor/ manufacturer or their authorized service provider. (Format of willingness and MOU is given below).

6. In support of the eligibility conditions of the proposed associated electrical contractor, copy of their registration documents, Electrical Contractor's License, GST documents, eligibility documents duly attested by Main contractor shall be submitted to the Engineer-in-Charge for deciding the eligibility. Such associate electrical contractor will certify that they are not debarred as on the day of application for sale of tender.

7. In the event of the concerned E&M agency not performing satisfactorily or failure of associate/ sub-contractor to complete the E&M work, the main contractor on the written direction of the department, shall remove the Associate/sub-contractor deployed on the work and shall submit name of new associate who fulfils the co77nditions mentioned in NIT to execute the leftover work without any loss of time or variation in cost to the department in this regard. Such associates shall also enter into Agreement with the main tenderer shall meet all the 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/sub-contractor and paid partly by the department 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 Electrical Contractor will be allowed without prior approval of the Engineer-in-Charge.

8. The main contractor shall be responsible and liable for proper and complete execution of the E&M works and ensure coordination and completion of both civil and electrical work.

9. The associate agency shall attend the inspection of the work by the Engineer-in-Charge as and when required.

10. The agencies executing the electrical work should have valid license for LT/HT as applicable.

11. The Main agency /associated agencies of E & M component should prepare the shop drawings as required and get it verified through E I C the main agency is bound to execute the work as required

Detailed Scope of E & M Works

1 ADDITIONAL TERMS & CONDITIONS FOR E&M WORKS:

1.1 The agency should possess valid electrical contractor license or associate registered contractor of CPWD in appropriate class having valid electrical license for execution of EI works etc. as applicable. The bidder will have to submit supporting documents for prior approval from Engineer-in-Charge.

1.2 All equipment's shall be delivered with (i) manufacturer's test certificate (ii) manufacturer's technical catalogues and (iii) installations, Operation & Maintenance instructions (O&M) manuals. The bidder shall submit three sets of these documents and list of equipment's installed stating make, model, serial number etc as required.

The bidder shall also submit three sets of As-Built drawings with Auto CAD drawings of all E&M works as per directions of Engineer-in-Charge.

All such "Completion/ As Built" drawings of all services shall have a unique ERP generated identified number (called the ERP Drawing/Document Number or EDN) through the Collaboration Tool of CPWD ERP. This EDN shall be in addition to the drawing/document number presently being written on drawings/documents and will be written/stamped/embedded clearly on the drawing/ document by the drawing/ document approving authority. All such "Completion/ As Built" drawings of services shall be uploaded in pdf format only on the Collaboration Tool for issue and transmittal along with unique EDN as issued by ERP unit.

The "Completion/ As Built" drawings of all services shall not be considered valid without EDN and without uploading and transmittal on ERP Collaboration Tool.

1.3 Scaffolding & any other T&P required for execution of work shall be arranged by the bidder and **nothing extra shall be payable on that account.**

1.4 The layout plans/ drawings/ other documents pertaining to E&M services shall have to be submitted for evaluation & approval, within timeline defined in the Milestone of work.

1.5 Inspection Before Dispatch:

(a) All major equipments such as Transformer, DG set, LT Panel with incomer as ACB or MCCB more than 200amp., rising mains/ bus duct, poles (if quantity is more than 100 nos.) Wires, Cables.

(b) Ventilation/ pressurization fan.

(c) AC system, Lift etc. or any such material/ item/ equipment as directed by Engineer-in-Charge shall be tested at manufacturers premises.

(d) All Routine Tests shall be conducted before dispatch of equipments. No equipment shall be dispatched out from the manufactures premises before such tests are conducted and test result recorded. These test certificates shall be given along the supply of equipments. The Engineer-In-charge shall, if he so desires inspect and witness the pre-delivery tests. For this purpose, the agency shall give 15 days advance notice. Agency shall arrange for inspection of the department. Department shall bear expenses of its officials for inspection as far as travelling, boarding and/ lodging is concerned. However, the inspection shall be done at the discretion of the department without any cost implication, but Routine Test &Type Test Certificates shall have to be submitted for equipments.

(e) Prior to dispatch, all equipments shall be adequately protected & insured for the whole period of transit, storage and erection against corrosion and incidental damages etc. from the effect of vermin, sunlight, rain, heat and humid climate.

1.6 Quality of materials and workmanship:

All parts of the equipment's shall be of such design, size and material to function satisfactorily under all rated conditions of operation. All components of the equipment's shall have adequate factor of safety. The work of fabrication and assembly shall conform to sound engineering practice. The mechanical parts subject to wear and tear shall be easily replaceable type. The construction of the equipment's shall be such as to facilitate effortless operation, inspection, maintenance and repairs. All connections and contacts shall be designed to minimize risk of accidental short circuits caused by animals, birds and vermin etc. All identical items and their component parts should be completely, interchangeable including spare parts.

1.7 Inspection and testing at site:

1.7.1 The installation shall be subject to necessary inspection during every stage of erection, by the Engineer-in-Charge or his authorized representative. The successful bidder shall provide all facilities and assistance for the purpose.

1.7.2 The completed installation shall be inspected and tested by the Engineer-in-Charge in the manner as will be laid down by him, in consultation with the agency.

1.7.3 All instruments and facilities necessary for the tests shall be provided by the agency free of cost.

1.8 Completeness of work:

1.8.1 The installations shall be completed in all respects along with all accessories as required and put into operation even where certain details have not been mentioned/ left out in these specifications. Any discrepancy may be brought out in pre-bid meeting.

1.8.2 All E&M services shall be considered for declaring complete by the Engineer in Charge after trial run of 1 month.

1.8.3 All electrical & mechanical fittings/ fixtures/ appliances, to be provided for the work, should have latest minimum 5-star rating (of BEE) as available in market. Since, the proposed construction is for GHARrating, all fittings and fixtures shall be provided which suits to the GHARrating. All specifications shall be latest up to the submission of Technical Data Sheet of equipments after award of work.

1.8.4 The CPWD specifications are available at CPWD website "cpwd.gov.in". The department shall not be responsible for the lack of knowledge and also the consequences there of to the Contractor. The information and data mentioned in the tender document have been furnished in good faith and for general information and guidance only. If the data or information furnished in tender document is different from data/ drawing after Preparation of architectural drawings, design approved for construction, the Engineer-in-Charge in no case shall be held responsible for any accuracy thereof and/ or interpretations or conclusions drawn there from by the Contractor. All consequences in this regard shall be borne by the Contractor and no claim from the Contractor, whatsoever, shall be entertained by the department. It is presumed that the Contractor has satisfied himself for all possible contingencies, situations, bottlenecks and acts of coordination, which may be required between different agencies.

1.9 Incidental Charges:

All incidental charges of any kind including cartage, storage, wastage and safe custody of material etc. shall be borne by the Contractor.

1.10 Quality Assurance:

The Contractor shall make available, on request from the Department, for record, copies of invoices, challans, cash memos, receipts and other certificates, if any, vouchers towards the quantity and quality of various materials procured and the same shall be kept in record. These shall also provide information on the name of the manufacturer, manufacturer's product identification, manufacturer's instructions, warning, date of manufacturing and test certificates from manufacturers for the product for each consignment delivered at site, shelf life, if any, for the department to ensure that the material have been procured from the approved source and of the approved quality, as directed by the Engineer-in-Charge. Day to day account of receipt of such material shall be maintained at site of work and shall be regulated by the department.

Nothing extra shall be payable on this account. The provisions as contained in the CPWD Quality Assurance Manual shall be complied with.

1.11 Storage of Materials:

Storage and safe custody of all materials shall be the sole responsibility of the Contractor. Nothing extra shall be payable on this account.

1.12 Quality Control and Testing of Materials:

(i) **None of the material/ items/ equipment etc supplied shall be more than six months old** from date of supply at site. Copy of GST Gate Pass/ Invoice/ Shipment/ Custom Clearance certificate/ details(in case of imported equipment) shall be submitted to prove the date of manufacture &genuineness of the equipment/ machines supplied.

(ii) If the department desires to send any samples of materials for testing in a accredited laboratory, the Contractor at his own expense shall supply all materials, labour for preparing and testing samples as required by the Engineer-in-Charge. The transportation and testing charges shall also be borne by the contractor. The Engineer in charge may waive the condition regarding testing if the quantity of the materials required for the work is small, subject to submission of related test certificates from the OEM. In all cases proof of procurement of materials from authentic manufacturers shall be provided by the contractor to the entire satisfaction of Engineer-in-charge. All materials equivalent to the one specified should be got approved by the Engineer-in-charge before using the said materials in the work.

(iii) The testing plan for quality control for material/equipment shall be as per CPWD Quality Assurance Policy and checklist for E&M services-2016.

1.13 Supervision Of Work:

The Contractor shall depute Site Engineers & skilled/qualified workers as required for the work as per the documents required in NIT. He shall submit organization chart along details of Engineers and supervisory staff. The Contractor shall also furnish list of persons for specialized works to be executed for various items of work. The Contractor shall identify and deploy key persons having qualifications and experience in the similar and other major works, as per the field of their expertise. If during the course of execution of work, the Engineer-in-Charge is of the opinion that the deployed staff is not sufficient or not well experienced; the Contractor shall deploy more staff or better-experienced staff at site to complete the work quality and in stipulated time limit.

1.14 Cooperation With Other Agencies

The successful tenderer shall ensure proper coordination between various associate contractor executing the work of different E&M services 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.

1.15 Guarantee

All equipments shall be guaranteed for a period of 12 months, from the date of taking over the installation by the User department, against unsatisfactory performance and/or break down due to defective design, workmanship or material. For LED fittings guarantee should be 5 years as per Terms and conditions of agreement. The main agency has to submit a security deposit towards warrantee of 5 years for LED fittings of 5% of the rates quoted by him for LED fittings in acceptable form (FDR/DD/BG) with as per part 'A' before expiry of defect liability period of one year, otherwise, the same will be deducted from the security deposit for the whole work before releasing the same. This Secuity Deposit against LED fittings will be released after expiry of years of warrantee period. The equipment's 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 & binding on the contractor.

Approval from local authorities

(a) The Consultant appointed by the contractor shall submit all details and carryout liaison/ coordination work with respective agencies for obtaining NOC for fire/ approval ,DG sets/ approval of electrical load/ release of load/ load sanction for each flat/ premises/ net metering for grid connected roof top solar PV power plant from local electric supply agency. Similarly, the consultant shall obtain NOC/ approval from pollution control board or any other authority as reqd. and contractor will assist him to get the NOC/ approvals required from local body.

(b) The contractor/ consultant shall coordinate with service provider such as MTNL /MGL/MCGM etc for providing telephones/ broad bands/ water and MGL for providing PNG connection as applicable.

(c) All payments required for these approvals from local authorities such as MCGM/ CEA/ MTNL/ MGL shall be made by the Engineer-in-charge. However, if paid by the agency for saving of time, amount shall be reimbursed by the department on production of relevant documents. Department's role shall be limited only to sign the application/ drawings/ documents on behalf of owner for submission to these authorities for their approval.

1.19 Care of the Building

1. Care shall be taken by the contractor while handling and installing the various equipments 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.
2. Foundation of all equipment's as per recommendations of OEM, Anti vibration isolators etc as required shall be provided.
3. Tables and chairs etc required for installing/placing any Hardware like computer/software including providing any facility for operation of such devices shall be provided by the contractor free of cost.
4. Minor building works necessary for installation of equipment's, foundation, trench for fuel line & cable, making of opening/ core cutting in walls or in floors and restoring them to their original condition/finish and necessary grouting etc. as required shall be done by the agency free of cost.
5. All support for exhaust & water pipes, chimney, bus trunking, cables, anti-vibration pads etc. as required shall be provided necessary.
6. All electrical work and neutral earthing, body earthing, control and instrument wiring, required for any E&M equipment shall be as per good engineering practice, CPWD specifications and applicable Indian/international standards.
7. Scaffoldings & any other T&P required for execution, testing and commissioning of work shall be arranged by the contractor and is included in the cost of work tendered by the contractor.
8. Being high-rise building, fire compartmentation (horizontal and vertical) is very important. Hence contractor shall provide fire barriers/sealants of suitable fire rating by using foam concrete/chemicals to close all horizontal and vertical openings in shafts/walls after providing service lines. Same shall be paid as per BOQ.

1.20 Following work is in the scope of work of Agency / contractor /Associated

Agency/Consultant

a) It is the responsibility of the main contractor for the liasoning work with local authorities like electrical Inspector of state govt. or any other authority, for obtaining lift related clearances for installation, operation license after final installation and handover to client department is in the scope of agency/contractor doing this work including all the liasoning work and nothing extra will be paid on this account

b) Obtaining Final NOC for fire protection/Fighting system for occupation of the building from Fire officer of state govt./local body as per local by- laws is in the scope of agency/contractor and same is responsible for all the liasoning workand nothing extra will be paid on this account.

c) Obtaining service/HT connection from local distribution company/MSEDCL/BEST, The main contractor is responsible for all the liasoning work only and nothing extra will be paid on this account.

d) Any delay w.r.t. obtaining license/ NOC/connection etc will be on account of main contractor only. Statutory inspection charges if any can be paid by the department on submission of vouchers/bills from appropriate statutory authorities.

e) Coordination with consultant as per drawings / TDS submitted by of consultant.

f) The successful tenderer would be required to submit the following drawings after award of work for approval before commencement of installation.

i. General arrangement drawing of all equipment of E&M components as per individual E&M component with AutoCAD Drawings .

ii. Details of foundations for the equipment and the weights of assembled equipment.

iii. Any other drawings necessary for the job.

Additional Terms & Conditions with Specifications

Sub-Head I

1. Internal Electrical Installations

The work will be carried out in a recessed PVC conduit wiring system in accordance of CPWD General Specifications for Electrical Works Part-I (Internal)-2023 and Part-II (External)-2023 with amendments up to the date of opening of bids and the governing specifications including makes for some of the important materials to be used in the work.

Scope of work shall include electrification works (Internal and External) complete with conduiting, cabling, electrical accessories and equipment etc. with shop drawings as required

1.1 FRLSH PVC insulated Copper conductor multi-stranded single core cables will be used for points, circuit & sub-main wiring. All flexible copper wires used **shall have Class 2 copper** conductor satisfying the resistance requirements of NEC 2023 Part 1 Section 17, Annex B.

1.2 To facilitate drawing of wires, 18 SWG GI fish wire shall be provided along laying of recessed PVC conduit.

1.3 Agency shall execute the work as per scale of amenities given elsewhere in this document after obtaining necessary approval of the layout for internal electrification of all houses, common areas and staircases from Engineer-In-Charge.

1.4 The agency shall provide required lighting fixtures as indicated in the NIT as per the scale of amenities, drawings enclosed, requirement of NBC 2026, local building bye laws etc. compliant to the specifications indicated as per the illumination level mentioned in the NIT. The firm will be required to submit the lighting design of indoor/outdoor areas using illumination software, as directed by Engineer-In-Charge.

1.5 For fixing Cove Lighting as given in the NIT surface mount triangle extrusion set with polycarbonate diffuser i/c mounting clips & claps of size 16 mm x 16 mm made of extruded Aluminium of thickness 1.2 mm.

1.6 The scope of work shall also include providing the illumination to artwork like murals, sculptures, wall hangings etc. including the required lighting fixtures, power cabling and controls as mentioned in drawing.

1.7 Buildings all floors shall be provided with modular type switches, sockets and stepped type (2-module) fan regulators, bell push, GI box all of same make shall be used. **Modular switches should have metallic plate, should be shrouded and should produce low sound on switching.**

1.8 Agency shall execute the work as per scale of amenities given elsewhere in this document after obtaining necessary approval of the layout for internal electrification of all houses, common areas and staircases from Engineer-in- Charge. .

1.9 PVC Conduiting for cabling of TV/DTH shall be provided from each outlet to junction box in each dwelling units and then to floor junction box in ELV shaft. Two Nos.PVC conduit of 25mm dia. shall be laid from ELV shaft as well as in front and back balcony in each floor to each dwelling unit as per layout approved by Engineer-In-Charge for laying/drawing of OFCs, data cables by internet service providers.

(i) T.V outlet wiring inside the room is covered in this room but Dish antenna (master or individual) is not covered in the scope of contractor.

1.10 Intercom wiring (with Cat6 A cables) shall be terminated in suitable size GI junction box in each dwelling units and then to respective floor ELV shaft through PVC conduits.

For intercom, each dwelling unit telephone cable will terminate to respective floor's (or as per approved schematic) distribution patch panel in ELV shaft. For telephone, the agency providing PVC conduits from dwelling unit to ELV shaft.

The agency to provide proper route through horizontal/ vertical installation of cable tray/ raceway from service provider room at basement to each tower's ELV shaft as per requirements approved from Engineer-In-Charge.

Wherever exposed to atmosphere/rains, IP65/67 switch, switch sockets or combination as required shall be provided.

1.11 Specifications and Design concept:

Conduit/ switches:

- The civil construction may involve monolithic structure/precast, so the agency has to execute conducting work i/c switch boxes and DBs etc. along the casting/pre-cast activity as applicable.
- The wiring and PVC conduit route plan/drawings shall be submitted by the contractor and shall be got approved from the Engineer-In-Charge before execution.
- While laying PVC conduits for fire alarm system, telephone, TV, Data networking, CCTV, IBMS sufficient junction outlets are to be provided for ease of drawing wires and maintenance as per the direction of the Engineer-In-Charge.

DBs:

(i) Size of distribution board shall be as per number of light/ power circuits. All distribution boards shall be **double door type.** 30 mA sensitivity RCCB and MCB/MCCB of suitable rating shall be provided as main incomer in all DBs and suitable rating MCBs shall be provided for outgoings. **DBs shall have minimum 10K impact rating.**

(ii) Location of DB's shall be decided considering aesthetics.

Wiring and switch sockets:

(i) All switches, sockets, IP Phone socket, Data sockets, stepped type electronic fan (minimum 100W, 2 module) regulators, bell push and accessories shall be provided matching with mounting boxes of modular type. **All switches will have a metal base plate. Plastic base plate shall not be accepted and paid.**

(ii) In parking areas, no switch for individual light control is to be provided; all such points shall be executed on a looping basis and controlled directly from DB. In these areas Light controls shall be provided in such a manner to switch ON/OFF general lighting as per requirement/bay or section wise while lighting in travel path of cars. PIR sensors shall be provided in parking areas for automatic switching on and off of the parking lights. MCB controlled lights may provide for driveways. As per NBC 2026 requirements, emergency lighting to be provided all area's which may controlled through MCB and backed by UPS.

(iii) In basement, one power point 6/16 Amps should be provided for every 30 sqmtr (excluding ramps, staircase and control room) as directed by engineer-in-charge.

(iv) Power points/light plugs shall be provided in common areas in each floor as per the enclosed drawings including one power point in Lift Lobby on each floor should be provided.

(v) In common areas, Corridors, Staircase etc, most of the points may be group controlled (not requiring separate switch other than service room) as per approval by Engineer in charge.

(vi) Minimum size of copper conductor for power wiring shall be 4 Sq mm and that for light and fan points wiring shall be 1.5 sq mm. Contractor shall prepare shop floor drawings for conduit layout as per site requirement.

(vii) The connection between incoming switch/ isolator and bus bar shall be made with suitable size of thimble and cable.

(viii) Aviation Lights: Minimum 1 Nos. at top of tower with required power supply arrangement. Light may increase as per aviation requirements.

(ix) Contractor will provide necessary power/ switch required for installation and operation of followings even if it not shown in the attached drawings. Same is also within the scope of work

- Motor operated Main gate,
- Inter com /Telephone operation system.
- CCTV equipment.
- Firefighting equipment.
- Security equipment in rooms like Door camera
- Security equipment like Metal detector, Bagges scanner if nay
- Split AC units in various rooms like control room, Gym, changing rooms, community room etc.
- Near Wifi and TV box in each room.
- Lift m/c panel at top floor.
- Any other power/ light point required for satisfactory completion of E&M services mentioned in tender documents.

1.12 Wiring in Lift shaft:

- Inside the lift shaft there shall be arrangement of one light point at each floor level and one light point at overhead, one light point in lift pit. All light points shall be in group controlled and wired with 4 sq mm FRLS copper conductor cable. LED Bulkhead fittings of suitable rating to provide a minimum lux of 100 shall be connected with each point of lift shaft.
- 6/16 amp power socket with switch shall be provided at each floor. Wiring of this power plugs shall be done with 4 sq mm FRLS copper wires in conduit.

1.13 Cable:

(i) Cables upto 16 sq mm conductor size shall be copper conductor XLPE insulted armoured or unarmoured (as required) PVC sheathed. Cables above 16sqmm conductor size shall be Aluminium conductor XLPE insulted armoured/unarmoured PVC sheathed as required. However, 3 phase distribution with copper wires in conduit of required size shall be done for the sub main wiring to each flat from the meter board.

(ii) All other areas like basement, podium, stilt, vertical shaft in tower common area, fan room, plant & electrical room, armoured cables shall be laid on Hot dipped galvanized cable trays compliant to relevant standards.

(iii) As per NBC 2026, fire survival copper conductor cable (IS:17505) shall be used for life safety equipment such as fire pump, pressurization fan, smoke ventilation fan, emergency lighting, lifts, FDA and PA system.

(iv) For UPS, all sizes of cables shall be copper conductor XLPE insulated armoured/ unarmoured (as per requirements) PVC sheathed (as required as per load, voltage drop and current carrying capacity).

(v) The power cabling shall be sized so that the distribution losses do not exceed 3% of the total power usage and overall voltage drop (from source to end-user points) shall not be more than 5% as per NBC 2026.

(vi) After cable laying all electrical shaft shall be fire sealed at every level.

1.14 Lighting fixtures LED type shall be provided in all dwelling units, common areas on each floor, basement, podium, stilt& terrace level, staircase, corridors, services rooms and non-residential buildings. Ceiling fans (BLDC without remote with compatible regulator on switch board) & exhaust fans(ISI marked)/ fresh air fans in all residential units, non-residential buildings and services rooms shall be provided and in common area these shall also be provided where required and as per direction of Engineer-In-Charge. The make & model number of fittings and fans shall be got approved from the Engineer-In-Charge before execution of work. Occupancy sensors shall be provided in lift lobbies, common washrooms and other common areas as per direction of Engineer-In-Charge, excluding circuits which are on UPS for emergency lighting.

1.15 Air Conditioning in UPS room and fire control room. Mechanical ventilation in electrical room, battery room etc.to be provided as per design and specification mentioned under relevat sub hed of tender document. The capacity and no. of AC Unit & exhaust fan shall be

calculated based on NBC 2026 requirements, as per Subhead-9 and Subhead-10 and after approval from Engineer-In-Charge.

1.16 Meter Boards & Main Distribution Boards as per Adani Electricity Mumbai Limited (BEST) specification/ requirement shall also be provided by the agency as per the drawings attached in tender.

1.17 As per the scope of work, Agency have to provide sandwich-type copper rising main and floor level meter board as per BEST specification for vertical power distribution. copper rising main will be designed for 20% extra capacity over and above the required capacity as per design. In this case, the dwelling unit's DB will be connected to respective floor Meter Board through laying of sub-main in PVC conduits.

The meter rooms / Boxes for buildings shall be located as per requirement/approved scheme of the BEST & with the prior approval of the Engineer-In-Charge. However, charges paid to the BEST for Energy meter for common services shall be reimbursed to the agency on actual basis after production of original deposit receipt.

1.18 Separate required number of shafts shall be provided as per CPWD specifications for laying of sub-main conduits of dwelling units, ELV systems, power cables etc. Sub main wiring MS conduit from Meter Boards up to electrical shaft (for horizontal distribution) shall be on Hot Dipped Galvanized Iron cable tray. Sub main PVC conduits in vertical shaft from meter board floor up to respective floor of quarters shall be properly supported on MS bracket etc.& layout of sub main PVC conduit shall be such that there is adequate space for future serviceability/ Maintenance. Shaft layout to be got approved from Engineer-in Charge. Cables from sub-station location up to meter boards shall be fixed on Hot Dipped Galvanized Iron cable tray suitably suspended from ceiling slab. Cable to be as per specification/ schematic approved from BEST and voltage drop to be as per NBC 2026.

False ceiling/boxing shall be provided as per civil works specifications in rooms/spaces like entrance lobbies, lift lobbies, control rooms or other areas as approved by Engineer-In-Charge. Hume/DWC pipes for taking LT cables up to meter boards along with brick masonry chambers of suitable size shall be provided by the contractor wherever required as per direction of Engineer in charge.

1.19 Separate required numbers of shaft shall be provided for mechanical & fire-fighting services for each tower/ block of residential quarter.

1.20 At basements , ground floors, 1st floor, terrace floor all horizontal cables shall be laid on Hot Dipped Galvanized Iron cable tray suitably suspended from ceiling slab. All cales for LV system / fire Alarm in side shaft shall be fixed on Hot Dipped Galvanized Iron cable tray suitably fix on wall.

1.21 DWC pipes for electric/ telephone/ street lighting cables/ CCTV/DATA cable/gas pipelines complete with adequate number of cable manholes shall be provided by the agency. In road crossing and entrance to buildings Hume pipes (NP-2)/GI pipes of suitable size shall be provided in place of DWC pipes. Minimum three (3) numbers DWC pipes from two sides

of periphery wall for laying telephone, TV cables/gas pipelines etc. shall be provided, including manholes as required by the Agency. For tower to tower looping similar arrangement shall be made by laying DWC pipes and manholes. All arrangements for laying of cables for HT/LT/ELV/Data/ Telephone or similar service etc. shall be made by the agency from the entry of the campus up to the consumer end within the quoted rate.

1.22 Lightning protection system with copper complete as required, as per CPWD General Specifications Part-I (Internal)-2023 and NBC-2026/ IEC-62305as amended up to date & aviation lights shall also be provided by the agency within quoted rate for tower. The lightning protection system shall be integrated with the requirements of solar PV system to be installed on the roof top of all the buildings and complete scheme shall be approved from Engineer-In-Charge before execution.

1.23 Internal electrification of all buildings and services infrastructure shall be done by the contractor as per layout approved from the Engineer-In-Charge.

1.24 LED outdoor light fixtures (IP-66 or better and IK 10) in die cast Aluminium housing of suitable lumen output/ wattage for compound lighting, open areas in terrace of podium, illumination of buildings up to podium level shall also be provided by the agency as per direction of Engineer in Charge. Luminaries shall be LM79 and LM80 tested from NABL accredited/Government lab.

1.25 All LED outdoor lighting fixtures should have following parameters and shall be selected as per minimum illumination requirement as per NBC-2026 (amended upto date).

Description	**Parameters**
CRI	> 80
THD	≤ 10%
Quarter binning minimum Macadam 3 rating System Efficacy	Street light: > 120 Lumen/ watt at temperature 0 to +45 deg. C and humidity 10% to 90% Post top fitting: 100- Lumen/ watt. For bollards, the efficacy shall be minimum 80 lumen/watt.
System lifetime (Burning Hours with driver)	50000 Hours @ L70 as per LM70 and testing as per LM 80
Driver Voltage	220-240V
Power factor	> 0.9
Efficiency	≥ 85%
Surge Protection	(L-N) 1kV, (E-L/N) 2kV and External 10kV
Color temperature	≥ 5700K or ≥ 4000K or ≥ 3000K (as per direction of Engineer in charge)
Driver	As per IS 15885/ IEC 61347
LED	As per IS 10322/ IEC 60598
Beam Angle of LED	≥ 120 degree
LED Lamp make	Cree, Nichia, Osram, lumiled, LMS, Seoul, Bridgelux

1.26 All LED indoor lighting fixtures (IP20 or better and IK02) in metallic housing should have following parameters and shall be selected as per minimum illumination requirement as per NBC-2026 (amended upto date).

Description	**Parameters**
CRI	> 80
THD	≤ 10%
Efficacy	Minimum 110 Lumen/ watt at temperature 0 to +45 deg. C and humidity 10% to 90%.
System lifetime (Burning Hours with driver)	50000 Hours @ L70 as per LM70 and testing as per LM 80
Driver Voltage	220-240V
Power factor	> 0.9
Efficiency	≥ 85%
Surge Protection	(L-N) 1kV, (E-L/N) 2kV
Color temperature	≥ 5700K or ≥ 4000K or ≥ 3000K (as per direction of Engineer in charge)
Driver	As per IS 15885/ IEC 61347
LED	As per IS 10322/ IEC 60598
LED Lamp make	Cree, Nichia, Osram, lumiled, LMS, Seoul, Bridgelux

Note: The firm will be required to provide items/material as per the specifications indicated herein. The department reserves the right to accept items/materials with richer specifications as available in the market/ with manufacturer due to technological upgradations/ model updation, without any extra cost implication with the approval of Engineer in charge**.**

1.27 Lux level at various area:

Artificial light Lux levels in various areas shall be maintained as under

Sl**. No.**	**Description**	**Parameters**
1.	Bed room	200 (As per fittings layout)
2.	Family lounge/ dining hall	200 (As per fittings layout)
3.	Kitchen	300 (As per fittings layout)
4.	Toilets/ bathroom in flats	150 (As per fittings layout)
5.	Common Corridors/Lift lobby/Staircase	100 (by switching ON all lights) and minimum 50% lights on UPS supply)
6.	Equipment's Room	200 (by switching ON all lights) and minimum 50% lights on UPS supply

7.	Reception areas	300 lux (by switching ON all lights)
8.	Car parking areas	100 (by switching ON all lights), 50 lux in lean hours (automatic timer controlled) to save energy
9	Out Door	30-40 lux

1.28 EXTERNAL STREET LIGHTING I/C LANDSCAPE LIGHTING

The scope of works under external street lighting system requires illuminations of all external areas like streets, roads, entrance gates, periphery of campus, parks, gardens, landscaping, porches, podium facades, walkways, pathways, etc., which shall be illuminated conforming to NBC 2026, National lighting code and CPWD specifications maintaining required Lux levels. Decorative, and conventional street light poles, bollards, gate lights, post-top lantern, Flood Light etc. shall be used for this purpose keeping in view aesthetical and architectural requirements and as per satisfaction of Engineer in charge. Accordingly, the agency will submit the design and details for approval by the department.

Incoming two nos. cable (one standby) from sub-station/ source of supply to street lighting main feeder pillar shall subsequently feed to feeder pillars located at different locations for street lighting.

The feeder pillars shall be fabricated as per typical drawing given in CPWD General Specification for Electrical work Part-I (Internal) 2023. Moulded case circuit Breaker (MCCB) as incomer and MCBs for outgoing circuits, AC contactor, Digital Time switch (Programmable) and Aluminium busbars shall be provided in the feeder pillar. The electrical single line diagram and GA drawing of feeder pillar shall be got approved from Engineer-In-Charge.

Note: Staircase lights of each tower shall be controlled from feeder pillar so that same may be switched on/off along with streetlight or to be connected from tower distribution panel with Astronomical timer switch.

The dimensions pertaining to pole, bollard and other items indicated below are nominal. The specification in brief shall be as per following, subject to approval of engineer-in-charge:

a) 7.5 M GI octagonal Pole with base dia 140mm & Shaft dia 76mm & Base plate 400x400mmX16mm, shaft door 500mm above form ground level, 140mm dia from base to 1000mm up casted design part, 76m dia 1000mm from casted part to 2nd casted part, with embellishments at base and at mid coupling portion, 65micron coating as per standard. Poles are welded through MIG welding &NDT process; the poles shall be coated with epoxy zinc coated primer and finished using environmentally stable polyurethane-based paint to minimum average DFT of 110 microns, as per enclosed drawing.

b) Pole height, single or double arm bracket, wattage of the luminaries, lux level etc. (as per NBC-2026 and other relevant standard) shall be decided as per Street Lighting Standards as per DBR. However, for street lighting in areas other than specified above, decision of Engineer-In-Charge shall be final & binding to the contractor.

c) For all the poles, bollards and solar trees, the firm will be required to provide suitable foundation as per manufacturer's design and structural requirement made of RCC not less than of M20 with stone cladding, mounting plates, anchoring hooks, reinforcement etc complete as per approval of Engineer-In-Charge with waterproof Joint.

1.29 Park Lighting:

(i) All parks irrespective of its size/area will have lighting arrangement with LED lights only.

(ii) Gate Entry passage to the entry of pathway and security lighting (for parks having large area) shall be properly illuminated as per CPWD specifications and NBC 2026 standards.

(iii) On pathways decorative poles, bollards and bush lighting shall be provided to achieve desired illumination levels. Independent circuits shall be provided to alternate poles so that one circuit can be switched off automatically during nighttime to save energy.

(iv) Park lighting shall be designed such that decorative poles shall be provided at distance approx of 10-12 mtrs; Bollard shall be provided at distance approx of 4-5mtrs.

(v) **All street lights and pole mounted lights will have inbuilt surge arrester/ separator of rating 10KV or more.**

NOTE: The firm will be required to provide items/material as per the specifications indicated herein. The department reserves the right to accept items/materials with richer specifications as available in the market/ with manufacturer due to technological up gradations/ model updation, without any extra cost implication with the approval of Engineer in charge.

1.30 Further, details (in brief) are as under: -

a. All external landscaped areas, pedestrian walkways will be adequately lit with appropriate and approved LED lighting fixtures. The landscape lighting will be done so as to create a pleasant environment in the evening for a safe &pedestrian friendly environment. The lighting will accentuate trees by up lighting, direct traffic by motorable embedded lights, highlight ramps by wall embedded lights, highlight traffic directions by corner/ curved street markings. There will be green planters that will have sufficient bollards/ planters ground embedded lights to showcase the greenery in the evenings. There will be up lighting in the water bodies with underwater lighting with proper safety.

b. The design of lighting and fixture selection in these areas shall harmonize with the landscape.

c. Ornamental and pole-mounted light fixtures are to be appropriately scaled for each landscape situation. Alternatives to pole lighting shall be considered to provide ambient and pathway lighting.

d. Pavement lights to be selected and spaced to provide even illuminations. Intersections, crossings, steps and ramps are to be adequately illuminated for safety.

e. **All External Light fittings out door wire/ cable connection shall be done with whether proof joint using suitable hardening solution**.

f. Provide adequate lighting for all directional, location and safety signage. The lighting in parks and open areas/ pathways shall be designed as below:

(i) The Horticultural Work, Landscaping, Water Bodies, Façade Lighting to be provided with appropriate illumination as per Aesthetic Considerations.

(ii) LED fittings installed in a decorative manner for illumination of columns of porch, within GRC jali of shafts, Arch on terrace etc.

(iii) Feeder pillar with programmable logic timer controller and astronomical timers to switch on and off external lighting i/c porch, GRC jalli and arc on terrace.

(iv) Arranging circuit and timer-based auto control to switch off 50% lights during lean hours namely: Street lighting, path lighting and Bollard lighting.

Note- Cable shall be terminated in IP-65 looping/junction box if terminated on surface.

Cables shall be laid invariably in DWC pipe throughout the entire work. 3 core 1.5 Sqmm copper wiring between termination box to fitting i/c their termination shall be within the scope of contractor.

The drawings and design for outdoor and park light are attached in tender drawings separately.

1.31 Electrical installation in Parking Area: -

General lighting by suspended/surface/ fixed below cable tray 4 feet IP 65 LED fittings.

Specification for Cable Tray

(i) GI Cable trays (perforated or ladder type) to be provided. Special attention shall be paid toward hanging/ suspension support system. The support system shall also be provided by cable tray manufacture as per recommendation of OEM of cable trays.

(ii) All tray and accessories shall be Hot Dip Galvanized. There shall not be any welded joints. the thickness of Galvanizing shall not be less than 75 Micron thickness, and the same shall be done after fabrication of cable tray and in accordance with IS 2629.

(iii) Proper factory-made Tee, Bend, cross, joints and other accessories shall be used.

(iv) All cables / conduit in Electrical shaft shall be fixed on cable tray. Electrical cables in basement and common area will laid on cable try only.

1.32 Earthing system:

Earthing system along with the required cabling, connecting strips, earthing arrangement with suitable earth pits shall be provided as per CPWD specification for Internal EI-2023.

1.33 **LT Panels and Feeder Pillars:**

(i) **All Electrical panels/feeder pillars shall be got fabricated from System integrator/channel partner of the ACB/MCCB manufacturer and strictly as per CPWD specifications.** The drawing of panel boards must be got approved from Engineer–in–charge before fabrication work. The panel board shall consist of 4 pole MCCB as incomer, required no. of outgoing MCBs and 20% spare outgoings feeders with, 4 strip aluminium bus bar with 100% neutral, digital type multifunction meter with RS 485port for remote monitoring through SCADA/BMS on Ethernet, selector switches, LED type indication lamps, cable alleys, gland plate, supported by angle iron frame etc as per standard sound engineering practice.

(ii) **All Panels with incoming greater than 400 AMP shall comply with CPWD GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS 2023 Para 7.1 to 7.2.15.3 & part-IV (Substation)-2013.**

1.34 **Painting:**

Painting at site of all exposed metal surfaces of the installation other than pre-painting items like fittings, fans, switchgear/distribution gear items, cubicle switchboard etc. damages to finished surface of these items while handling and erection, shall however be rectified to the satisfaction of the Engineer-In-Charge.

1.35 **QUALITY** ASSURANCE PLANS- Internal Electrical Installations

(i) The detailed instructions on safety procedures given in BIS code no. 5216:1982

(ii) "Code of safety Procedures and Practices in Electrical works" shall be strictly followed.

(iii) Safety procedures given in Chapter 10 of CPWD General Specifications for Electrical works Part-1(Internal 2023) shall be followed.

(iv) Safety recommendation as per Central Electricity Authority Regulation 2023.

(v) No. of wires in one PVC conduit shall be ensured as per CPWD Specifications.

(vi) Colour coding of wires to be ensured.

(vii) Lugs and thimbles at cable/ wire ends in switch boxes as per CPWD Specifications. Flexible GI / PVC conduits to be provided for the wiring wherever required, particularly for the light fittings below the roof and above the false ceiling areas, with proper coupling arrangements.

(viii) Labelling of switch boxes shall be ensured.

(ix) Termination of earth terminals in earth pits, switch box, DBs and accessories to be ensured. Earth chamber to be constructed and proper marking to be done.

(x) A comprehensive schematic diagram is prepared starting from the main board up to the final DBs. All such boards are duly marked and numbered.

1.36 Test:

After completion of the work, necessary test reports as envisaged in CPWD General Specifications Part-I (Internal)-2023 (amended up to date) &Central Electricity Authority

Regulation 2023, BEST format(if any) shall be recorded and submitted to the department. The test results of the installations shall be within the permissible limits. Test report forms duly signed by authorized person (Electrical Engineer) of the agency shall be given to allottees for obtaining electric connection (energy meters) by the respective allottee from BEST (if any) . It will be the responsibility of contractor to get electricity connections.

The following tests, besides other tests specified in the CPWD specifications shall be carried out for the internal and external EI works:

(i) Insulation resistance test.
(ii) Polarity test of switch.
(iii) Earth continuity test.
(iv) Earth electrode resistance test.
(v) All the tests at site shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer in Charge by the contractor. All the test results shall be recorded and submitted to the Department.

On completion of an electrical installation (or an extension to an installation), a certificate shall be furnished by the electrical contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix "E" of CPWD General Specifications for Electrical Works Part-1(Internal-2023) in addition to the test certificate required by the local electric supply authorities.

1.37 Drawings for approval on award of the work

(i) The contractor shall submit relevant LOD 350 drawings for internal and External EI works
(ii) The contractor shall prepare and submit 03 sets of hard copy of following drawings and in soft copy and get them approved from the Engineer –In –Charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipment/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.
(iii) Layout drawings of the Light fittings along with DIALUX report/Lux calculations and IES files of fittings.
(iv) Layout drawings of the Power points along with DB details (LDB, PDB, UPS DB) wiring sizes etc as required.
(v) Layout of equipment's to be installed including power and control cables and supports/ structure for bus ducts/ cable trays.
(vi) SLD's with discrimination analysis done.
(vii) Earthing layout
(viii) GAD of LT Panels and feeder pillars
(ix) Street lighting Cables layout including fittings and lux calculations.
(x) Drawings showing details of support for pipes, cable trays, ducts etc.

(xi) Any other drawings relevant to the work.

1.38 Drawings on completion of the work

The contractor shall submit three sets of as built drawings on white paper and 3 sets in soft copy to the owner/ Engineer-In-Charge after completion of the work. In addition, following shall also be provided:

(i) Test Certificates
(ii) Warrantee Certificates
(iii) O&M Manuals of Equipments
(iv) Any other information the Engineer-In-Charge may deem fit.

Note: In case of non-compliance with the above requirements, a recovery of ₹20,000/- shall be made for each E&M package in respect of which the contractor fails to comply

1. **Note :- within 06 months from the date of commencement of the work, The Main Contractor shall submit, complete details of all proposed vendors/sub-agencies required for execution of the E&M works for approval of the Engineer-in-Charge. Any delay in the approval of vendors/sub-agencies arising by department due to late submission or incomplete submission of details by the Main Contractor shall be entirely attributable to the Main Contractor. No claim on account of loss of profit, idle resources, escalation in the prices of materials/labour, or any other consequential losses/damages arising therefrom shall be entertained or paid by the Department.**

2. **It may also be noted that, as per the time period stipulated in Schedule A–F of the NIT document, the total stipulated period for execution of the work is as per Part A of NIT, considering the construction of basements and G+18 floors using monolithic construction technology. Accordingly, the Contractor is advised to take the above factor into consideration while quoting the rates for the tender, particularly for the E&M services, and quote the rates suitably to cover the requirements for the entire stipulated period of the work. Looking at the limited working space at site, the schedule for delivery of major equipment is mentioned below. Material received before that shall not be paid.**

Sl	E& M equipment (only main units)	Stage of construction before delivery will not be paid
1	DG set unit , water Pumps,	After completion of external plaster of the building

2	fire Pumps	After completion of painting of fire room First coat and fire plaster of basement
3	Solar panel	before completion of waterproofing of terrace slab
4	Lifts	After painting of Lift shaft
5	Addressable Fire Alarm System and Public Address System, intercom equipment, CCTV equipment,	After completion of Plaster and Base putty in all floors

The E&M equipment mentioned in the above list includes only the major/capital equipment. The associated wiring, conduiting, cabling, control panels and other works required for operation of the respective services shall be executed in advance, as required, to avoid any delay in completion and commissioning of the work.

The Contractor shall plan and coordinate the E&M activities in accordance with the overall construction programme and the sequence of work, as well as in accordance with the directions of the Engineer-in-Charge (E-I-C).

i) Standard Guaranty/Warranty of LED light Fixtures =**5 Years from OEM only**

5 % amount of LED fittings will be deposite as a security which will be released after successful completion of work every year wise

Sub-Head II.

2. Solar Power plant

a. Scope of work

The solar PV system roof top type has to be provided by the firm on the roof of following buildings:

(i) Residential Building – One Block
(ii) Any other utility area

The firm has to provide Solar PV system in total . Any positive or negative deviation complying the GHAR rating, with approval of the department, from the proposed capacity shall be paid/deducted if it is found justified by the department.

The scope of work pertaining to solar PV system shall include installation of solar PV module on terrace of Building tower and other utility areas along with related mounting arrangement, inverters, protection arrangement, cabling (DC and AC), lightning protection and earthing. For each of the tower or for each of the building, power supply generated through Solar PV on respective terrace of the building/tower, shall be brought to the common area services panel, to be installed separately for each tower in basement/stilt. Provision for installation of solar meter compliant to BEST specifications needs to be ensured in each common area service panel, where generated solar supply needs to be connected. The agency should coordinate with BEST for installation of solar meter for each of the building/tower and NET Meter at the common services substation for complete net metering arrangement. The meters shall be provided by BEST . The cost of these meters shall be borne by the department.

Roof top grid interactive solar photo voltaic plant system shall be inclusive of the Solar panels of prescribed efficiency, mounting structure, cabling, inverter, panel, metering devices, earthing, lightening protection system complete as per state-of-the-art technology as per good engineering practice compliant to relevant Indian standards/ local/ statutory authorities/ MNRE guidelines.

The Contractor shall work as a System Integrator for providing an end to end solution for the above, including but not limited to design, supply, erect, testing and commissioning of the required Solar Photo Voltaic power plant with accessories, peripherals like Power conditioning units, cables, cable tray, junction boxes, Cable termination & connections sockets & other suitable accessories, earthing, solar interface panel between PCUs, ACDB, Data Acquisition & storing, Metering, DC system & Bus etc. and installation, performance testing, commissioning, warranty, annual maintenance, etc.

DG-PV Synchronization system to be provided to optimize the use of DG set and maximizes the use of solar power system in case of non-availability of grid supply also.

The bidders have to ensure the planning and smooth execution of the project. The Contractor shall carry out and complete the said work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the Engineer in charge. The contractor shall furnish all labour, materials and equipment as listed and specified otherwise, transportation and incidental necessary for supply, installation, testing and commissioning of the complete system as described in the Specifications. The work shall also include interfacing the PV Plant with the nearest grid equipment's (LT/HT) of Supply Company.

b. Solar Photo Voltaic Module

(i) The Solar PV module will be minimum 530Wp nominal Power rating.
(ii) Solar modules offered shall have RFID chip and certified as per IEC 61215-2005 and IEC 61730 -1, -2.
(iii) SPV module shall contain Monocrystalline half-cut high-power silicon solar cells. The solar cell shall have surface anti-reflective coating which help to absorb more light in all weather conditions.
(iv) The module frame shall be made of aluminum or corrosion resistant material, which shall be electrolytic ally compatible with the structural material used for mounting the modules.
(v) Photo electrical conversion efficiency of SPV module shall not be less than 21% for vertical and horizontal installation of module.
(vi) Fill factor of the module shall not be less than 0.70
(vii) Each module shall have low iron tempered glass front for strength & superior light transmission. It shall also have tough multi-layered polymer back sheet for environmental protection against moisture & provide high voltage electrical insulation.
(viii) Solar PV module shall be highly reliable, light weight and shall have a service life of more than 25 years.
(ix) The rated output of any supplied module shall not vary by more than 3% from the average power rating of all ratings. Each module, therefore, has to be tested and rating displayed.
(x) The module shall perform satisfactorily in relative humidity upto 95% and temperature between – 40°C and 85°C.
(xi) The solar modules should have suitable encapsulation & sealing arrangements to protect the silicon cells from the environment. The encapsulation arrangement shall ensure complete moisture proofing for the entire life of solar modules.
(xii) Bidder must consider Shading Losses as per the relevant Industry Standard & Practice while designing the proposed power plant and effort to minimize the shading losses to keep within limit. Shading analysis report from OEM has to be submitted for the approval along with the other drawings and layouts.
(xiii) Performance Warranty on power output of solar module will be as follows:

End of Year	Performance Output
1	98.5%
10	90.00%
25	80.00%

(xiv) Marking: Each module shall carry the following clear and indelible markings:
(xv) Name, monogram or symbol of manufacturer;
(xvi) Type or model number;
(xvii) Serial number;
(xviii) Polarity of terminals or leads (colour coding is permissible)
(xix) Maximum system voltage for which the module is suitable date & place of manufacture;

c. Module Mounting Structure

(i) The modules and equipment will be installed on terrace of tower. All structures, foundations for erection of modules and equipment shall be designed, installed/provided by the bidder.
(ii) Design drawings with material selected shall be submitted for prior approval
(iii) The structure shall be designed to allow easy replacement of any module & shall be in line with the site requirements.
(iv) The array structure shall be made of hot dipped galvanized MS angles/ Channels/ RHS&LHS sections of suitable size.
(v) The support structure design & foundation shall be designed to withstand wind speed upto 150 kmph and it shall be designed as per relevant Indian wind load codes. Complete structure design, selection of structure profiles should be in accordance with the STAAD pro software report, same report has to be submitted for approval & vetting.
(vi) The module alignment & tilt angle shall be calculated to provide the maximum annual energy output. This shall be decided based on the location of array installation.
(vii) All structure assembly fasteners shall be of stainless steel of grade SS 316.
(viii) The array structure shall be grounded properly using maintenance free earthing kit.
(ix) Galvanized (Hot Dip) Steel Structural must be considered for all type of structural steel proposed for the power plant.

d. Power conditioning unit

Power Conditioning Unit (PCU) consists of an electronic Inverter along with associated control, protection and data logging devices. The system shall incorporate a uni-directional inverter and should be designed to supply the AC power to the gridsupply without any disturbance to the loads. The power conditioning unit shall adjust the voltage and frequency

levels to suit the Grid also. All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.

e. General requirement

(i) Each PCU shall be compliant with IEC 61683:2000 or equivalent. The DC (PV) to AC conversion efficiency of the PCU shall be at least 98% for output ranging from 20% of full load to 100% load. The PCU shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line The PCU shall have the required protection arrangements against earth leakage faults. Specifically, the PCU should be three phase power conditioning unit using static solid-state components. DC lines shall have suitably rated isolators to allow safe start up and shut down of the system. Circuit breakers used in DC and AC lines must be rated suitably. The PCU shall be suitable for Grid integration operation.

(ii) Each solid-state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter. The PCU shall have anti - islanding protection in the event of outage of grid. And should reconnect the grid automatically after restoration of grid. The PCU shall have arrangement for adjusting DC input current and should trip against sustainable fault downstream and shall not start till the fault is rectified.

(iii) Suitable synchronizing methodology shall be provided for synchronizing the AC output from the inverters. The Agency has to provide the provision for remote as well as local monitoring. The entire inverter cabinet shall have to be adequately protected taking into consideration the atmosphere and weather prevailing in the area. Preferably the cooling air shall not enter into hardware cabinet. Dimension,weightandPower consumption by PCU during operation & standby condition of the PCU shall be indicated by the manufacturer in the offer.In case of imported P.C.U all M.N.R.E related documentation for waiving of import and custom duties has to be done by agency.

(iv) The PCU shall include appropriate self protective and self diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices.

f. Modes of PCU

1. Standby mode:

The control system shall continuously monitor the output of the solar power plant until pre-set value is exceeded and that value to be indicated.

2. Basic system operation (full auto mode):

   The system shall automatically 'wake up' in the morning and begin to export power provided there is sufficient solar energy and the grid voltage and frequency is in range.

3. Maximum power point tracker (mppt):

   MPPT control algorithm shall adjust the voltage of the SPV array to optimise solar energy fed into the grid.

4. Sleep mode:

   Automatic 'sleep' mode shall be provided so that unnecessary losses are minimized at night. The power conditioner must also automatically re-enter standby mode when threshold of standby mode reached.

g. Balance of System (BoS) Item/Components:

The BoS items/components of the SPV power plants/systems deployed under the mission must conform to the latest edition of IEC/ equivalent BIS standards as specified below:

BoS Item/component	**Applicable IEC/ Equivalent BIS standard**	
	Standard Description	**Standard Number**
Power conditioner/Inverters	Efficiency Measurements Environmental Testing	EN 61000-6-3 EN 50178
MPPT units	Design Qualification Environmental Testing	EN 50178 UL 1741 CSA 107.1
Cables	General test and measuring methods PVC insulated cables for working voltage upto and including 1100 V-Do-UV resistant for outdoor installation	IEC 60189 IS 694/IS 1554 IS/IEC 69947
Switches/Circuit Breakers/Connectors	General Requirements Connectors Safety	IS/IEC 60947 part I, II & III, EN 50521
Junction Boxes/ Enclosure	General Requirements	IP 65 (for outdoor)/IP 21(for indoor) IEC 62208
SPV System Design	PV Stand-alone Systems Design Verification	IEC 61215 IEC 61730 IEC 61701
Installation Practices	Electrical installation of buildings requirements for SPV power supply	IEC 61730

	systems	

h. Inverter

The inverter output shall always follow the grid in terms of voltage and frequency. This shall be achieved by sensing the grid voltage and phase and feeding this information to the feedback loop of the inverter. Thus, control variable then controls the output voltage and frequency of the inverter, so that inverter is always synchronized with the grid. The capacity of each inverter should be as per system requirement.

Efficiency	> 98.3%
Output frequency 50Hz	inverter to follow grid frequency up to +/- 5 Hz of the nominal output frequency during normal operation
Maximum Input voltage	1000V
THD (at point of connection)	Less than 3 %(of rated power)
Ambient temperature	20 to 50 deg C without any derating in nominal inverter Rating and 60 deg C with derating.
Humidity	100 % **non- condensing**
Input DC Range	400 V to900 V
Reactive Power Capability	0.8 (leading) and 0.8 (lagging)
Maximum Permissible Voltage	1000 V
Enclosure	IP 67 (Outdoor rated)

1. The solar Inverter shall have following features:

(i) Auxiliary power consumption shall be < 0.5% of rated power and maximum loss in sleep mode shall be less than 0.02%

(ii) Sinusoidal current modulation with excellent dynamic response

(iii) Unit wise & integrated Data logging.

(iv) Dedicated Ethernet for networking

(v) Protection against

- (a) over-under current
- (b) Over voltage & under voltage,
- (c) Over and under frequency
- (d) Sync loss
- (e) Over temp.
- (f) Line to line fault
- (g) Short circuit

(h) Protection against lightning

(vi) Surge voltage induced at output due to external source

(vii) Set point pre-selection for VAR control

(viii) Remote control via telephone modem or mini web server
(ix) Integrated protection in the DC and three phase system
(x) Insulation monitoring of the PV array
(xi) Ground fault detector – which is essential for large PV generators in view of appreciable discharge current with respect to ground.
(xii) Over voltage protection against atmospheric lightning discharge to the PV array is required.
(xiii) The power conditioner must be entirely self-managing and stable in operation. A self-diagnostic system check should occur on start up. Functions should include a test of key parameters on start up.

In case external auxiliary power supply is required, UPS shall be used to meet auxiliary power requirement of PCU. It shall have a backup storage capacity of 2 hours.

1. Circuit Breaker of appropriate voltage and current rating shall be provided at the output to isolate the PCU from grid in case of faults.
2. All the conducting parts of the PCU that are not intended to carry current shall be bonded together and connected to dedicated earth pits through protective conductor of appropriate size. DC negative terminal shall be grounded.
3. PCU front panel shall be provided with LCD/ LED to display all the relevant parameters related to PCU operation and fault conditions. It shall include, but not limited to, the following parameters.

(i) DC input power (
(ii) DC input voltage
(iii) DC input current
(iv) AC output power
(v) AC output voltage (all the 3 phases and line)
(vi) AC output current (all the 3 phases and line)
(vii) Frequency
(viii) Power Factor

i. **Operating Modes :**

Operating modes of PCU shall include, but not limited to, the following modes. These operating modes and conditions for transition are indicative only. The Contractor shall provide the detailed flow chart indicating the various operating modes and conditions for transition during detailed engineering.

(i) Standby Mode the PCU shall continuously monitor the input DC voltage and remain on Standby Mode until it reaches the pre-set value.

(ii) MPPT Mode When the input DC voltage is above the pre-set value and AC grid connection conditions are fulfilled, the PCU shall enter into MPPT mode.

(iii) Sleep Mode When the AC output power/DC input voltage decreases below the pre-set value for pre-set time delay, the PCU shall switch into Sleep Mode.

j. **Protection Features:**

The PCU shall provide protection against the following type of faults, among others.

3.1.1.1 DC/AC over current (ii) DC/AC over voltage (iii) DC reverse polarity (iv) DC earth fault (v) AC under voltage (vi) AC under frequency/over frequency (vii) Islanding (viii) Over temperature (ix) Lightning surges

k. **Grid Support Functions:**

Active power regulation the PCU shall be able to limit the active power exported to the grid based on the set point provided through PCU front control panel. The PCU shall also be able to automatically the limit the active power after an increase in grid frequency above a pre-set value. The ramp rate shall be adjustable during operation and start-up after fault. The applicability of the requirement shall be as per CEA regulation and compliance. Reactive power control the PCU shall be able to inject /absorb reactive power to/ from the grid based on the set point provided through PCU front control panel. The same shall be performed automatically with adjustable ramp rate based on dynamic changes in grid voltage or reactive power reference.

Voltage Ride Through the PCU shall remain connected to the grid during temporary dip or rise in grid voltage as per the LVRT and HVRT requirements of CEA Technical Standards for Connectivity to the Grid Regulations. The PCU shall also be able to inject reactive power during the period of voltage dip.

l. **Warranty of PCU:**

The complete Power Conditioning Unit shall be warranted for minimum of 5 (five) years against all material/ manufacturing defects and workmanship.

m. **Tests of PCU:**

1) Type Test:

All the type test certificates as per the standards mentioned above shall be submitted for approval. The tests should have been conducted at a test laboratory compliant with ISO 17025 for testing and calibration and accredited by an ILAC/IECEE member signatory. Laboratory accreditation certificate or weblink along with scope of accreditation shall also be submitted. It is the responsibility of the Contractor to substantiate the compliance for CEA Regulations using test reports.

2) Routine Test:

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

n. **AC Cables:**

i) Standards and Codes All AC Cables shall conform to the following standards and codes.

ii) Crosslinked polyethylene insulated PVC sheathed cables, Part 1: For working voltage up to and including 1100 V IS 7098.

iii) All AC cables shall be HFFR type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions.

iv) Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. However, cable joints may be allowed if the route length is more than maximum available drum length subject to Employer's approval.

v) In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath. (i) Cable size and voltage grade (ii) Word HFFR at every meter (iii) Sequential marking of length of the cable in meters at every meter

vi) Cables shall be sized based on the following considerations: (i) Rated current the equipment (ii) Maximum voltage drop in LT cable (from inverter to inverter transformer) shall be limited to 0.5% of the rated voltage. For HT cables , maximum voltage drop shall be limited to 0.5 % of the rated voltage. The Contactor shall provide voltage drop calculations in excel sheet. (iii) Short circuit withstand capability as per design for 1s. (iv) De-rating factors according to laying pattern.

vii) All cables shall be warranted for minimum of 5 (Five) year against all material/ manufacturing defects and workmanship.

viii) Testing- Routine test and acceptance tests requirements shall be as per relevant standards for all cable sizes.

ix) Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.

x) All AC cables shall be provided with punched/embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.

o. Earthing of PV array field

Standards and Codes Earthing system shall comply with latest revisions and amendments of the relevant IEC standards and IS codes and Indian electricity rule and act, up to date.

p. **General Requirements**

i) All PV Modules, Module Mounting Structures (MMS) and String Monitoring Unit (SMU) structures in the PV array field shall be bonded to the earthing system by two distinct connections.

ii) Each PV Module frame shall be earthed using copper wire of sufficient cross section. The copper wire shall be connected to the earth hole provided in the module frame using suitable arrangement in line with the manufacturer recommendation. The earthing arrangement shall use stainless washers to prevent galvanic corrosion between aluminum frame and copper wire. In order to achieve effective earthing, serrated washers shall be employed to penetrate the anodization layer of the module frame.

iii) Continuous copper earthing wire shall be run to connect a group of modules and both ends of the loop shall be bolted to the DC earth grid using bimetallic lugs and stainless-steel fasteners. The copper earthing wire shall be routed in such a way to avoid physical contact with the module aluminium frame.

iv) The connection between MMS and DC earth grid shall be bolted or welded. Portion of the MMS which undergoes welding at site shall be coated with two coats of cold galvanizing and anti- corrosion paint afterwards.

v) Earth electrodes of the DC earth grid shall be uniformly distributed throughout the PV array field so that optimum earth resistance is offered to leakage current flowing from any module frame or MMS.

vi) SMU equipment earthing point shall be connected to the DC earth grid using flexible copper cable of sufficient cross section as recommended by the manufacturer. The connection with the DC earth grid shall be done using suitable bimetallic lugs and stainless-steel fasteners.

q. **PCU Earthing**

(i) DC negative bus bar of the PCU shall be earthed to avoid Potential Induced Degradation (PID). DC negative bus bar and PCU equipment earth shall be bonded to the PCU earth bus and connected to earth electrodes through flexible copper cable of sufficient cross section as mentioned by the manufacturer. The interconnection of PCU earth electrodes with DC earth grid shall be as per PCU manufacturer recommendation.

(ii) Tests On completion of installation, continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded.

(iii) The earth plate shall be provided to facilitate its identification and for carrying out periodical inspection.

r. **Lightning Protection System:**

Lightning Protection System (LPS) for entire building against lighting strokes shall be provided as per drawing.

Conventional lighting protection system shall be provided. The systems includes conductor grid at roof level with multiple down conductor connecting to main grid at ground level with earth pits.

Good Quality of Coordinated SPD protection is provided in all Electrical & Electronic services. Especially it equipment, cameras, & Lift room equipment.

s. **METERING AND GRID CONNECTIVITY**

Metering and grid connectivity of the roof top solar PV system under this scheme would be the responsibility of the Bidder in accordance with the prevailing guidelines of the concerned power supply company (APDCL) and / or CEA (if available by the time of implementation).

t. **Grid Islanding:**

In the event of a power failure on the electric grid, it is required that any independent power- producing inverters attached to the grid turn off in a short period of time. This prevents the DC- to-AC inverters from continuing to feed power into small sections of the grid, known as “Islands.” Powered Islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.

A manual disconnect 4-pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

u. **Plant performance evaluation**

The successful bidder shall be required to meet minimum guaranteed generation with Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor (CUF) as per the GHI levels of the location during the O&M period. PR should be shown minimum of 75% at the time of inspection for initial commissioning and acceptance. Minimum CUF of 13% should be maintained for a period of 5 years . The bidder should send the periodic plant output details to user for ensuring the CUF. The PR will be measured at Inverter output level during peak radiation conditions.

The "Capacity Utilization Factor" (CUF) means the ratio of the actual output from a solar plant over the year (kWh) to the maximum possible output from it for a year (kWh) under ideal conditions CUF = Actual Plant Output in kWh over the year / (Installed Plant Capacity in kW x 365 x 24).
Monthly CUF: Monthly Plant out in kWh / (installed plant capacity in kW x number of days in a month x 24).

During grid failure or power outage due to any reason, the SPV system stops generating. Any instances of grid failure/power outage needs to be mentioned in the monthly report and those instances need to be authorized by local supply company and user. Then the period will be excluded in calculation of CUF.

v. Completion of work:

- Work will be treated commissioned and completed after evaluation of performance for 30 days after receipt/intimation of contractor in this regard. All parameters will be checked as per code, practices and tender documents.

Sub-Head III

3. Lifts in Residential Block

3.2 Scope of work shall include SITC of below mentioned capacity of lifts in residential and non-residential tower along with all ancillary works. One lift in each tower should be stretcher/hospital lift. The energy efficiency measures shall be adopted as per NBC-2026 and ECSBC norms.

(i) **Six no. 16 passenger,** VVVF, Gearless, regenerative, ARD, 2.5 m/sec speed, centre opening doors of height 2.2 mtr, Lift with / without Machine Room (serving 1 basements + Ground + 18 floors) with SS doors and cabins, having disable friendly features, 25 mm thick Granite Flooring.

(ii) Required civil work such as beams, all structural steel fascia work, woodwork, emergency windows and trap door, plastering work of shaft, pit depth etc.

(iii) All Passenger lifts doors shall be provided with vision panel having minimum 120 minutes fire rating.

(iv) Required electrical works such as facia strip lighting, shaft lighting, earthing etc.

(v) All the lifts shall be functionally integrated with suitable capacity online UPS system so as to provide minimum 30 min of backup,to avoid jerk during failure of supply.

3.3 Work of supplying and installation of lifts will be carried out by the agency as per provisions contained in General Specifications for Electrical Works (Part – III Lifts & Escalators)-2003, manufacturers standard and local bylaws as amended up to date.

3.4 Scope of work of the successful bidder shall be inclusive of the following and shall be done by the agency at no extra cost.

(i) Proper ventilation in machine rooms, lift wells and waterproof of lift pits including lighting & Power point outlets, shall be provided as per requirement.

(ii) Electric supply to individual lift shall be given from Tower Fire Emergency Panel through fire survival cable in machine room. Tower fire emergency panel located in tower electrical room at stilt level.

3.5 Agency shall furnish the following drawings and data to the Engineer-in-Charge in triplicate, for approval.

(i) General arrangement drawing.

(ii) Detail of foundations for equipment, load data of various assembled equipment's. Data will include breaking load on guides, reactions on buffers, reaction on support in machine room, lift well etc.

(iii) Dimensions for every unit and group of units for erection purpose, as required.

(iv) The correction/changes, if any, intimated by the Engineer-in-charge shall be incorporated and three sets of such corrected drawing shall be furnished to the Engineer-in-Charge within 15 days from the date of approval of drawings. The work shall be executed in accordance with the approved drawings by the department.

3.6 Inspection and Testing at Site:

(i) The lift installation shall be subject to necessary inspection during every stage of erection, by the Engineer-in-Charge or his authorized representative. The bidder shall

provide all facilities and assistance for the purpose of inspection of lift by the department.

(ii) On completion of the installation, all adjustments as necessary shall be made for the satisfactory performance of the lifts. The completed installation shall be inspected and tested by the Engineer-in-Charge in the manner as will be laid down by OEM, in consultation with the contractor.

3.7 Technical Specification

(i) The lift shall work on microprocessor-based control system with self-diagnostic features, site programming to suit the changing need of the user. The lift shall be silent in operation & shall have smooth and controlled acceleration and de-acceleration with levelling accuracy of ±5 mm.

(ii) Potential free contacts for each floor position and up and down movement of the lift shall be provided in the controller.

1	Supplying, installation, testing & commissioning of 16 Passenger (1080 Kg) lift, MRL/with machine room type, having contract speed of 2.5 MPS, serving eleven floors (B1, GF, 18 nos. Floor) as per detailed specifications and technical particulars (Note:- Lift shall be inclusive of all ancillaries and accessories as are mandatory as per the updated Bombay Lift Act, IS and GOI guidelines, whether specifically specified in the item and specifications or not)
2	Speed: 2.5 MPS
3	Floors: 20 floors (B+G+18)
4	Travel: 70 mtr (approx. height of Shaft)
5	Stops & opening: 20 & 20
6	Controller: VVVF Regenerative (Closed Loop)
7	ARD: Automatic Rescue Device complete with dry, maintenance-free SMF batteries shall be provided
8	Operation: Microprocessor based duplex selective collective with/without attendant in a group of two lifts installed adjacently.
9	Power: 415V, 3-Phase, 50 Hz, 4-Wires System
10	Phase Reversal protection: Shall have auto phase corrector device and single phase preventer protection
11	BMS Compatibility: Potential free contacts for each floor position up and down movement of the lift shall be provided in the controller which can be used for the building management system.
12	Type of Doors:
13	a.Car entrance door:
	(a) Number: 1 No. (Centre Opening)
	(b) Size: 900mm centre opening.
	(c) Type of doors: Power operated, centre opening, horizontal sliding with VVVF controller, stainless steel in scratch proof finish () {Fire rating of ≥ 120 minutes}

	b. Landing doors: Centre opening, horizontal sliding, stainless steel, scratch proof finish (Mirror /Hairline/ Honeycomb / Moonrock Finish And Combination)) [Fire rating of ≥ 120 minutes]
14	Lift Car:-
	a. Lift car Size: As per CPWD specification for lists or equivalent
	b. Finish: Stainless steel Mirror /Hairline / Honeycomb / Moonrock Finish And Combination copper finish with Granite stone flooring
	c. Ceiling: Ceiling should be finish stainless steel with three rows of LED luminaires and ventilation grills
	d. Ventilation: Suitable ventilation from ceiling with no noise high quality ventilation (fans) with two rows of louvers along the depth of the car
	e. Hall Buttons: Illuminated Hall buttons with Braille Markings in car and at all landings. The Hall button panel shall be with running arrow display to indicate the moving direction of the lift car
	f. Hand Rails: One hand rail of full depth of car, at 900mm above floor level to be fixed on three side in the lift car
	g. Voice announcement system: To be provided in the car to announce the position of the elevator in the hoist way as the car passes or stops at a floor served by the elevator
	h. OLI: To be provided as per OEMs standard design and capacity
	i. Protection: 1. Protection against (i) overload voltage (ii) under voltage (iii) single phasing. 2. Full height infrared curtain door protection. 3. Door time protection 4. Parking Key switch 5. All other standard safety features as per CPWD specs
	j. Door close safety: Full height infar light curtain door safety in addition to pressure operated switch.
	k. Fireman switch: Required for all Lifts at ground floor.
	l. Operating system: Full duplex collective selective operation. All floors (except lower most basement) shall have Up and down key.
	m. Car Fittings: Overload Device, Emergency Car light unit, Emergency Alarm Button, Door Open/ Close Button, Manual Rescue Opertion, Belt Inspection Drive.
	n. CCTV camera with microphone shall be provided inside each lift car (compact dome, lift-duty rated), with video carried over the lift travelling cable (or a shaft wireless bridge) to the building NVR, and live view available at the security/fire control room
	o. Independent service (for Duplex only) All other accessories and/or

	ancillaries as required and as per technical specifications and IS requirements. The lift shall be suitable for differently abled and the entrance shall be suitable for a mechanised wheelchair)

3.8 Technical Particulars for all lifts

(1) Type of lift: with / Without Machine room & regenerative technology.

(2) Type of operation: Automatic group supervisory control with/ without attendant.

(3) Type of control: A.C. drive variable voltage variable Frequency with Microprocessor based group control system.

(4) Landing car doors: Centre opening stainless steel centre opening door in the Mirror / Honeycomb / Moonrock Finish And Combination finish as approved by engineer-in-charge.

(5) Automatic power operated horizontal sliding-centre opening construction & design and stainless-steel body. Interior finish of the lift car shall be of SS as approved by Engineer-in-Charge. The car shall be complete with toe guard of adequate depth, cabin fan, LED light fixtures, music system, intercom system and LCD display etc. Car opens in front only.

(6) Landing doors should have a fire resistance of 2hour.

(7) Type of signal system: All signal & operating fixtures shall be provided with stainless steel face plates.

- (i) Call registration indication in buttons of operating panel.
- (ii) Digital car position indicator in car.
- (iii) Digital car position indicator with up & down direction on all floors separately for each lift.
- (iv) Backlit hall call buttons on all floors.
- (v) Maintenance free re-chargeable battery-operated alarm bell & emergency light.
- (vi) Fire man's switch at ground floor for each group of passenger lift.
- (vii) Overload warning with visual indication 'OVER LOADED' and audio beep of overloading.
- (viii) Voice announcement system having standard features.

(8) Intercom system in each lift for communication between the passengers in the elevator & fire control room, Reception (press & speak type) with rechargeable maintenance free battery backup.

(9) Elevator should be equipped with manual as well as automatic rescue devices (ARD).

(10) Infra-red beam type door safety device shall be provided for full height of door.

(11) CCTV camera shall be provided in each lift &Lift shall be provided as per approved Building/ Tower plan.

(12) BMS connectivity: RS 485 port & enable status monitoring of each lift at BMS

(13) All features related to universal accessibility.

(14) All lifts shall be without Machine room. Lift machine Control panel door shall be made of SS 304 with a lamp holder above it.
(15) There shall be a separate electrical power distribution panel for lifts and it shall be powered by DG as per the direction of E-I-C.
(16) Each lift should be provided CCTV Camera including all wiring.
(17) Each lift lobby should be provided Cove light .

Make of lift

1) The lift manufacturer company shall comply the following criteria as per DG's circular:

केंद्रीय लोक निर्माण विभाग
कार्यालय ज्ञापन

सं.– महानिदेशक/अधीक्षण अभियंता(वै)टास/पीपीपी–एम आई आई आर्डर/22
निर्माण भवन, नई दिल्ली दिनांक 28.09.2020

विषय: Eligibility Criteria for Lift Works (Revision-3)

Eligibility Criteria for Lift Works (Revision-2) in CPWD notified vide OM No. महानिदेशक/अधीक्षण अभियंता(वै)टास/ पीपीपी–एम आई आई आर्डर/17 dated 20-04-2020 is hereby revised and notified as enclosed, since the list of designated labs or certifying agencies has not been issued by the Bureau of Indian Standards yet. This supersedes all earlier issued eligibility criteria for lift works. This shall come into force with effect from the date of issue of this order.
This issues with the approval of DG, CPWD.

अनुलग्नक: यथोपरि

(डी के तुलानी)
अधीक्षण अभियंता (वै)
तकनीकी अनुप्रयोग एवं मानक

फाइल नं ई–9077096/30(1)/लिफ्ट– बैठक/मु. अभि. सी एस क्यू (वै)/2017 से जारी

सेवा में, (केवल केंद्रीय लोक निर्माण विभाग की वेबसाइट के माध्यम से)

सभी विशेष महानिदेशकों, अतिरिक्त महानिदेशकों, के. लो. नि. वि., प्रमुख अभियंता, लो. नि. वि., दिल्ली, सभी मुख्य अभियंताओं, मुख्य अभियंता एवं कार्यकारी निदेशकों, अधीक्षण अभियंताओं, अधीक्षण अभियंता एवं परियोजना निदेशकों, कार्यपालक अभियंताओं, कार्यपालक अभियंता एवं वरिष्ठ प्रबंधकों, के. लो. नि. वि. को सूचनार्थ एवं आवश्यक कार्रवाई हेतु।

Eligibility Criteria for Lift Works (Revision-3)

1. The lift manufacturer shall comply with BIS standards, duly certified by the manufacturer itself.

2. The manufacturer shall be compliant with the Public Procurement (Preference to Make In India), Order 2017 (as amended from time to time) issued by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry.

3. The experience of successful completion of similar works shall be as per the CPWD Works Manual/SoP.

4. The manufacturer shall furnish an undertaking regarding the availability of spares for the entire expected life of the lift, i.e. 15 to 20 years.

5. The complete lift installation including its components, safety devices, various types of controls etc., testing, inspection, operation & maintenance shall conform to relevant Codes, Standards, code of practices, guidelines, safety rules, inspection manual(s), rules issued by Bureau of Indian Standards, as amended up to the last date of receipt of tenders.

6. Quality standards shall conform to latest IS/ISO-9001:2015.

7. The downtime of installed lifts being maintained by the manufacturer shall not be more than 8 hours (average) in case of minor faults and 7 days (average) in case of major faults during the last financial year.

Sub-Head IV.

4. Uninterruptible Power Supply (UPS)

4.1 Scope of work covers providing online UPS of 20 KVA with 30 minutes back-up for common area lighting, SMF batteries, battery racks and all associated work to cater to uninterrupted power supply to ELV services and emergency lighting load mentioned herein below:

A- UPS 20 KVA will provide emergency supply to following (Redundancy N + 1)
(i) All CCTV , FIRE ALRAM SYTEM equipment's
(ii) Any other common area designated by Engineer in charge.

A separate electrical power distribution with suitable DB and cabling for UPS and invertor shall be installed by contractor. Consultant will prepare separate drawing for same.

The scope of work shall also include SITC of 2 tonn air conditioning and ventilation works for UPS and battery room along with all required accessories, which are part of respective section of the NIT.

The UPS shall consist of, as required by the project, the UPS module, top covered battery rack (s), and inbuilt input isolation transformer, maintenance bypass, parallel card inbuilt and other features as described in this specification.

Required precision air conditioning system with 100% standby arrangement shall be provided for the UPS and battery room. Exhausts to be provided for battery room.

4.2 Technical Specification

UPS should be as per BOQ online double conversion, IGBT PWM rectifier based input charger (float cum equalizing) based UPS system, (having in built automatic Bi-directional static transfer switch for auto switchover), in built Manual bypass switch, K13 Copper wound Galvanic Isolation transformer at UPS output after the static Galvanic inverter output isolation transformer (inbuilt) switch as per IEEE 1100-2005 in a separate cabinet, PWM controlled using DSP logic as Analog control shall not be acceptable, inbuilt/ external Back feed protection, Input phase reversal protection & correction, provision for separate input for rectifier and for Bypass, microprocessor based built in protection against short circuit, overload, high/low voltage cut-off, TVSS protection and all required protections and LED display panel for display parameters and event Monitoring & Diagnostics last 100 events with exact date and time & upto 900 events from UPS system memory using Laptop etc complete as required.

A UPS shall be tested against EMC (Electromagnetic compatibility) category C2. The UPS system shall be continuous duty, highly reliable and solid state. The system shall be modular in design

so that any individual unit can be easily isolated/ taken out for repair or any additional added in future for enhancement of the capacity.

Reference standards for UPS: EN 62040-2, EN62040-1, EN62040-3, IS Standard: 16242

4.3 SYSTEM DESCRIPTION

4.3.1.1 Components:

a) Rectifier
b) Sealed Lead Acid Batteries
c) Battery Charger
d) Automatic Bypass
e) User Interface Panel/ Display
f) USB Communication Interface for service use
g) Communication Card Slots (2)
h) Remote Emergency Power Off Contacts
i) Environmental (Building Alarm) Inputs (3)
j) Hardwired Input, Output
k) Internal Maintenance Bypass Isolator
l) Input, Output & Bypass Isolators
m) External Top Covered Battery Racks
n) Base Frame for UPS
o) Communications - Mandatory

4.3.1.1.o.1 SNMP/Web adapter

4.3.1.1.o.2 Modbus RTU interface

4.3.1.1.o.3 SNMP & MODBUS Combo Card should be Cyber security Certified (UL & IEC Standards both) Certificates to be submitted before manufacturing start.

4.3.1.2 **Modes of Operation:** The UPS shall operate as an online, double-conversion UPS with the following modes:

(i) Normal: During the Normal or Double-conversion Mode the rectifier shall derive power as needed from the commercial AC utility or generator source and supply filtered and regulated DC power to the online inverter. The inverter shall convert the DC power to highly regulated and filtered AC power for the critical loads. The Inverter shall be Three Level latest technology.

(ii) Battery: Upon failure of the AC input source, the critical load must continue to be supplied by the inverter without switching. The inverter must obtain its power from the battery. There must be no interruption in power to the critical load upon failure or restoration of the AC input source.

(iii) Recharge: Upon restoration of the AC input source, the rectifier/battery charger must recharge the battery. The inverter shall, without interruption of power, regulate the power to the critical load.

(iv) High Efficiency or ECO Mode: The static bypass switch will conduct, and the UPS rectifier and inverter will be operated in a “suspended” mode, unless incoming power

conditions require conventional double conversion operation. In High Efficiency mode the UPS input and output filters shall remain in-circuit to provide surge suppression. Transfer time from HE mode to Double Conversion mode, and vice versa, shall be typically less than 4ms.

(v) Bypass: The static bypass switch must be used for transferring the critical load to the AC utility supply without interruption, and shall be rated for continuous operation. Automatic re-transfer to normal operation must also be accomplished without interruption of power to the critical load. The static bypass switch must be capable of manual operation via the front panel controls. An optional integrated bypass back-feed protection contactor, in series with the static switch, shall prevent system voltages from bleeding backwards through the static switch and rectifier snubber components to the utility source in the event of a utility failure and shall also open upon detection of a short circuit static bypass SCR.

(vi) Internal load testing: The UPS system will be capable of utilising the Internal Capacity Test function, including internally adjustable load testing at the customer site, without the need for a load bank. Testing shall only be initiated using the UPS OEM Engineer's Software Service Tool. This testing is not intended to be performed while the UPS is servicing the critical load.

4.4 RATNGS

A. System Rating

1. The UPS module(s) shall have an output rating of:
   a. 0.9 LOAD P.F @ 40 Degree C (kVA/ kW RATING AS PER Calculation based on design criteria on clause 12.4, approved by Engineer-In-Charge.)
   b. Isolation Transformer shall be inbuilt at Input side, rating of Transformer should be higher than UPS Rating.

iii. System Input

2. Input Voltage Operation Range
   a. Nominal 400/230 (or 380/220 or 415/240 adjustable) VAC, 4-wire plus ground
   b. -15% to +20% from nominal at 100% load or better
   c. -50% to +20% from nominal at 50% load or better.
3. Input Frequency
   a. 40 to 72 Hz or better
   b. auto-sensing Input Power Factor: 0.99 typical @ 100% loading
4. Input Current Distortion: 5% THD maximum at full rated linear load
5. Inrush Current:
   a. ≤130% of rated current for ≤2 cycles
   b. System Output, Normal Mode -Nominal Output Voltage, UPS on Utility
   c. 400/230, or 380/230 or 415/240VAC, Selectable through front panel or through serial port connection with power management software
6. Voltage regulation: +/-1% of selected output voltage in steady state

Transient Voltage Response: Meets Class 1 performance of IEC62040-3 and VFI-SS-111; +/-5% for 100% step load change; recovery in <20ms.

7. Voltage THD:
    1. 2% Total Harmonic Distortion (THD) maximum for rated linear load
    2. 5% THD maximum for a non-linear load
8. Nominal Frequency: 50 or 60 Hz selectable
9. Frequency Regulation: 50/60 Hz +/- 3Hz, +/-1 to +/- 3 Hz selectable
10. Slew rate: 0.8 Hz per second or better
11. Current Overload Capability without Bypass at nominal Load P.f 0.9:
    1. 111-125% load 10 minutes @ 40 Deg C
    2. 126-150% for 1 min @ 40 Deg C
12. Bypass:
    1. Automatic bypass shall provide an alternate path to power in the case of overload, inverter failure or other UPS failure.
    2. Internal Maintenance Bypass to be provided with Each UPS.
    3. Transfer time to and from any internal bypass shall be no-break, when UPS and Utility are in sync.
    4. Unit shall be able to detect bypass module failure.

4.5 SYSEM INPUT & OUTPUT CONNECTIONS

B. AC Input:

1. All UPS units shall be capable of utilising hardwired input. Input, Bypass, Output, MBS isolators shall be provided inside the UPS as mandatory
2. The building/Utility input neutral is required for proper UPS operation.
3. The Isolation Transformer Neutral to be separately earthed.
4. UPS Body Earth Should not be same as Isolation Transformer Neutral Earth.
5. All Connections should be done with Copper Flexible Cables.
6. AC Output:

All UPS units shall be capable of utilising hardwired output

i. Extended Battery Connection: UPS module will include terminations for External battery. UPS Manufacturer to provide Battery Breaker (MCCB) and Battery terminal caps as Mandatory for additional safety.

ii. Remote Emergency Power Off (REPO) Connection: The UPS shall provide a built-in landing for field connection of a Remote Emergency Power Off circuit. Upon initiation of the REPO circuit, the UPS shall open its input relays, and disengage the battery converter, preventing power from being delivered to the attached loads.

iii. Communication Card Slots: The UPS shall provide (2) communication mini-slots in the front of the UPS allowing for optional plug-in connectivity options, including SNMP/Web interface, 4x relay contacts & RS232 port, and Modbus capabilities. Vendor need to supply SNMP + Modbus Card along with UPS as standard. The Cards should be

UL/IEC Certified for cyber security standards. Reports/ Certificates should be submitted.

iv. Programmable Input Connections: The UPS shall provide built-in inputs for field connection (environmental input). The inputs shall be parameter programmable to suit the needs of the application.

4.6 USERINTERFACE

B. Front Panel Display: The UPS shall include a front panel display consisting of a graphical LCD display with backlight, four status LED's, and a six-key keypad. Touch Screen Display is not advisable due to its prone to early failure.

C. Graphical LCD display: Includes basic language (English or local selectable language), display of unit function and operating parameters. It shall be used to signify the operating state of the UPS, for indicating alarms, for changing operations control parameters and set points.

D. Four status LED's, which indicate:

(i) Alarms, with a red LED

(ii) On Battery, with a yellow LED

(iii) On Bypass, with a yellow LED

(iv) Power On, with a green LED

E. Six-Key Multifunction Keypad: UPS shall have keypad to allow user to adjust UPS parameters, view alarm and inverter logs, change UPS operational modes, and turn the UPS on and off. Keys will be marked as UP, DOWN, LEFT, RIGHT, ESC and ENTER

F. Meters: When selected, the front display shall show individual screens of input parameters, output parameters or bypass parameters including voltage, current, frequency, true power, apparent power and power factor. The display shall also show DC Voltage and current.

G. Power Management Software Package: The UPS shall offer optional communications interface that provides the following communication capabilities:

1. Monitor and graphically display input and output voltage and other operating characteristics
2. Notify end-users in the event of a power anomaly via E-mail.

4.7 Battey should be designed to provide 30 minutes back up or more as required. If thermotical battery calculation and actual battery bank installed at site does not able to provide required backup for given load . to meet required backup time ,additional battery shall be provided by the contactor without any extra cost and nothing shall be provided for same.

Battery should be 12V lead acid sealed maintenance free type. The UPS module shall have the Battery Circuit breaker mounted in the battery Rack. When this breaker is opened no

battery voltage should be present in the UPS enclosure. The UPS module should be disconnected automatically when the battery reaches to the minimum discharge voltage level or when signalled by other control functions.

4.8 Design basis for INVERTER.

Inverter power supply is required for light fittings in Common areas of Residential Tower, Basement and Stilt .

(i) Common Corridors/Reception/ Lift lobby: 100% lights .
(ii) Staircase: 100% lights
(iii) Car parking areas and Equipment Room in basement: 100% Lights
(iv) All Electrical Exit Signages .
(v) Security guard room at entry of complex: 50% Lights shall be on UPS supply

4.9 Documents to be submitted after award of work

(i) Drawing, load calculation & datasheet of selected equipment to be submitted after award of work
(ii) Layout drawings of the equipment's to be installed including power and control cables, and supports / structure for cable trays.
(iii) SLD's
(iv) Earthing
(v) GAD of UPS Distribution Panels
(vi) Battery calculations
(vii) Any other drawings relevant to the work.

Sub-Head V

5. Firefighting, Sprinkler and Fire Extinguisher system

5.1 Fire Protection System including Sprinkler System, wet-risers, Yard-hydrants, internal hydrants, hose reels and pumps (diesel as well as electric driven) etc. shall be designed and provided as per provision given in NBC 2026, relevant BIS Codes, Fire Bye Laws as applicable & CPWD Specification for Electrical works Part-V (Wet Riser & Sprinkler Systems)-2020, all with up-to-date amendments. NOC shall be obtained by the contractor from Mumbai Fire Service for Fire Fighting scheme before execution of work.

5.2 Fire Fighting System scope of works includes followings

i). Supply, installation, testing, commissioning (SITC) of FIRE PUMP of capacity 2850 l/m.- 2 no.
ii). SITC of Diesel engine-operated Fire hydrant Pump of capacity 2850 l/m. -1no.
iii). SITC of sprinkler pump of capacity 2850 l/m.- 2no.
iv). SITC of Booster pump of capacity 900 l/m.-2 No.
v). SITC of Jockey pump of capacity 180 l/m.-2 No.
vi). SITC of PLC-based control panel for automatic operation of the above-mentioned pumps.
vii). Supply and installation of necessary Hydrant valves, as per inventory attached.
viii). Ring main pipe of 200 mm dia with external hydrant and suitable Stainless steel box for same with hydrant pipes, Fire Brigade outlet and inlet at suitable location as per local fire norms.
ix). Supply and laying of GI pipes as per the system requirement.
x). SITC of sprinklers in basement area, common area i/c floor lobby , Inside the rooms , common area etc to fulfil the Local body norms.
xi). SITC of fire extinguisher at each floor as per PFSA
xii). All other incidental works i/c painting required to run the Fire Fighting System satisfactorily as per local body norms.

Drawings for Approval on Award of the Work

The contractor shall prepare and submit three sets of hard copy of shop floor drawings and soft copy and get them approved from the Engineer –In –Charge before the start of the work. The approval of drawings, however does not absolve the contractor not to supply the equipment / materials as per agreement, if there is any contradiction between the approved drawings and agreement.

(i) Layout drawings of all equipments (hydrants, sprinklers, water curtain) along with hydraulic calculations and Data sheets of pumps, sprinklers and other fittings.
(ii) Layout drawings of the Sprinkler and water curtain Flow switches, wiring, Annunciation Panel etc as required.

(iii) Layout of equipment's to be installed in pump house including power and control cables, Cable trays etc.

(iv) Arrangement of Diesel engine Chimney

(v) Electrical Panel GAD and control wiring along with write up of logic of operation of pumps.

(vi) Earthing

(vii) Drawings showing details of support for pipes, cable trays etc.

(viii) Any other drawings relevant to the work.

Sub-Head VI

6. Addressable Fire Alarm System and Public Address System

A. Addressable Fire Alarm System

6.1 The work shall consist of supplying, installation, testing & commissioning of Addressable fire detection & alarm system as per CPWD specifications and NBC 2026 and LED Exit and Fire Signages with 2 hrs. battery backup as per NBC-2026. Public announcement and talk back system shall be provided. Planning and designing of addressable fire detection & alarm system and public address system shall be done as per provision given in NBC-2026, CPWD General specifications for electrical works part-VI(Fire detection and alarm system), relevant BIS, NFPA-72 and shall be provided as per requirement and satisfaction of Engineer-in-Charge. The work shall also include getting the drawings approved from local fire authority as required, if required.

Power supply to fire detection and public address system equipment's shall be given through fire survival cables.

All major components of fire alarm system shall be product of a single manufacturer as per the list of approved make and shall conform to the requirement of NFPA 72/ UL/ IS 2189 approved and designed according to DIN VDE-14675 and VDE- 0833 Fire Alarm Systems CODE OF PRACTICE FOR SYSTEM DESIGN, INSTALLATION AND SERVICING.

Scope of work shall include FAS and PAS for residential tower, basements and podium comprising of following:

(i) SITC of detectors, PA system, FFT, MCP, Hooter etc. as per CPWD specifications.
(ii) Providing suitable compatibility in the Main Fire Alarm Control Panel for Integration of Public Address System through TCP-IP/ Modbus / Bacnet/RS232.
(iii) Providing Public Address System with Audio Amplifiers, speakers & required wiring. The system shall be used for public announcements, evacuation, tower wise as a whole and floor wise independently. The system shall also be capable to use as car call system (for cars parked in basement, Podium and at stilt level).
(iv) There will be a public-address system for use from tower Control Rooms/ Reception lobby at Ground Floor to address all Basements, Podiums & specific areas like Drivers Room.
(v) Electrical works, including Cabling, Earthing etc. for the installation.
(vi) The required PC and printers for monitoring the system.
(vii) Integration of FAS with Smoke Ventilation & pressurization fans, Lifts, sprinkler monitoring panel, water curtain system, water levels of Fire water tanks and as required.
(viii) **Safety Signages / Sign Boards:** Photo Luminescent Signages for Warning/Information/egress route guiding strip, Electrical Signages etc.

(ix) LED Exit and Fire Signages with 2 hrs. battery backup.
(x) Getting necessary approval from local fire officer before commencement of work and after completion of work.
(xi) Any other item required to make fire alarm and public address system as per approved plan/ scheme functional, but is not specifically mentioned in this scope.
(xii) Fire alarm system GUI software shall be integrable with CCTV VMS so that zone specific cameras can be programmed to record any fire incident
(xiii) Residential Tower to have a Fire Control Room on the Ground Floor which will also have:
  a. CCTV Security Services
  b. Voice & Video Communication Control
  c. Public Address System
  d. Intercom system

6.2 Detail system requirement

The work shall be carried out as per CPWD specification for Fire Alarm and Public Address System.

Detectors, manual call points, spot indicators and PA system shall be installed at locations as per requirement of local fire authority, NBC-2026 and CPWD specifications as required. The type of detector to be installed shall be decided as per the utility and as per direction of Engineer- in-charge based on requirement of local fire authority, NBC-2026 and CPWD specifications. Electrical rooms shall be provided with heat and smoke multi detectors, Kitchens shall be provided with Heat detectors.

i. The AFAS shall be integrated to the following Mechanical, Electrical & Low Voltage Services for required at site functioning as required.
  a. Access Control System
  b. Air Conditioning-VRF System
  c. Ventilation and/ or Pressurization System
  d. Public address system/ Voice Evacuation System
  e. Lifts
  f. Fire-fighting system
  g. Any other service as per the directions of the Engineer-in-charge.
ii. In the event of a fire alarm, but not in a fault condition, in addition to other activities described in the CPWD Specifications, all lifts initiated through the system shall automatically be returned to Main landing or Ground Floor.
iii. FAS 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.
iv. FAS Panels shall be interconnected with each other suitably so that each FAS panel provide required information of other panels as well.

v. Microprocessor based modular intelligent addressable fire alarm control panels shall be compatible with detectors used for connecting and monitoring the fire detectors and other devices. The panel shall have redundancy by providing additional CPU so that in case of failure of one CPU other takes over and system remain fully functional.

6.2.1 Description of items/ Particular Technical Specifications

1. Intelligent Addressable Detectors: As per CPWD specification.
2. Addressable Manual Call Points (Resetting Type): As per CPWD specification.
3. Microprocessor Based Modular Intelligent Addressable Main Fire Alarm Control Panel compatible with detectors: As per CPWD specification.
4. Low/High Intensity Hooters activated from the Panel: As per CPWD specification.
5. AV strobes in basement: As per CPWD specification.
6. Fire Fighter's talk back system in each staircase.
7. Intelligent Addressable Repeater Panel as per the CPWD Specifications.

6.3 Description of items/ Particular Technical Specifications:

(i) Intelligent Detectors: As per CPWD specification.
(ii) Manual Call Points (Resetting Type): As per CPWD specification.
(iii) Main Fire Alarm Control Panel compatible with detectors: As per CPWD specification.
(iv) Low/High Intensity Hooters activated from the Panel: As per CPWD specification.
(v) Fire Fighter's talk back system in each staircase.

6.4 The different component of fire alarm system shall be capable of functioning as per details below:

6.4.1 Detailed Description of The System and Components of Fire Alarm Control Panel (FACP)

The FACPs used in the Building shall confine to the UL & FM / EN54 & VdS Certification standards having the following features

Features

All the FACPs provided shall have the capacity to expand from 1 to 10 loops for Future expansion.

Each loop shall accommodate maximum 250 detectors and devices in any combination with a loop length capable with 2C x 1.5 sq mm cable as per CPWD specification.

It shall have facility to discriminate between a real fire alarm and a false alarm.

FACP will function as fully stand-alone panel & networked to other FACPs with peer-to-peer communication.

Each FACP shall have inbuilt 640 LCD Display or more than 7" Inch LCD colour touch screen to clearly indicate the location of fire, type of device activated other indications like service requirement of a

component, etc.

The Panel shall have 200 Nos of Soft programmable keys with status indicators for individual triggering of NAC Outputs, evacuation speaker zones, AHU Modules, Damper switch, Smoke extraction Fans, Lifts. etc.

It shall have a provision for battery storage.(24 Hrs Standby time and 30 Minutes Alarm time)

In case of a Loop Card Failure, the FACP shall allow to replace the Loop card without switching off the panel and reprogramming.

The FACP shall have facility such that alteration or access to the stored program shall be done through a passcode, for protection against unauthorized personnel interference.

The FACP shall be capable of PA Integration with the use of TCP-IP / Modbus / Bacnet/RS232.

FACP shall have provision to accept 230V single phase, 50 Hz supply.

All the major components like processor, memory, etc., shall be available as spare in case of emergency requirement.

FACPs shall have inbuilt buzzer to alert the personnel in case of maintenance requirement.

FACP shall be programmed for sequence of events to happen in case of fire like closing of fire dampers, shutting down supply fans for HVAC, Deactivating the access control system and activating the hooters with the help of a control relay module provided near the system to be activated.

The fire alarm control panel shall be suitable for Class-A type of wiring as per NFPA-72.

The fire alarm control panel shall work on positive sequence as per NFPA – 72.

The fire alarm control panel shall be capable of disabling an individual detector, a group and or zone of for building maintenance purposes. Facility shall be provided on the FACP for simulating the fire condition to enable testing of the various alarm circuits.

All the fire alarm modules (loop cards, networking cards, and communication card. Etc.) should be hot pluggable and hot swappable to facilitate easy replacement of faulty modules. All the electronic components shall be compatible to non-air-conditioned environment for working satisfactorily.

The fire alarm control panel normal power supply failure shall be annunciated audio-visually.

In case of multiple alarms the multiple alarm indication shall be ON. The multiple alarm indication shall be displayed in chronological order.

FACP shall have the facility such that each detector can be identified as a separate zone.

The FACP shall be reset only by authorized users after the clearance of a fault.

Whenever there is a third party actuation to happen, like closing of fire dampers, switching off supply / exhaust units etc , the actuation shall happen only when the fire signal is received from two different initiating devices located in a zone connected to different fire alarm panels. The communication between

the FACPs shall happen with two pair cables and the fire alarm status of one panel shall be communicated to the second panel in which the control relay module of the third-party device is connected to. Inter panel communication is a must and needs to be provided for controlled actuations. All the necessary systems to ensure reliable communications between panels are to be built into the FACPs.

FACP shall have the facility to silence / acknowledge / reset the alarm. Apart from the FACP, Repeater panel present in the control room shall have the facility to silence / acknowledge / reset the alarm of all FACP's.

The FACP shall have FALSE ALARM REDUCTION algorithms like

Alarm Verification, Dual Detector/Group Dependency, and Intermediate Alarm Storage to eliminate False alarms due to Dirt/Dust/Disturbance values.

EMC/EMI Monitoring - To inform the possibility of a false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc. The panel shall display the EMI/EMC Current and Average Values reported by the detector. The User/Installer shall have access to this reading during Maintenance (with password protection).

When fire condition is confirmed, the following sequence of annunciation will take place on the FACP:

Alarm Condition	Audible Alarm	Visual Alarm
First Fire Condition	ON	ON FLASHING/Description of area of fire origin with detector type
Acknowledge (first Alarm)	OFF	ON STEADY
New Fire Alarm Condition (after acknowledge of first alarm)	ON	ON FLASHING
Acknowledge (New fire alarm)	OFF	ON STEADY
Back to normal	OFF	ON STEADY
Reset	OFF	OFF
Reset Before Normal	OFF	ON STEADY

Construction details

The FACP shall have an ingress protection of at least IP – 30.

The housing containing the fire alarm control panel shall be of 2 mm thick steel construction finished in colour as per relevant standard.

It shall be capable of being surface, semi-flush or fully flush mounted with additional bezel. The fully flush bezels shall be painted to specification, stainless steel or brass as required.

The FACPs shall be provided with triplicated earthing terminals on the either side. The grounding terminal G1 shall be for safety grounding, G2 shall be for shield grounding and G3 shall be for signal grounding.

The panel shall be completely factory wired, absolutely ready-in all respects for installation at site and termination of all external cabling. The internal wiring of the panel shall be carried out with 650V grade, stranded copper wires of size rated for the current in the corresponding circuit. The minimum size of the wire shall not be less than 0.8 sq. mm for electronic circuits and 1.5 sq. mm for electrical circuits &16 SWG for grounding.

All the wiring shall be done using ferrules having indelible marking.

Cable entry for the FACP from the bottom

FACP shall mount in wall.

CPU

The FACP shall have a processor which shall be of at-least 32 bit, which shall be designed to accept all the inputs and process the outputs within the time stipulated by the standards.

The CPU shall have the facility to communicate with other FACPs and process the fire signals received from other FACPs to actuate a third party device.

The capacity of the processor shall be adequately designed include all input / output signals and various functional requirements.

The processor shall be designed in such a way that the parameters in the repeater panels shall be refreshed in 1 sec.

It shall have its own, built in advanced microprocessor, sophisticated software and extensive memory for storing the logs of alarms, times and action taken report.

Loop Modules

The loop module shall have a microprocessor inbuilt & shall be capable of handling 254 detectors/devices in any combination.

It shall have a line length up to 2000m depending upon the configuration & cable type.

It shall have an LED test button.

The loop module shall be encapsulated & shall be hot pluggable.

The front fascia of the loop cards shall be visible for easy identification of faults.

In case of the failure of loop card, it should be replaced without the need of any additional programming.

6.4.2 Repeater Panels

Repeater Panel shall be an 640 Character LCD Display or more than 7”inch LCD color touch screen same as main panel. The MMI shall be the same as the main Controller.

It shall have inbuilt network ports for networking of Panels and Integrated Ethernet switch for networking and interfaces to remote services, building management and voice alarm systems.

Repeater panels shall be suitable for Wall mounting which will be displayed all the major entrances and stair cases which will enable the staff and fire fighting personnel to exactly locate the fire.

It shall be compatible to receive data from FACPs.

Audio visual Alarms during fire shall be generated in case of fire.

It shall connect to any of the Fire Panels in the Network using a 2 core – 1.5 sq.mm wire.

The Power supply to the Repeater Panel shall be drawn from the nearest Fire Panel and also be supervised by the Main Panel.

The Repeater Panel shall display Messages like Alarm & Fault similar to the Main Panel and shall be accessed only by Authorized Users through a passcode.

The Repeater Panel shall be connected to the Main Panel and other repeater panels in such a way – 1 pt Failure in the cable shall not affect the performance and shall intimate the exact location of failure in all Panels.

The Repeater Panel shall be equipped with a Key switch that allows Authorized users to Acknowledge/Reset Alarms.

The Repeater Panel shall be equipped with 2 different power inputs. On failure of primary power, the secondary shall take over.

The Repeater panel shall allow the users to login locally or login to the remote FACP.

The Repeater panel shall allow to create users with different access levels locally and shall also allow users of panels to login based on access levels.

The repeater panels shall integrate with the main panels without any additional interface or the bidder shall consider necessary accessories required to complete the system and quote as part of this model.

The Repeater panel should confirm to UL & FM / EN54 & VdS Certification standards.

6.4.3 Intelligent Addressable Photothermal (Multisensor)Detector

The Intelligent Addressable Multisensor Detector used in this Building shall confine to the relevant standards having the following features

It shall be combination of Smoke detection and heat detection. The smoke detection system shall work on Light scattering type principle using Infrared and the Heat detection system shall be of Rate of rise of temperature and Fixed Temperature.

The Intelligent Addressable Multisensor Detector shall be of Spot type and Addressable type.

The Intelligent Addressable Multisensor Detector shall be addressed either by DIP switches or through Programming from the Panel.

The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.

All the detectors shall have a visible multi-color LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.

It shall possess False alarm immunity and a superior signal to noise ratio

It shall have a Built in signal processor

It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)

It shall have drift compensation facility built in.

The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

The detector shall have at least 15 levels of sensitivity settings based on the application and room where it is installed.

The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

The detector shall be programmed to work as Optical only or Thermal only detectors. It shall a provision to switch off any component (optical or thermal) of the detector.

The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency

features that shall be programmed based on site application.

The detector shall be capable of detecting both smoldering fires and open fires and shall confirm to UL & FM / EN54 & VdS Certification standards.

6.4.5 Response Indicators

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

6.4.6 Manual Call Points

The Manual call points (MCP) used in the building shall confine to the relevant standards having the following features

Manual call points shall be of Double action - break glass type with Push Button.

The mounted arrangement shall be such that it can be either surface mounted or flush mounted.

Each addressable MCP will comprise of an electronic circuit built into it to provide addressing capability.

The MCPs shall be provided with inbuilt fault isolator. (the bidder shall consider a external isolator if not inbuilt).

The MCP shall have a LED to indicate Alarms.

The MCP shall be shall confirm to UL & FM / EN54 & VdS Certification standards.

6.4.7 Control relay module(CRM)

The Control Relay Modules used in this Building shall confine to the relevant standards having the following features

The Control Relay Module shall provide a dry potential contact o/p for activating a variety of auxiliary devices and other fire fighting / ventilation equipment.

The Control Relay Module shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt for each control module)

It shall have a capability of handling at least 1A @ 30VDC to integrate with third party system.

The Control Relay Module shall be addressable either by Dip switch or by the Panel.

The Control Relay Module shall be loop powered and shall confirm to UL & FM / EN54 & VdS

Certification standards.

6.4.8 Monitor Module (Input module)(MM)

The Monitor Modules used in this Building shall confine to the relevant standards having the following features

The Monitor Module shall provide 2 inputs and these inputs shall work independently to monitor 3rd party devices and shall allow to program with different parameters.

The Monitor Module shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt for each Monitor module)

The Monitor Module shall be programmed to monitor contacts, Voltage and EOL resistor as per site applications.

The Monitor Module when programmed to monitor contacts shall also allow to program to monitor either open/close contacts.

The Monitor Module shall be addressable either by Dip switch or by the Panel.

The Monitor Module shall be loop powered and shall confirm to UL & FM / EN54 & VdS Certification standards.

6.4.9.1 Loop Powered Sounder

The Sounder used in this Building shall confine to the relevant standards having the following features:

The Sounder shall be an Addressable loop powered sounder. (Bidder shall consider external power supply, cable, conduits, modules required for activating externally powered sounders and include the costing as part of the item – Sounders)

The Sounder shall have inbuilt fault isolator module (bidder shall consider external isolators if not inbuilt).

The Sounder shall either be addressed by Dip switch or by the Panel.

The Sounder shall be placed in the detection loop only and a separate loop or cables for sounders shall not be used.

The sounder shall have a sound pressure level of 90 dB and the volume shall be adjusted from the Fire Alarm Panel

The sounder shall be capable of programming at least 32 different tones for alarm detection in different floors or at different time intervals.

The sounder shall be tested and maintained with ease from the FACP.

The Volume levels for Testing and Drill shall be programmed as per site conditions.

The Sounder shall consume a minimal current of <5mA and thus allowing to connect at least 25 loop powered sounders in the same loop.

The Sounder shall be capable of either accommodating a Flasher or a Detector and shall work as Sounder cum strobe or Sounder cum detector base.

The Sounder shall have a feature of synchronizing with other sounders in the loop.

The Sounder shall be loop powered and shall confirm to UL & FM / EN54 & VdS Certification standards.

6.4.9.2 Loop Powered Strobe

The Strobe used in this Building shall confine to the relevant standards having the following features

The Strobe shall be an Addressable loop powered Strobe. (Bidder shall consider external power supply, cable, conduits, modules required for activating externally powered Strobes and include the costing as part of the item – Strobes)

The Strobe shall have inbuilt fault isolator module (bidder shall consider external isolators if not inbuilt).

The Strobe shall either be addressed by Dip switch or by the Panel.

The Strobe shall be placed in the detection loop only and a separate loop or cables for Strobe shall not be used.

The Strobe shall have a red flashlight and shall flash at minimum of 1Hz.

The Strobe shall be tested and maintained with ease from the FACP.

The Strobe shall also be part of Testing and Drill and shall be programmed as per site conditions.

The light output shall be at least 2 cd.

The Strobe shall consume a minimal current of 10mA and thus allowing to connect at least 10 loop powered strobes in the same loop.

The Strobe shall be capable of either fixing it in a Sounder and shall work as Sounder cum strobe as per site conditions.

The Strobe shall be loop powered and shall confirm to UL & FM / EN54 & VdS Certification standards

B. PUBLIC ADDRESS SYSTEM

6.5 GENERAL OBJECTIVE

The objective is to have an effective Public Address System in the following areas of the building: basements, stilt and common areas of the building.

Key features include:

- Requisite booster amplifiers shall be installed in the Fire Control Room to support the speaker circuit load.
- The system shall have a built-in message manager which will relay an emergency Message to all zones on all floors, in case of a fire or likewise emergency.
- Voice Evacuation Messages shall be relayed 5 minutes after the hooter cum flashers are sounded. The public address system shall be integrated with the Fire Alarm system.
- Emergency zone announcements shall be made using a call station with a keypad for zone selection.
- Emergency announcements shall override any other communication being operated through the system.

6.5.1 Network Controller

A requisite number of speakers shall be connected to the Network controller. The controller shall have 12 trigger inputs to start business or emergency messages. The controller shall be used as a stand-alone system with up to 6 zones or expanded to up to 24 zones using additional 6-zone routers. Up to 4 call stations shall be connectable. Interconnections shall be made using standard RJ45 connectors and CAT5 cable. Shall be digital & EN54 certified.

6.5.2 Router(If applicable)

The router shall be an expansion unit adding 6 zones as well as 6 input and 6 output contacts to the voice alarm system. It shall be able to increase the number of zones along with the voice alarm controller. Shall be EN54 certified.

6.5.3 Booster Amplifiers

The requisite number of Booster Amplifiers shall be connected to the Network Controller and Routers installed in the Fire Control Room to increase the power of the PA system. The booster amplifier with the following specifications shall be used:

- Rated Output Voltage (RMS): 75/120 W
- Battery Voltage: 24 VDC (max ±10%)
- Frequency Response: 60Hz to 15 KHz
- Impedance: 20K Ohms
- S/N: >80db
- Sensitivity: 1 V balanced

6.5.4 Speakers

6 W output, ceiling/wall-mounted speakers shall be located on all floors as per code requirements. All Speakers shall be 6W with multiple tapings.

6 W box-type speakers shall be installed in the basement area, stilt floor & refuge area.

6 W box-type speakers shall be installed in the parking area.

The speakers shall be flush with the ceiling and walls as approved by the Architect.

6.5.5 Call Station

6 zone Call station with additional keypad to select a minimum required zones selector and with a microphone shall be connected to the Network Controller for emergency announcement and shall be kept in the Fire Control Room. Shall be EN54 certified.

Interface with Fire Alarm

Fire Alarm shall be linked to the public address system by using a Control Module (dry contacts) or seamless integration to activate the designated zone & to relay an automated voice evacuation message. Voice Evacuation Messages shall be pre-recorded and shall be triggered by the Fire Alarm system.

Sub-Head-VII

7. Diesel Engine Driven Generator Set:

7.1 The work shall be execute as per CPWD DG Set specification

7.2 Scope of this sub head covers supply, installation, testing and commissioning of complete DG Set of capacity not less than 250 KVA with AMF panel and required ATS , cabling work etc. This includes not only the items exclusively defined hereunder but also any other item required to commission and complete the work as per site requirement in this sub head or as per good Engineering practice or as required under the codes or by local/statutory authorities.

The DG sets should meet the latest CPCB IV+ norms/ CAQM requirement (whichever is more stringent) as applicable and/or shall be provided with Retrofitted emission-control equipment having a minimum specified PM-capturing efficiency of at least 70%, type approved by one of the CPCB recognized labs. If the CPCB/CAQM norms are revised after the last date of submission of bids, then if any additional cost has to be incurred by the agency and the same is proposed for payment, then department will scrutiny it with corresponding market rate, and additional cost may be paid if found justified.

Contractor shall do detailed design and calculations and provide the capacity of equipment's with requisite standby accordingly, for approval of engineer-in-charge.

7.3 PLC based system to ensure:

(i) Auto Synchronization of diesel generator sets
(ii) Either Grid supply incomer breakers or DG sets supply incomer breaker only are made on in Main LT Panel
(iii) Only required no. of DG sets are made on depending on Electrical Load
(iv) Programmable selection of outgoing feeders based on priority set, to control load.

7.4 LT panel with MCCB for local control/isolation of DG sets, to be provided with in soundproof enclosure for emergency operation.

7.5 Complete Electrical and control wiring for various accessories etc.

7.6 Earthing system etc. as required.

7.7 Foundations for equipment's including vibration isolation springs/pads.

7.8 **Diesel and lube oil for engine for testing & commissioning for 12 hours i/c 1hr of 10% overloading at OEA/OEM works shall be arranged by the contractor**. Diesel and lube oil for trial run of each DG sets for 120 Hrs or 15 days whichever is earlier at the available load at site shall also be arranged by the contractor.

7.9 The exhaust pipe shall be insulated with suitable thickness of fibre glass with aluminium jacket for its entire length.

7.10 All pipes or cable connections.

7.11 Painting of all exposed metal surface of equipment's and components in appropriate colour.

7.12 Clearance/Approval of the complete installation from CPCB/State Pollution Control Board, Central Electricity Authority (CEA)/Local Bodies/Explosive Department and other licensing authorities as required/applicable.

7.13 Certificate from OEM/OEA or authorized service provider of engine manufacturer for satisfactory installation and commissioning of Diesel generator sets after completion of the work.

7.14 An undertaking that mandatory free service is carried out during the guarantee period by the authorized service provider of engine manufacturer.

7.15 The supply from DG sets to DG Synch panel through sandwich type bus trunking/ cables as approved by Engineer-in-Charge. As per the site conditions, since DG will be placed at ground level and DG Synch panel at suitable located room, IP68 rated bus trunking arrangement shall be provided.

(i) The provision of Diesel tank for 8 Hrs working. Else required capacity external fabricated tank shall be provided (fabricated by minimum 3mm thick M.S. sheet) for each DG Set shall be kept in addition to in built diesel tank.

7.16 DG set installation at ground shall be preferred. In case of installation required to be done in basement, selection of set should be done after considering derating and shall provide required acoustic treatment for DG room (if required), exhaust and ventilation arrangement etc.

7.17 Load estimation/Load Calculation –

Power backup Generator sets shall cater for power requirement of following facilities for which the agency has to submit the load calculation for approval by Engineer in charge:

S.no.	Description of type of load	Diversity factor
1	Light load for common area of residential tower, basements, Podium levels.	80%
2	Power load for common area of residential tower, basements, Podium levels.	20%
3	Lifts	60%
4	Pumps (Water supply etc.)	60%
5	Fire Fighting System – Jockey Pump	100%
6	Fire Fighting System – Fire Pumps	100% in fire mode but Dead load in Normal Case
7	External, Façade, Landscape Lighting etc.	80%
9	Normal Ventilation fans (with VFDs and CO sensors) in parking	80%
10	Smoke Ventilation, Pressurization fans for staircase and lift, lift lobby	100% in fire mode but Dead load in Normal Case
11	Overall Diversity factor of simultaneity as per NBC 2026 Part-8, Section-2.	80%

12	Maximum loading on DG Set	80% of rated capacity
13	Power factor assumed for kVA calculation of transformer	0.80

The incomers rating of LT breakers of DG Synch Panel shall match with Generator Set rating or next available standard ratings of ACB /MCCB.

7.18 Specifications

DG sets shall be silent type, minimum rating/ capacity specified is nominal capacity at standard test conditions. The DG Sets will be installed at suitable location as approved by Engineer-in-charge. DG set shall have all required features as per CPWD specifications for DG sets amended up to date.

7.18.1 Inspection And Testing of DG Sets of Capacity More Than 200kVA

7.18.1.1

The successful tenderer will arrange staff/POL/for test run at his cost.

7.18.1.2

For DG sets of capacity more than 200kVA, testing shall necessary be carried out at Factory/manufacturing premises in presence of representative of the Department.

7.18.1.3

For testing, following procedure will be followed: All major items/equipment's i.e. engine & alternative in assembled condition, associated electrical control panels etc. shall be offered for inspection and testing at factory/manufacturing works. The successful tenderer shall give a notice of minimum two weeks for carrying out such tests. All expenditure on diesel and lubrication oil for factory test shall be borne by the tenderer. The Engineer-in Charge/ or his authorized representative shall witness such inspection & testing at mutually agreed date. The cost of the representative's visit to the factory will be borne by the Department.

iv) Exhaust System:

(a) Exhaust Piping: All M.S. Pipes for exhaust lines shall be conforming to relevant IS. The work includes necessary cladding of exhaust pipe work using 50 mm thick Loosely bound resin (LBR) mattress/ mineral wool/ Rockwool, density not less than 120 kg/m3and aluminium cladding (0.6 mm thick) for the complete portion. The exhaust pipe work includes necessary supports, foundation etc. to avoid any load & stress on turbocharger/ exhaust piping. The exhaust pipe shall be *run along the existing wall of the building duly clamped/*supported on independent structure for which, the design and Drawing for such structure shall be got approved from the Engineer-in-charge. Requisite shaft shall also be constructed by the agency and camouflaged by suitable means taking into account aesthetic aspects

(b) Exhaust system should create minimum backpressure.

(c) Number of bends should be kept minimum and smooth bends should be used to minimize backpressure.

(d) Pipe sleeve of larger dia. should be used while passing the pipe through concrete wall.

(e) Exhaust piping inside the Acoustic Enclosure/ Genset room should be lagged with asbestos rope along with aluminium sheet cladding/ insulated as per CPWD specification for DG sets, to avoid heat input to the room.

(f) Exhaust flexible shall have its free length when it is installed. For bigger engines,2 flexible bellows can be used.

(g) For engines up to 500kVA, only one bellow is required. However, if exhaust pipe length is more than 7 m then additional bellow/ provision for expansion should be provided.

(h) 'Schedule B' MS pipes and long bend/elbows should be used.

(i) The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet/ windows etc.

(j) When tail end is horizontal, 45 Degree downward cut should be given at the end of the pipe to avoid rainwater entry into exhaust piping.

(k) When tail end is vertical, there should be rain trap to avoid rain water entry. Ifrain cap is used, the distance between exhaust pipe and rain cap should be higher than diameter of pipe. Horizontal run of exhaust piping should slope downwards away from engine to the condensate trap. Silencer should be installed with drain plug at bottom.

(l) Care should be taken to ensure that no carbon particles emitted due to exhaust leakage enters and deposits on alternator windings and on open connections.

(m) Support to Exhaust Piping: Exhaust piping should be supported in such manner that load of exhaust piping is not exerted to turbo charger.

(n) Emission standard for diesel engines (engine rating more than 0.8 MW (800kW) for power plant, generator set applications and other requirements shall be provided as per Commission for Air Quality Management in National Capital Region and Adjoining Areas letter No. A-11018/01/2021-CAQM/15322-15331 dated29-09-2023 or amended upto date.

S.No.	Parameter	Emission Standards
i.	PM (at 15% O2)	50 mg/Nm3
ii.	NOx (at 15% O2)	650 mg/Nm3
iii.	CO (at 15% O2)	100 mg/Nm3
iv.	Minimum DG stack height	30 meters or minimum 6 meters above the heigh of the building where DG set is installed whichever is higher.

(o) **Air System:-**

It is preferable to provide vacuum indicator with all engines to indicate hoked filter. Maximum air intake restrictions with clean and choked filters should be within prescribed limit as per OEM / manufacturer recommendation for the particular model of the engine. Gensets should be supplied with heavy duty air cleaners.

(i) The department also reserves the right to inspect the fabrication job at factory and the successful tenderer has to make arrangements for the same.

(ii) DG set will be tested on load of unity power factor for the rated kW rating (to be calculated considering power factor as 0.80). During testing, each of the D.G sets covered under of work, shall be operated for a period of 12 hours on the rated kW at DG set's kW rating including one hour on 10% overload after continuous run of the 12 Hours. During testing during all controls/operations safeties will be checked and proper record will be maintained. Any defect/abnormality noticed during testing shall be rectified. The testing will be declared successful only when no abnormally/failure is noticed during the testing. The DG set will be cleared for dispatch to site only when the testing is declared successful by authorized representatives/Engineer-in-Charge.

7.19 Terminal Boxes:

Terminal boxes shall be suitable for terminating multiple nos. of required size UG cables. The terminal box shall be suitable to withstand the mechanical and terminal stresses developed due to any short circuit at the terminals.

7.20 Earthing system:

Earthing system including type & selection of earth electrodes, earth conductor, earth bus and protective conductors etc shall be as per CPWD General Specification for Elect. Works (Part-I Internal) 2023 as amended and corrected up to date.

7.21 Cabling

Power cabling from MCCB near alternator to main panel shall be done with multiple numbers of required size Cross- linked XLPE insulated LT armoured Aluminium cable and shall be as approved by engineer-in-charge. Multi core armoured copper cable of
1.1 KV grade shall be used for inter connecting the engine controls with the switch gear and other equipment's.

7.22 Foundation

The Genset along with acoustic enclosure shall be installed on suitable CC foundation asper the OEM design. Genset should be mounted on AVM's pad inside the enclosure.

7.23 Acoustic enclosure:

The enclosure shall be out door type and to reduce the sound level as per CPCB norms as modified by Government of India on the date of execution and CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013) as amended and corrected up to date. The enclosure shall be provided by the OEM as per CPCB certification and corrected up to date on the date of execution.

7.24 The canopy will enclose the following items inside: -

i) Diesel Engine.
ii) Alternator.
iii) Control Panel.
iv) Starting Battery.
v) Daily service fuel tank.
vi) MCCB (Four Pole) of suitable capacity.
vii) Other accessories so that the DG set with all items and accessories could be placed in open space without any other requirement of Diesel Generator room suitable to withstand all weather conditions.

7.25 Adequate ventilation shall be provided to meet total air requirement. Suitable numbers and size of ventilation fans complete with necessary auto start arrangement shall be provided as per the manufacturers design. It shall also be provided with auto stop arrangement to stop the fan after 5 minutes of the stopping of D.G. sets.

There should have a provision of DC Emergency light operated automatically with door opening. The inside of the enclosure shall be illuminated by the LED tube with the help of PVC insulated HRRF copper conductor wiring in recess/surface conduit suitable for single phase AC supply and shall be operated automatically with door opening as well as manually. To avoid re-circulation of hot air, durable sealing shall be done between radiator and canopy. The acoustic enclosure should be suitable for cable connection. Such arrangements on acoustic enclosure should be water proof and dust-proof confirming to IP-65 protection.

7.26 DG Control Panel

DG control panel shall be manufacturer standard and shall provide the following minimum operational requirements. Control panel must be BMS compatible and it should have Rs 485 port with ModBus / BacKnet/ LON interface protocol:

7.26.1 Auto mode:

i) A line voltage monitor shall monitor supply voltage in each phase. When the mains supply fails completely or falls below set value variable between 80% to 95% of the nominal value on any phase the monitor module shall actuate startup of diesel engine. To avoid initiation due to momentary drips or system disturbance a time delay adjustable between 0.5 to 5 second shall be incorporated in the startup module.

ii) A three-attempt starting facility shall be provided with the sequence. 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF, and 6 seconds ON, if at the end of the third attempt, the engine does not start, engine shall be locked out to start, a master timer shall be provided for the function. Suitable adjustment timers be incorporated which will make it

feasible to very independently ON-OFF setting periods from 1-10 sec. An audio-visual alarm shall be given.

iii) Suitable adjustable timers shall be incorporated which will make it possible to vary independently ON-OFF setting periods from 1 second to 10 second. If on starting the alternator does not build up voltage after the first or any start as the case may be, further starting attempts will not be made and the starting facility will be reset.

iv) Once alternator has built up voltage, signals shall be provided to each of the alternator circuit breaker and mains circuit breakers as required. The Mains supply circuit breaker shall open before the alternator circuit breaker closes. System provided in the logic panel shall check and ensure that all the engine oil pump etc. are running and healthy. In case of any fault in engine auxiliaries the system shall automatically stop the DG set and audio-visual alarm shall be given.

v) When the mains supply is restored and is healthy as sensed by the line voltage monitor the load shall be transferred automatically to mains by providing signals to mains and alternator circuit breakers as required. The alternator supply circuit shall open before mains circuit breaker closes.

vi) The diesel alternator set reverts to standby mode for next automatic operation.

7.26.2 Manual mode:

i) Under manual mode it shall be possible for the operator to start the generator by 'Pressing the (START) push button.

ii) Three attempt starting facility shall also be operative for the startup function.

iii) Alternator and mains circuit breakers "CLOSE" and "TRIP" operations as required shall be manual by pressing the appropriate push button on the panel "closure shall be feasible only after alternator has built up voltage. If the load is already on "MAINS" pressure on "CLOSE" button shall be ineffective.

iv) Engine shut down other than due to fault shall be manually by pressing a "STOP" button, in manual mode.

7.26.3 Test mode

i) When under "TEST" mode pressure on "TEST" button shall complete the startup sequence simulation and start the engine. The simulation will be that of mains failure.

ii) Engine shall build up voltage but the set shall not close alternator circuit breaker when the load is on the mains. Monitoring performance of voltage/frequency etc. should be feasible without supply to load.

iii) If during "TEST" run the power supply has failed the load shall automatically get transferred to alternator.

iv) Bringing the mode selector to auto position shall shut down the sets as per the required sequences.

Suitable rating Four Pole MCCB (as per SLD) for 250 KVA DG set confirming to CPWD General Specifications for Electrical Works Part-IV (Sub stations)-

2013 as amended and corrected up to date) shall be provided for each DG set in coming side (one no each in synchronization panel) fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, Independent electrical and manual closing mechanism and One no Four pole MCCB for 250 KVA DG set(as per SLD) load current electrically operated horizontal draw out type with microprocessor release with short circuit, overload & earth fault protection fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, Independent electrical and manual spring closing mechanism, service/test/isolated position indicators and frame earthing contact in outgoing of synchronization panel.

a) Control system equipment and components such as PLC, relays, contactors, Timers, etc. both for automatic operation on mains failure and as well as for manual operation.

b) Suitable capacity 4 strip heat shrinkable sleeved aluminium busbars (100% neutral)

c) Necessary controls for testing the generating set's healthiness, with test mode and with load on mains.

d) Necessary instruments and accessories such as multi-function meter/ Load Manager in all incoming feeder to read Voltage, Current, power factor, KW, KWH, Frequency etc.

e) LED type indication lamps, MCBs, terminal blocks, push buttons control switches etc. as required in all incoming feeder.

f) Battery charger with trickle and boost selection.

g) Cable terminals shall be suitable for the number, size and type of cables as per design loads. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals.

h) All internal wiring, connection etc. as required.

i) Terminals for neutral conductors for three phase and neutral circuits shall be the same size as for phase conductor, except where reduced section neutral cable cores are indicated.

7.26.4 Automation failure operation

i) Operation of DG Set shall be monitored and controlled by PLC panel. In case of mains failure this logic panel shall control auto change over from mains to DG Set supply and interlocking the MCCBs/ACBs, auto load management functions along with annunciation for alternate control and protection. The logic panel shall be provided with a total manual over ride facility.

ii) The logic panel shall be complete with all Auxiliary Relays. Timers, Contactors, Programmable logic controller of approved make, control wiring with not less than 1.5 sq.mm. 1.1 KV grade HFFR PVC insulated copper conductor wires etc. The PLC based logic panel shall ensure providing suitable software interlocks.

7.26.5 Automatic start & stop of Engine.

The system should come in operation after sensing of grid failure and automatically start & stop of the engine depending on the pre-defined load setting on the PLC. The automatic start& stop of engine, Back up protection and sequence of operation shall be as described in chapter 3 of CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013).

7.26.6 Synchronizing cum PLC panel.

Synchronization panel shall be cubical type LT panel suitable for 415V, 3 Phase, 4 Wire 50 Hz Ac supply system fabricated in compartmentalized (preferably) design from CRCA sheet steel of 2mm thick for frame work and covers, 3mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type 4 strip (4 pole) aluminium alloy bus bars of high conductivity, DMC/SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100mmx 50mm x 6mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25mm x 5mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switchgears.

a. Suitable rating Four Pole MCCB for 250 KVA load current with rotary handle confirming to CPWD General Specifications for Electrical Works Part-IV (Sub stations)- 2013 as amended and corrected up to date) shall be provided for each DG set in coming side (one no each in synchronization panel) fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, Independent electrical and manual closing mechanism and frame earthing contact in outgoing of synchronization panel.

b. Control system equipment and components such as PLC, relays, contactors, Timers, etc. both for automatic operation on mains failure and as well as for manual operation.

c. Suitable capacity 4 strip heat shrinkable sleeved aluminum busbars (100% neutral).

d. Necessary controls for testing the generating set's healthiness, with test mode and with load on mains.

e. Necessary instruments and accessories such as Multi-function meter/ Load Manager in all incoming feeder to read Voltage, Current, power factor, KW, KWH, Frequency etc.

f. LED type indication lamps, MCBs, terminal blocks, push buttons control switches etc. as required in all incoming feeder.

g. Battery charger with trickle and boost selection.

h. Cable terminals shall be suitable for the number, size and type of cables as per design loads. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals.

i. All internal wiring, connection etc. as required.

j. Terminals for neutral conductors for three phase and neutral circuits shall be the same size as for phase conductor, except where reduced section neutral cable cores are indicated.

7.26.7 Automation failure operation

i) Operation of DG Set shall be monitored and controlled by PLC panel. In case of mains failure this logic panel shall control auto change over from mains to DG Set supply and interlocking the MCCBs/ACBs (as per SLD), auto load management functions along with annunciation for alternate control and protection. The logic panel shall be provided with a total manual over ride facility.

ii) The logic panel shall be complete with all Auxiliary Relays. Timers, Contactors, Programmable logic controller of approved make, control wiring with not less than 1.5 sq.mm. 1.1 KV grade HFFR PVC insulated copper conductor wires etc. The PLC based logic panel shall ensure providing suitable software interlocks.

iii) The PLC panel have all necessary OFC infrastructure i/c contact etc. to connect to PLC load to OFC network. The PLC load should have programmed and wired such network operation and DG set for the common control switch shall be possible.

7.26.8 Automatic start & stop of Engine.

The system should come in operation after sensing of grid failure and automatically start & stop of the engine depending on the pre-defined load setting on the PLC. The automatic start& stop of engine, Back up protection and sequence of operation shall be as described in chapter 3 of CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013).

7.27 DG set shall be installed with stack formation. For structural details please follow the drawing and as per manufacturer's guidelines.

7.28 The emission limits of DG sets shall be as per Gazette Notification GSR 804 (E) dated 03-11-2022 of Ministry of Environment Forest and Climate Change (The Environment (Protection) Third Amendment Rules 2022).

7.29 The factory inspection, trail run, running in period, safety measure and statuary clearances shall be as per CPWD specification for DG Set 2013 and amended upto date.

7.30 Trial Run/Running-in-Period

After successful testing of the DG Set's, a trial run at available load will be carried out for 120 Hours or 15 Days whichever is later. The DG Set will be operated and a log of all relevant parameters will be maintained during this period. The arrangement of staff for trial run/running in period will be made by the successful tenderer. The diesel and Lub oil shall also be provided by Contractor. The contractor will be free to carry out necessary adjustments. The DG Set will be said to have successfully completed the trial run, if no break-down or abnormal/unsatisfactory operation of any component of the entire installation included in the scope of work of the contract occurs during this period. After this the DG Set will be made available for beneficial use. After the DG Set has operated without any major break-down/trouble, Bidder has to replace lubricant oil/engine oil and then, it shall be taken over by the department subject to guarantee clause of the contract. This date of taking over of the DG Set, after trouble free operation during the trial run/ running-in period shall be the date of acceptance/taking over.

7.31 Safety Measures

All equipment shall incorporate suitable safety provision to ensure safety of the operating personal as per manufacturers' standard practice.

7.32 Statutory Clearance(S)

Approval/clearance of the complete installation shall be obtained by the contractor from CPCB/state pollution Control Boards/ Local Bodies/ Central Electricity Authority (CEA)/other licensing authorities wherever required. However, application shall be made by Department and any statutory fee, as applicable, shall be paid by Department directly to the govt. authorities concerned.

7.33 Drawings for Approval & Completion Drawings

7.33.1 Drawings for approval on award of the work

7.33.1.1 The contractor shall prepare and submit three sets of following drawings and get them approved from the Engineer–In–Charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipment/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

7.33.1.2 Layout drawings of the equipment's to be installed including control cables, fuel/ lube oil pipes and supports/ structure for exhaust piping, chimney and bus ducts/ cable trays.

7.33.1.3 Drawings including section, showing the details of erection of entire equipment's.

7.33.1.4 Drawings including section and elevation showing the details of erection of Chimney

7.33.1.5 Dimensioned drawing of Acoustic enclosure/Engine-Alternator set and Electrical control panel.

7.33.1.6 Drawings showing details of support for pipes, cable trays, ducts etc.

7.33.1.7 Any other drawings relevant to the work.

7.34 Drawings / Documents to be furnished on completion of installation.

7.34.1 As built drawings as below shall be submitted

7.34.1.1 Two sets of the following laminated drawings shall be submitted by the contractor while handing over the installation to the Department. Out of this one set shall be laminated on a hard base for displayed in the DG set room where synchronization panel/auto load sharing panel is installed. One set shall be displayed in Junior Engineer's room. In addition, drawings will be given as soft copy on Compact Disc (CD)/Pen drive:

7.34.1.2 DG set installation drawings giving complete details of all the equipment's, including their foundation.

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

7.34.1.4 Control wiring drawings including all control components and sequence of operation to explain the operation of control circuits in Synchronization panel/PCC.

7.34.1.5 Manufacturer's technical catalogues of all equipment's and accessories.

7.34.1.6 Operation and maintenance manual of all major equipment's, detailing all adjustments, operation and maintenance procedure.

7.34.1.7 Test Certificate Routine and Type Test for Alternator, Engine and Acoustic Enclosure

7.35 After Sales Services

The contractor shall ensure adequate and prompt after sales service free of cost during guarantee period, and against payment after the guarantee period is over, in the form of maintenance, spares and personnel as and when required during normal life span of the equipment's and shall minimize the breakdown period.

(i) The PLC based AMF Panel provided with the DG sets shall have AMF controller with RS 485 port modbus, PLC with Ethernet port and all Energy meters having modbus RS 485 port.

(ii) The PLC Panel shall have all necessary OFC infrastructure including ethernet to OFC convertor so as to connect the PLC Panel to the OFC network. The PLC Panel shall be programmed and wired such that remote operation of DG Sets from the Command Control station shall be possible.

7.36 Schedule of Technical Particulars to be submitted by the firm for equipment and submitted before supply of material for approval of department after award of work.

Sl. No.	Description	Parameters
1	DG Set	

	Engine	
	Make	
	Model/ISS reference	
	No. of cylinders	
	Rated R.P.M.	
	Method of Starting	
	Aspiration Method	
	BHP	
	Specific Fuel oil consumption (gm/BHP/hr.)	
	Lub. Oil recommended	
	Lub. Oil pressure	
	Qty. of lub. Oil required	
	Time required for starting	
	Lub. Oil sump capacity.	
	Nos. of exhaust pipe required	
	Dia. of exhaust pipe	
	Whether meets CPCB IV+ norms for Emission. (To provide related certificates/documents form OEM)	
	Fuel Consumption at full load.	
	Any other data.	
2	Alternator	
	Make	
	Enclosure details	
	Full Load output in kVA	
	Full Load output in kW at 0.8 PF	
	Designed over load capacity at max. ambient temp.	
	Efficiency at full load.	
	Class of Insulation of rotor.	
	Class of Insulation stator.	
3	General	
	Overall Length of DG set LxWxH	
	Overall Weight of DG set.	
	Noise Level of DG Set at one Metre with Acoustic Enclosure.	
4	AMF/DG Synchronization Panels	
	Make.	
	Type (Floor/ Wall mounted).	
	Overall dimensions (LxBxH)	
	Finish	

5	Generator Control Panel	
	Make	
	Acoustic Enclosure.	
	Make	
	Size	
6	Details of Acoustic lining Material & Make	
7	PCC/L.T. Panel:	
	Make	
	Thickness of the sheet metal	
	Size of the bus bars	
	Material of bus bars –Aluminium.	
	Bus bar insulation	
	Over all dimension	
	Degree of protection	
	Copy of CPRI Test certificate for fault level to be attached –	Yes/ No

SUB HEAD- VIII

8. HVAC System

It comprises of an indoor unit and an outdoor unit. The indoor unit may be mounted on floor or on wall, or at ceiling. The outdoor unit consists of a compressor, heat exchanger, fan and motor; installed in a separate independent cabinet. The indoor unit is an air handling system, designed primarily to provide conditioned air to an enclosed space, room or zone (conditioned space). The split AC shall be Five Star BEE rated and variable speed compressor.

Compressor for outdoor unit and air-distribution for indoor unit, as below:

- Outdoor unit with variable speed compressor: It is also called an inverter AC or
- variable speed AC, which works on part load depending on the demand for the
- conditioned space. This uses a variable-
- Frequency drive to control the frequency and thereby the speed of the compressor
- motor.
- Free-blow indoor unit : It could be high wall mounted, ceiling suspended cassette
- (exposed type), or floor-mounted.
- Furred-in indoor unit (ceiling suspended) : It is mounted in the ceiling and provided
- with a duct collar and grille.
- Ducted indoor unit : It requires ducting for air distribution.

INSTALLATION

a. Wherever split A.C. are planned in the new buildings, necessary openings in wall may be provided by with use of 75 mm PVC pipe sleeves at suitable locations for taking refrigerant pipes and cable to outdoor unit, so as to avoid unnecessary cutting/ damage to walls at a later stage. The slope of sleeve of PVC pipe should be towards exterior to 20 avoid seepage of water into the room. This opening should be sealed properly after installation to avoid entry of vermin and rain water.

b. For condensate drain, 40 mm PVC/ HDPE pipe be also provided and taken to nearest drain or up to the stack for collection & disposal of condensate. The slope of such pipe also should be downwards. As far as possible, joints should be avoided in this pipe.

c. The length of connecting refrigerant pipes between outdoor and indoor unit be kept to minimum feasible at site. However, it should not exceed 9 m, as the efficiency of the unit gets severely affected on increase of distance. The refrigerant pipes should be taken along the walls/ columns etc. duly clamped to their surface by saddles. If walls etc. are not available, tray be used to support the refrigerant pipes. Where bending of refrigerant pipes is required, proper pipe bending tool should be used to avoid pinching of pipes.

d. The refrigerant pipes should be properly insulated as per the recommendations of the manufacturer of split type AC units. The insulation over refrigerant pipes be examined once in a year and in case of any deficiency/ defect the same may be replaced.

e. Wall mounted unit and similar exposed indoor unit are provided with installation plate for ease in installation. Care shall be taken to ensure that enough clearance space is available below the ceiling in order to have free intake of return air.
f. Outdoor unit is mounted on an epoxy-coated steel frame with rubber gourmet to minimise vibrations in an open area so that the fan of the air cooled condenser can discharge hot air to the atmosphere, without any obstruction. Care should be taken to ensure that free intake of air is also available to the outdoor air cooled condenser.
g. Also precaution should be taken that hot air from any one outdoor unit does not mix with the outdoor air intake of any other air cooled condenser.
h. The location of the Outdoor unit shall be ensured that the outdoor unit shall be easily approachable for maintenance activities.

Scope of works included:

Supply, Installation, Testing and Commissioning of Air Cooled HI Wall split type Air conditioners complete

a) Copper power cable size as per BOQ copper wire from IDU to ODU i/c drain pipe
b) Green Refrigerant :- R-32/R-410/ R-407 Green Refrigerant,
c) Wireless remote control,
d) working voltage :-between 180-260V with low & high voltage cut off and50 hz ,1 phase AC supply
e) capable of performing cooling, dehumidification, air circulation
f) compressor :- Scroll /rotary .
g) The system shall be able to deliver 100% of the rated capacity upto 42 Degree Celsius. The system shall be able to operate up to 50 Degree C (out door ambient temperature)
h) warranty :-Min 5 year Original Equipment Manufacturer (OEM) warranty both compressor and Printed Circuit Board (PCB).
i) Comply : Electrical cable IS694 or IS 9968 temperature sensing control IS/ International Electro technical Commission (IEC) 60730, hermetic compressor IS 10617, heat exchanger IS 11329, capacitor IS 2993 and motor IS 12615. Complete as per CPWD specification and IS :1391 Part II 2023 .

Outdoor units shall be installed on metal platform at appropriate height and shall be camouflaged with suitable material.

Sub-Head IX

9. CCTV & Intercom System

9.1 Scope of work involves IP based CCTV system for building security comprising of PTZ/ fixed camera, cabling, digital recording, HD display system with minimum display 5''x8'' per camera and hardware & software support both for indoor and external surveillance and shall be provided in following areas in each tower and basement/podium/ service areas:

(i) Corridors of each floor
(ii) Lift lobbies on each floor
(iii) All inside Lift cars
(iv) Drive way in basements
(v) Terraces entry on tower
(vi) All drive way in common area
(vii) Entrances and Reception Room to Residential Tower.
(viii) All the main gates (entry and exit) with suitable mounting arrangement (on wall/ octagonal GI poles of proper size in a vandal proof housing with anti-bird spikes and earthing on outdoor Cameras) compliant to relevant Indian Standard 13252.
(ix) CCTV cameras and storage server/ NVR shall have compliance for interoperability. The proposed IP CCTV camera: NVR and VMS shall have cyber security certificate BIS, UL, EN, CE, FCC certifications. The proposed IP CCTV camera, NVR and VMS shall be compliant to original licensed H.265 HEVC video compression for recording and streaming. The recorded images to be stored for at least 15 days.

9.2 Laying, terminating and connection with copper armoured power cables, CAT-6A cables (armoured CAT 6A cables for external work & un-armoured for internal work), OFC cables with redundancy between entire backbone network &control room. It shall also include laying DWC/Hume pipes and PVC conduits for laying of cables. Within basement area, include cable tray/ raceway for laying of cables. The complete LAN networking, for the CCTV should be separate and exclusive for CCTV system only and not mix with other LAN System.

9.3 Cabling for switches shall be in a ring configuration.

9.4 8/16/24 port layer 2 as per requirements, indoor/ outdoor (industrial type Field network switches for outdoor installation)with 10G SFP ports with all required connecting accessories should be provided in different areas of the Buildings/Campus for the Camera connectivity with the backbone network. Network rack outdoor/indoor type shall be provided. Switch and SFP modules must be from the same OEM.

9.5 A layer 3 switch with suitable network management functionality should be provided in the control Room/ Guard Room for the central network management and control.

9.6 Establishing 1 Centralized Network control rooms for configuration, operation, monitoring and maintenance with at least Eight nos. full HD minimum 55" LED or better display along with one workstation. Moreover, each building block/tower will be provided with network

video recorder (So that no perceivable time lag occurs) and at least nos. full Ultra HD 42"/43" display unit.

9.7 Installation, configuration & customization of Video management System either Integrated or with separate server hardware and software support for all cameras @ 1080p and expandable with equipped storage of RAID 5 protected suitable capacity in single server. Multiple servers shall be provided as required with backup power supply from central UPS. The system should be capable of creating minimum 30days of back-up.

9.8 Outdoor /Indoor 5/6 MP Dome / Bullet Cameras should be capable of functioning in Day Night/ minimum Smart IR with up-to 50m, WDR 140dB minimum illumination: 0.005 lux @ Colour& 0 lux IR On; Electronic Shutter: 1/100,000 - 1/3 resolution 5 MP(2502 x 1944) @ 25/30fps PAL with Triple Video Streams

SITC of Outdoor /Indoor 5/6 MP IP IR Dome / Bullet Cameras should be capable of functioning in Day Night/ minimum Smart IR with up-to 50m or better, CMOS progressive Image Sensor 1/2.8 (0.357) inch or better, Focal Length(mm) 2.8 to 12mm, PoE Power Input ,Resolution Profile 1: 2592 x 1944p/ 2592 x 1520/ 2048 x 1536/ 1920 x 1080/ 720P/D1/ 2CIF/ VGA/ CIF/ QCIF @30fps (H.264/H.265) Profile 2: D1/VGA @30fps H.265/H.264) Profile 3: 2048x1536p/ HD/ 720P/ D1/ VGA @8fps (MJPEG) or D1/VGA@15fps(H.264/H.265) Profile 4: 1920 x 1080p/720P/ D1/VGA @30fps H.25/H.264/MJPEG) WDR 120dB minimum illumination: 0.005 lux @ Colour& 0 lux IR On; Electronic Shutter: 1/30 to 1/10,000 sec or better, ONVIF Profile S,G,T, with API & SDK, Video analytics : Motion Detection, View Tamper Detection, Trip/No Trip Detection, Object Intrusion/Zone Intrusion, Audio Exception, Missing/Abandoned Object Detection, Object Counting, Loitering Detection, Certifications and Compliance NDAA Compliant, BIS, CE, IP67, FCC Part-15 Subpart – B, ONVIF S, G & T, IK10, UL, NEMA 4X**, SIRA, MTBF>100,000 Hours, Essential Requirement (ER) by STQC

S. No.	Technical Specification	Description	Compliance (YES/NO)
1	Image Sensor Type	CMOS progressive	
2	Image Sensor Size	1/2.8 (0.357) inch or better	
3	Camera Image Sensing Capacity (Picture Mode)	5 resolution or better	
4	Resolution	Profile 1: 2592 x 1944p/ 2592 x 1520/ 2048 x 1536/ 1920 x 1080/ 720P/ D1/ 2CIF/ VGA/ CIF/ QCIF @30fps (H.264/H.265) Profile 2: D1/VGA @30fps (H.265/H.264) Profile 3: 2048x1536p/ HD/ 720P/ D1/ VGA @8fps (MJPEG) or D1/VGA@15fps(H.264/H.265) Profile 4: 1920 x 1080p/720P/ D1/VGA @30fps (H.25/H.264/MJPEG)	
5	Electronic Shutter	1/3 to 1/30,000 sec or better	
6	Day/Night Capable	Yes, True day/night	
7	IR Illumination Range (mtr)	30 or better	
8	Focal Length (mm)	2.8MM - 12MM Lens or better	
9	Frame Rate (fps)	30fps or better	
10	Video Compression	H.264, H.265, MJPEG	
11	Video Streaming	4 streams or better	
12	Privacy Masking	8 Zone or better	

13	Image Features	Defog, BLC, HLC	
14	Audio Support	Yes, 2 way audio with Built-in mic	
15	Alarm Support	Yes. Alarm in and alarm out	
16	Audio Compression	G.726 (ADPCM), AAC-LC*7, G.711	
17	Protocols	TCP/IP, UDP, HTTP, HTTPS, DHCP, DNS, DynDNS, DDNS, RTP, RTCP, RTSP, PPPOE, SMTP, NTP, SNMP, FTP, TLS/SSL, SFTP, ICMP, IGMPv2 & v3, ARP, 802.1x, IPv4, IPv6, QoS Layer 3, DSCP, CIFS, SSH, UPnP, Bonjour	
18	Minimum Illumination for Capturing Color Image	0.08 or better, 0 lux with IR	
19	WDR (Wide Dynamic Range)	True 120DB WDR or better	
20	SNR (Signal to Noise Ratio)	50 or better	
21	On Board SD/SDHC Card Support	Yes	
22	SD Card Memory (GB)	512 or better	
23	ONVIF Support	Support for all profiles, (S, G, T)	
24	Available ROM for AI Application	Should be available	
25	Available RAM for AI Application	Should be available	
26	Installation Type	Indoor Type	
27	Material of the Housing Construction	Alluminium/Metal	
28	Protection	IP66, NEMA 4X compliant or better	
29	Vandal Resistant Housing	Should be available	
30	IK Rating	IK10	
31	Power Input	PoE	
32	Operating Temperature	-30 °C to 50 °C or better	
33	Operating Humidity	Max 95% RH or better	
34	Used SoC Must be Declaration	Must be available on datasheets or OEM website	
35	Certification	Certifications and Compliance NDAA Compliant, BIS, CE, IP67, FCC Part-15 Subpart – B, ONVIF S, G & T, IK10, UL, NEMA 4X**, SIRA, MTBF>100,000 Hours, Essential Requirement (ER) by STQC	
36	SSL Certificate	GlobalSign / DigiCert device Certificate or similar should be pre-installed	
37	Lens Type	Motorized Varifocal Zoom lens	
38	Type of Camera Housing	Dome CAMERA	

39	IP Camera with Built-in AI Engine for Ready to Installing 3rd Party Applications	Yes	
40	Video Analytics Requirements	Motion Detection, View Tamper Detection, Trip/No TripDetection, Object Intrusion/Zone Intrusion, Audio Exception, Missing/ Abandoned Object Detection, Object Counting, Loitering Detection	

S. No.	Technical Specification	Description	Compliance (YES/NO)
1	Image Sensor Type	CMOS progressive	
2	Image Sensor Size	1/2.8 (0.357) inch or better	
3	Camera Image Sensing capacity (Picture Mode)	5 MP resolution or better	
4	Resolution	Profile 1: 2592 x 1944p/ 2592 x 1520/ 2048 x 1536/ 1920 x 1080/ 720P/ D1/ 2CIF/ VGA/ CIF/ QCIF @30fps (H.264/H.265) Profile 2: D1/VGA @30fps (H.265/H.264) Profile 3: 2048x1536p/ HD/ 720P/ D1/ VGA @8fps (MJPEG) or D1/VGA@15fps(H.264/H.265) Profile 4: 1920 x 1080p/720P/ D1/VGA @30fps (H.25/H.264/MJPEG)	
5	Electronic Shutter	1/3 to 1/30,000 sec or better	
6	Day/Night Capable	Yes, True day/night	
7	IR illumination Range(mtr)	35 or better	
8	Focal Length(mm)	2.8MM - 12MM Lens or better	
9	Frame Rate (fps)	30fps or better	
10	Video Compression	H.264, H.265, MJPEG	
11	Video Streaming	4 streams or better	
12	Privacy Masking	8 Zone or better	
13	Image features	Defog, BLC, HLC	
14	Audio Support	Yes, 2 way audio	
15	Alarm Support	Yes. Alarm in and alarm out	
16	Audio Compression	G.726 (ADPCM), AAC-LC*7, G.711	

17	Protocols	TCP/IP, UDP, HTTP, HTTPS, DHCP, DNS, DynDNS, DDNS, RTP, RTCP, RTSP, PPPOE, SMTP, NTP, SNMP, FTP, TLS/SSL, SFTP, ICMP, IGMPv2 & v3, ARP, 802.1x, IPv4, IPv6, QoS Layer 3, DSCP, CIFS, SSH, UPnP, Bonjour	
18	Minimum Illumination for Capturing Color Image	0.05 or better, 0 lux with IR	
19	WDR (Wide Dynamic Range)	120dB or better	
20	SNR (Signal to Noise Ratio)	50 or better	
21	On Board SD/SDHC Card Support	Yes	
22	SD Card Memory(GB)	512 or better	
23	ONVIF support	Support for all profiles, (S, G, T)	
24	Available ROM for AI Application	Should be available	
25	Available RAM for AI Application	Should be available	
26	Installation Type	Outdoor	
27	Material of the Housing construction	Alluminium/Metal	
28	Protection	IP66, NEMA 4X compliant or better	
29	Vandal Resistant Housing	Should be available	
30	Ik rating	IK10	
31	Power Input	PoE	
32	Operating Temperature	-30 °C to 60 °C or better	
33	Operating Humidity	Max 99% RH or better	
34	Used SoC must be declaration	Must be available on datasheets or OEM website	
35	Certification	Certifications and Compliance NDAA Compliant, BIS, CE, IP67, FCC Part-15 Subpart – B, ONVIF S, G & T, IK10, UL, NEMA 4X**, SIRA, MTBF>100,000 Hours, Essential Requirement (ER) by STQC	
36	SSL Certificate	GlobalSign / DigiCert device Certificate or similar should be pre-installed	
37	Lens Type	Motorized Varifocal Zoom lens	
38	Type of Camera Housing	BULLET CAMERA	
39	IP Camera with built-in AI Engine for Ready to installing 3rd party applications	Yes	

40	Video analytics requirements	Motion Detection, View Tamper Detection, Trip/No TripDetection, Object Intrusion/Zone Intrusion, Audio Exception, Missing/ Abandoned Object Detection, Object Counting, Loitering Detection	

IR PTZ Cameras 45X, 5/6 MP ,IP, IR CMOS progressive Image Sensor Size 1/2.8 (0.357) inch or better, 120 WDR (Wide Dynamic Range) , Color:0.03lux@F1.69,0 Lux with IR , Resolution D1 (704 x 480 Pixel), 720p (1280 x 720 Pixel), 1080p (1920 x 1080 Pixel), 1440p (2560x1440 Pixel), 1728P (3072 x 1728 Pixel) or better, Focal Length (mm) 4.4 mm - 169.4 mm or better, Pan Range 360° Pan Speed Pan manual speed: 0.1°to 240°/s, pan preset speed: 240°/s, Tilt Range -15° to 90° (auto-flip), Tilt Speed Tilt manual speed: 0.1° to 200°/s tilt preset speed: 200°/s, Presets 300, Privacy Masking, Defog, ONVIF S,G,T , BLC, HLC support, 2 way audio, Protocols TCP/IP, UDP, HTTP, HTTPS, DHCP, DNS, DynDNS, DDNS, RTP, RTCP, RTSP, PPPOE, SMTP, NTP, SNMP, FTP, TLS/SSL, SFTP, ICMP, IGMPv2 & v3, ARP, 802.1x, IPv4, IPv6, QoS Layer 3, DSCP, CIFS, SSH, UPnP, Bonjour

S. No.	Technical Specification	Description	Compliance (YES/NO)
1	Image Sensor Type	CMOS progressive	
2	Image Sensor Size	1/2.8 (0.357) inch or better	
3	Camera Image Sensing Capacity (Picture Mode)	5MP resolution or better	
4	Resolution	D1 (704 x 480 Pixel), 720p (1280 x 720 Pixel), 1080p (1920 x 1080 Pixel), 1440p (2560x1440 Pixel), 1728P (3072 x 1728 Pixel) or better	
5	Electronic Shutter	1/1 to 1/30,000 sec or better	
6	Day/Night Capable	Yes, True day/night	
7	IR Illumination Range (mtr)	300 or better	
8	Focal Length (mm)	5 - 135 (+/- 2mm) Motorized Varifocal Lens with 30X optical Zoom or better	
9	Frame Rate (fps)	30fps or better	
10	Panning Range	360° Endless Panning	
11	Tilting Range	Operational -20° – +90° or better	
12	Pan Speed	Pan Range 360° Pan Speed Pan manual speed: 0.1°to 240°/s, pan preset speed: 240°/s Tilt Range -15° to 90° (auto-flip) Tilt Speed Tilt manual speed: 0.1° to 200°/s tilt preset speed: 200°/s Presets 300 Patrol 8 patrols, up to 32 presets for each patrol Pattern 4 pattern scans, record time over 10 minutes for each scan	
13	Tilt Speed		
14	Video Compression		
15	Video Streaming	4 streams or better	
16	Privacy Masking	8 Zones Supported or better	
17	Image Features	Defog, BLC, HLC	
18	Audio Support	Yes, 2 way audio	

19	Alarm Support	Yes. Alarm in and alarm out	
20	Audio Compression	G.726 (ADPCM), AAC-LC*7, G.711	
21	Protocols	TCP/IP, UDP, HTTP, HTTPS, DHCP, DNS, DynDNS, DDNS, RTP, RTCP, RTSP, PPPOE, SMTP, NTP, SNMP, FTP, TLS/SSL, SFTP, ICMP, IGMPv2 & v3, ARP, 802.1x, IPv4, IPv6, QoS Layer 3, DSCP, CIFS, SSH, UPnP, Bonjour	
22	Minimum Illumination for Capturing Color Image	Color:0.03lux@F1.69,0 Lux with IR	
23	WDR (Wide Dynamic Range)	120 dB or better	
24	SNR (Signal to Noise Ratio)	70DB or better	
25	On Board SD/SDHC Card Support	Yes	
26	SD Card Memory (GB)	256 or better	
27	ONVIF Support	Support for all profiles, (S, G, T)	
28	Installation Type	Outdoor	
29	Material of the Housing Construction	Alluminium/Metal	
30	Protection	IP66, NEMA 4X compliant or better	
31	Vandal Resistant Housing	Should be available	
32	IK Rating	IK10	
33	Power Input	PoE	
34	Operating Temperature	-30 °C to 60 °C or better	
35	Operating Humidity	Max 90% RH or better	
36	Used SoC Must Be Declaration	Must be available on datasheets or OEM website	
37	Certification	Certifications and Compliance NDAA Compliant, BIS, CE, IP67, FCC Part-15 Subpart – B, ONVIF S, G & T, IK10, UL, NEMA 4X**, SIRA, MTBF>100,000 Hours, Essential Requirement (ER) by STQC	
38	SSL Certificate	GlobalSign / DigiCert device Certificate or similar should be pre-installed	
39	BIS Registration for Safety General Requirements as per IS 13252 (Part 1): latest	Yes	
40	Lens Type	Motorized Varifocal Zoom lens	
41	Type of Camera Housing	Outdoor PTZ CAMERA	
42	IP Camera	Yes	

43	Video Analytics Requirements	Motion Detection, View Tamper Detection, Trip/No Trip Detection, Object Intrusion/Zone Intrusion, Audio Exception, Missing/ Abandoned Object Detection, Object Counting, Loitering Detection	

Sr. No.	Category	Tender Specification	Compliance (Yes/No)
1	Software Specifications	It Should be Possible to configure, playback & live streaming of cameras added to other NVR from the main NVR without the need of any Server/workstation.	
2		The system should be capable of integrating with IP cameras of any brand which supports ONVIF 2.0 & above or ONVIF S profile.	
3		It should be possible to define a different number of Retention days for individual cameras.	
4		NVR should have a configuration wizard for quick configurations.	
5		NVR should show the estimated number of storage days.	
6		The device must be capable of taking Snapshot with integrated Access Control and Time Attendance System of the same brand in case of user allow/denied events.	
7		Digital Zoom during live view.	
8		The system should be able to take a Snapshot during live view/playback in JPEG format.	
9		The Device Must Provide Configuration Backup.	
10		It Should Have its Own Free DNS Server.	
11		Video pop-up for both Desktop and Local clients.	
12		3 User Access Levels (Default): Admin, Viewer, and Operator.	
13		10,000 Events Log.	
14		NVR Should Be Capable of Exporting Files in Native and AVI File Format to FTP and USB.	
15		NVR should have IP Address Filtering to Enhance Security.	
16		System Admin Should Be Capable of Programming PTZ Tour.	
17		Dual Stream Option Should Be Available for Simultaneous Recording and Transmission of Video on The Network Depending on The Bandwidth.	
18		The system should support Daylight Saving Time (DST).	
19		The Device Should Be Designed, Developed, and Manufactured in India.	
20	Mobile Client	Mobile application should be Provided by The Vendor Free of Cost with the NVR.	
21		It should be possible to see the playback from a mobile client.	
22		The Mobile Client Should Have 4 × 4 Layout for Display Cameras.	

23		The Mobile Client Should Have Digital Zoom functionality.	
24		The Mobile Client Should Be Able to Control PTZ Cameras.	
25		The Mobile Client Software Should Support Up To 50 NVRs.	
26		Software Should Have Feature to Configure Camera as Favourite Channels.	
27		Mobile Viewer Application Should Function on Android and IOS Based Phones.	
28		Mobile Viewer Application Should Support Calling from Mobile App Feature Where a Mobile Number Can be Added Per Camera in the Device and the User Can Directly Call a Concerned Person by Just One Click on Camera View from Mobile (without any SIM card in NVR).	
29	System	Control Mode: Desktop Client, Mobile Client, and Local Client (Through HDMI).	
30		OS: Embedded Linux.	
31		Processor: ARM Cortex – Quad Core.	
32	Video and Audio	Video Input: 64 IP Channels.	
33		Video Output: HDMI (2.0) – 1 Port (Main).	
34		Video Compression: H.265/H.264/Motion JPEG.	
35		Audio Input: 1 Channel, RCA Port.	
36		Audio Output: 1 Channel, RCA Port.	
37		Audio Compression: G.711u.	
38		Two-way Audio: Required.	
39	Display	Recording Resolution: 12MP, 8MP, 5MP, 4MP, 3MP, 2MP, 720p, D1, CIF.	
40		Decoding Resolution (on Local Display): Up to 4K.	
41		Split (Through LAN/HDMI): 1x1, 2x2, 3x3, 4x4, 1+5, 1+7, 3+4, 2+8, 1+12, 1+9, 4+9, 2+12, 5x5, 6x6, 8x8 and Sequential.	
42		Digital Zoom: Required in both Live View & Playback.	
43		OSD: Channel Number, Name, Bitrate, Video Loss.	
44		Snapshot Format: JPEG.	
45		Recording Type: Continuous, Scheduled, Manual, Alarm.	
46		Bandwidth Optimization: Yes.	
47	Playback and Backup	Synchronous Playback: 4 Channels @1080P (Desktop Client), 16 Channels @1080P (HDMI).	
48		Search Mode: Date & Time, Camera, Recording Type, Recording Drive.	
49		Playback Modes: Fast Forward, Slow Forward, Slow Reverse, Fast Reverse at Different Speed Control, Next-Previous Frame.	
50		Backup: Manual Backup & Scheduled.	
51		Configuration Backup: Required.	

52		Remote Operations: Monitor, PTZ Control, Playback, System Setting, File Download, Log Information, Upgrade.	
53	Video Detection and Alarms	Camera Events: Motion Detection, Recording Start, Recording Fail, Camera Offline, Camera Online.	
54		System Events: Manual Trigger, On Boot Alarm, Storage Alert, Disk Volume Full, Disk Fault, Scheduled Backup Fail.	
55		Actions: Recording on Selected Channel, Upload Images on FTP/Email Server, Email Notification with Snapshot, TCP Notification, Recall PTZ Preset Position, Turn On/Off Alarm Outputs, Buzzer Notification, SMS Notification.	
56	Device Status	Camera Status, Manual Recording, Scheduled Recording, Alarm Recording, Adaptive Recording: Required.	
57		FPS and GOP Count: Required.	
58		Motion Detection, View Tampering, Tripwire, Object Intrusion, Missing Object, Suspicious Object, Loitering Detection, Audio Exception, Object Counting: Required.	
59	Device Status	CPU Usage Display: Required.	
60		CPU Temperature Display: Required.	
61		Thermal Shutdown: Required.	
62	Storage	SATA Interface: 4 SATA III (18TB per Port).	
63		NAS: 2 NAS (CIFS, NFS).	
64		RAID: RAID-0, RAID-1, RAID-5, RAID-10.	
65		Recording Retention: Camera-wise, HDD Usage % Wise, Day Wise.	
66	Network	Incoming Bandwidth: 512 Mbps.	
67		Outgoing Bandwidth: 512 Mbps.	
68		Maximum User: 128 Programmable.	
69		Simultaneous Login: 9.	
70		Network Protocols: TCP/IP, DHCP, PPPOE, DNS, DynDNS, FTP, SMTP, NTP, RTP/RTSP, CIFS/NFS.	
71	Interfaces	Audio Input: 1 Channel, RCA Port (1V RMS).	
72		Audio Output: 1 Channel, RCA Port (0.5V RMS).	
73		Alarm Input: 2 Ports (Max. Load Resistance: 4.7 KΩ).	
74		Alarm Output: 1 Port (Max Load Power: <50VA, Max Load Current: <1A).	
75		Network Interface: 2 × Ethernet (RJ-45) 10/100/1000 Mbps.	
76		USB: 3 Ports (2 × USB 2.0, 1 × USB 3.0).	
77		Number of SATA Interface: 4 Ports (SATA III).	
78		HDD Size: 10 TB HDD Support (with 6Gb/s Speed).	
79		HDMI: HDMI (2.0) – 1 Port (Main).	
80		Reset Switch (Network, User Account and General Settings): Required.	
81		Buzzer: Required.	

82	Certification	Regulatory Approvals/Certifications: FCC (FCC Part 15 Subpart B Class A), ROHS, BIS, CE, EN/IEC, NDAA Complied Product.	
83	Electrical and Mechanical	Operating Temperature: 0°C to +50°C (32°F to 122°F).	
84		Humidity Range: 5% to 95% RH Non-Condensing.	
85		Chassis: 19" Rackmount.	
86		Power Input: SMPS (100–240V AC).	
87		Power Consumption (without Hard Disk): ≤60W.	

PoE Switch for CCTV

24 port PoE Layer 2 Network Switch with PoE Support of 420 W or higher with each copper port supporting 802.3at PoE+ min.

Core Switch for CCTV

Supplying, installation, Testing and commissioning of 10 Giga Bandwidth Data Centre Network Switch of 48port Layer 3 having features and specifications etc. as mentioned here under: - ToR/EOR/Core Network Switch 48x 10GbE SFP+, 6x 100GbE QSFP28, RPS, with Console Port, Management Port and 1 x USB 2.0 Type A port, The switch must provide a switching capacity of no less than 2.16 Tbps and a forwarding rate of at least 1600 Mpps, ensuring non-blocking performance for high-bandwidth applications. It should support hot-swappable dual power supply modules (AC or DC) for 1+1 redundancy and load sharing, as well as hot-swappable, front-to-back airflow fan trays with N+1 redundancy to ensure continuous availability. IEEE 802.1X support for port-based and MAC-based authentication should be available, along with integration for RADIUS and TACACS+ authentication services. Guest VLANs, DoS prevention, and management access restrictions are essential. SNMP v1/v2c/v3, syslog, sFlow, and support for autoconfiguration via DHCP. Support for and LLDP is required for modern network automation. Support ONIE (Open Network Install Environment), IEEE 802.1Q bb Priority-based Flow Control (PFC), OpenFlow v1.4, IPv6 Tunneling, IP interfaces and supported, VXLAN, Private VLAN, Multicast VLAN, Guest VLAN Double VLAN (Q-in-Q), PIM-SSM/SM, MSDP. Support High Availability with MLAG/VSS and Layer 2/3 for Multi-tenant, Virtualized, and Containerized Environments. BGPv4/v6, OSPFv2/v3, RIPng. VRRP, ECMP, BFD, and route redistribution for high-availability routing. Support flexible routing domains and secure inter-segment traffic flow. Certifications: CE, FCC, MTCTE /Product must be on Trusted Telecom Portal of Department of Telecommunication, Government of India etc. complete as required.

9.9 IR PTZ Cameras with mounting arrangement & power supply in weather-proof enclosure should be provided at all parking entrances and main gates of the campus.

9.10 The VMS and Camera should not be from same OEM, License for camera & software for minimum 10 years.

9.11 Complete system is to be designed as per above requirements and scheme along with layout and inventory is to be submitted to the Engineer-in-Charge for approval before taking up the installation work. Suitable Network management solution shall be established by providing hardware and software at Central control room/ Guard room.

Note: - 1. This list is not exhaustive. CCTV for other left out places shall also be provided if required as per direction of Engineer-in-charge.

2) All the cameras and VMS should be STQC certified as per CPWD Specification and latest Norms

Intercom System

9.12 Scope of work includes SITC of extension/Intercom facility and interconnection wire/ cable for the following locations:

(i) Control room of Residential building.
(ii) Reception and Guard rooms of the tower.
(iii) Main control room.
(iv) Guard rooms at main entry/exit gates.
(v) In-service rooms i.e., fire Pump room, Electrical substation, Reception, security guard any other area as per clint requirement etc.
(vi) One point in each Residential unit.
(vii) Any other area as directed by the engineer-in-charge.
(viii) Kron boxe with non metallic enclouser and telephone cable for connection of suitable pair. With minimum 20 % more spare capacity in cable and Krone box connection

The system will include all related infrastructure, EPAPX/ Inter com unit with 200 extension facility, cable, termination, I/O, telephone speaker phones and all related accessories. Handset will be provided in all the above areas.

9.13 Inter com System Features

(i) Visit confirmation
(ii) Vendor call
(iii) Customized massages(8to10)
(iv) Call facilities from flat to flat so fall tower, flat to security.
(v) Emergency call with voice message
(vi) Caller ID to all terminals.
(vii) Security watchdog.
(viii) Auto call back.
(ix) Flexible numbering.
(x) Paging to parking area.
(xi) Unlimited conference. It shall be possible for an extension user (up to a minimum number of 10 to talk to each other at the same time on a conference circuit.
(xii) Call tracing.
(xiii) Call blocking
(xiv) Call Forwarding:
(xv) Privacy of call: Full privacy of conversation shall be available on all calls whether established directly or by the attendant.
(xvi) Do not disturb.
(xvii) Panic button (optional to occupant).

(xviii) Extension to extension dialing: It shall be possible to establish internal calls automatically by dialing any number without assistance of the attendant.

(xix) Battery back-up. The battery shall be lead acid asper IS-1652 for 10(Ten) hours back-up for100% load with suitable rack.

9.14 Telephone instruments:-

The instrument shall be having following minimum features:

(i) Tone/pulse switchable
(ii) LED indication.
(iii) In ringing volume control
(iv) Redial.
(v) Flash.
(vi) Mute.
(vii) Pause.
(viii) Caller ID

9.15 Display:

Digital display system of same make shall be provided along with Intercom.

9.16 Telephone Cable

i) For individual connection Required Cat 6A LSZH HFFR PVC insulated annealed copper conductor, unarmoured telephone cable of approved make shall be drawn in existing heavy class PVC conduit in side the building.

ii) Proper identification tag with crimpling at both ends of each pair of cable including for spares and should be ready for use.

iii) Proper coordination with the agency laying the conduit pipes for telephone cable to be done by the intercom work executing agency.

9.17 Junction boxes

i) Telephone junction boxes of approved make with locking arrangement and shall be of IP65 rating.

ii) The boxes should have required number of krone terminal with10% spares.

iii)

9.18 Earthing

i) All metal enclosures, conduits, junction/pull boxes/ Cabinets shall be grounded in compliance of CPWD General Specifications for Electrical Works Part-I (Internal2023)

SUB HEAD- X

10. EV CHARGING SYSTEM

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

- CPWD General Specification for Electrical Work Part I Internal 2023 as amended up to date.
- CPWD General Specification for Electrical Work Part II External 2023 as amended up to date.
- National Building Code 2026
- Central Electricity authority
- Ministry of Power's guidelines
- Relevant standards of the Bureau of Indian Standards
- Maharashtra Electric Vehicle policy 2025 as amended up to date.

The SCOPE OF WORK includes: -

Planning, Design, Preparation of drawing & supply, installation, testing and commissioning as per BOQ/agreement & CPWD Specification .

AC Charger (Mode -3)

j) Supply, Installation, Testing and commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc.
k) Light EV AC Charger (Mode-3) Power : 7 kW,
l) Input power supply: 1phase 230 +10% Volt,
m) Output supply: 230 Volt AC,
n) Frequency:50 Hz +/-3%,
o) Operational temperature range : -25 to 55 degree C (outdoor), -5 to 55 degree C(Indoor)., RH upto 95%,
p) Charging Device as per IS-17017-22-1 EV-EVSE Communication: as per relevant IS Codes, Bluetooth Low Energy,
q) one Charge Point Plug/ Socket as per IS-60309 and IS-17017-2,
r) Vehicle Inlet/ Connector As per EV manufacturer, suitable for 2 Wheelers and 4-wheelers.
s) Indoor use: at least IP41;
t) Outdoor use: at least IP44.
u) Mechanical Strength :protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.O/L,S/C protection.
v) Insulation Resistance > 1 M Ω.
w) Cable Length: 7.5 m.
x) RCD having a rated residual operating current not exceeding 30 mA;
y) Separate RCD for multiple outputs.
z) Telecommunication port of the EV supply equipment according to IS 13252 (Part 1) : 2010. OCPP (Open charge point protocol) 1.6J upgradable to ocpp 2.0.

aa) Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.

DC Charger (Mode -1)

(i) Supply, Installation, Testing and commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc.
(ii) Parkbay DC Charger (Mode-3)
(iii) Power Level 2: Normal Power ~24 KW and above,
(iv) 3 phase 415VAC(-40% to +20%),
(v) Frequency:50 Hz +/-5%,
(vi) output supply: DC 12/24 Volt,
(vii) Operational temperature range : -25 to 55 degree C (outdoor), -5 to 55 degree C(Indoor),
(viii) RH upto 95%,
(ix) Charging Device as per Device/protocol: IS-17017-23, EV-EVSE Communication as per IS-17017-24 ,ISO-15118,
(x) Infrastructure Socket as per IS-17017-2-2/3,
(xi) Vehicle Connector as per IS- 17017-2-3
(xii) Vehicle Inlet/ Connector As per EV manufacturer, suitable for 4 wheelers.
(xiii) Indoor use: at least IP41;
(xiv) Outdoor use: at least IP44.
(xv) Mechanical Strength :protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.
(xvi) O/L,S/C protection.
(xvii) Insulation Resistance > 1 M Ω.
(xviii) Cable Length: 7.5 m.
(xix) RCD having a rated residual operating current not exceeding 30 mA;
(xx) Separate RCD for multiple outputs.
(xxi) Telecommunication port of the EV supply equipment according to IS 13252 (Part 1) : 2010.
(xxii) OCPP(Open charge point protocol) 1.6J upgradable to OCPP 2.0.
(xxiii) Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.

The Firm shall be required to supply, erect, test and commission app-based electric vehicle Charging Stations (EV CS) for four-wheelers at the premises.

All associated electrical works and equipment required for installation of app based electric vehicle charging station of AC type including laying of cable from metering to LT panel and from LT panel up to the EV Charging Station.

App-enabled EV CS shall be as per the latest technology available in the market for EV charging stations and shall inter-alia, include recording, billing and payment related facility. The app has to be compatible and available for both Android and iOS. Contractor shall put

the Standard Operating Procedure (SOP) for operating the Charging Station through the app on the EV CS.

The Contractor shall be responsible for availing electricity connection and separate Metering for the EV Charging System. In this regard, the Contractor shall be responsible for submission of all forms and compliance of all formalities with the concerned distribution Licensee. Contractor should get inspection done & obtain approval from Central Electrical Authority/Maharashtra State Electrical Inspectorate as the case may be.

Provision for Electrical supply of 3-Phase, 415 Volts including providing LT metering panel, supply and laying LT cable, as per the line item of work, EV charging station and its associated civil works.

The Contractor must ensure that Indian Electricity Act, 2003- any rules/amendments pertaining to EV Charging Stations are followed

The Contractor shall provide 03 years Original Equipment Manufacturer's (OEM's) Comprehensive on-site warranty for supplied materials.

Appropriate Fire Protection & safety equipment and facilities as per applicable guidelines, if any, and/or Prudent Industrial Practices in place for the setting up of EV CS.

Test reports related to Safety functions verification, Mechanical Stability, Climatic Environment, EMC verification, Electrical System etc. should necessarily be part of the type tests conducted on EV CS and shall be provided by contractor.

All the EVC points / stations shall be designed, installed, tested, certified, Inspected and connected in accordance with provisions as per prevailing Electricity Act & Rules, guidelines etc. issued by Central Electricity Authority, BIS & all the other competent Govt. authorities

The charging device i.e. charger shall be certified by a nationally recognized testing laboratory such as National Accreditation Board for Testing & Calibration Laboratory NABL.

Use of EVSE integrated with IOT based safety devices can be insisted upon in Consultation of Electrical authorities at this stage.

Suitable Earthing system shall be provided for the EV CS.

The charger must support RFID, QR Code etc. As mentioned, or any other proven technology for authenticating the user availing charging services at the charging station. The flow of the authentication, payment etc. shall be suitably designed to provide user friendly customer interfaces.

Communication: The EV CS shall be enabled with suitable data communication protocol for communicating to an external location and shall be suitable for remote monitoring and control. Battery backup for minimum 30 minutes for the control system and billing unit to enable activities such as billing to be provided. Interfacing the EV CS with Network/System shall be in the scope of firm.

The EV CS shall have the suitable provision for Local Metering & billing system and communication with remote Monitoring System

Network Connection: 2G / 3G/ 4G, 5G GSM, Optional Wi-Fi

The separate Electrical panel complying IEC 61439 shall be provided for receiving and distribution of power supply to EV charger i/c cable, metering devices and other required

List of Approved Makes for Electrical Works

List of Preferred make sub head wise		
S No	**Items**	**Make**
SH-I Electrical Installation		
1	PVC insulated FRLSH copper conductor single core cable	Finolex/Havells/ RR Kabel
2	Co-axial TV cable	LK/ Havells / Finolex
3	PVC (HMS)/MS Conduit and ISI marked accessories	AKG/ BEC/ NIC/ Steel kraft/ RMCON/Pressfit
4	Raceway	Legrand/ MK (Honeywell)/ OBO BETTERMAN
5	Modular Switch & Socket/ USB charger/ Telephone socket/ TV socket/ Fan Regulator	Legrand (Arteor)/ MK Honeywell (Aspect) /Havells (Murano) /North West (Artisa)
6	PVC Tape	Anchor/ steel grip/ 3M
7	Anchor fastener	As per Civil make list
8	Fan Box (with rod & hook assembly)	Cast iron / GI Continuously welded
9	1.1KV Grade XLPE Power Cable	Finolex/ Havells/ RR Kabel
10	1.1KV Grade Fire survival cable	Finolex / Havells/ RR Kabel /KEI /Polycab
11	33or11KVGradeXLPE Power Cable	Finolex/ Kenter/ Havells/ RR Kabel /KEI /Polycab
12	Cable Lugs and Gland	Commet/ Gripwel/ Dowell/Raychem
13	Cables (Control, Signal & communication, Coaxial, PA system cable)	Finolex/ Kenter/ Havells/ RR Kabel/KEI /Polycab
14	GI Perforated Cable Tray	Slotco/ Apex/ Indiana/ Steelways/ Pilco/ AKG/ RMCON / Prefab Axis
15	Jointing Kit/Termination	Raychem/ ABB/M seal/3M
16	UPVC/HDPE Pipe/DWC	Duraline/ NOCIL/ Rex/ Jain Irrigation/ Finolex/ Kisan /AKG
17	AC/DC Electric Vehicle Charger	Panasonic / Legrand/ABB/SCHNEIDER/ SIEMENS/Servotech / Havells
18		Any reputed make having ICAO (International

	Aviation Obstruction Lights	Civil Aviation Organisation) and FAA (Federal Aviation Agency) compliance.
19	String Combiner Box	Hensel/ Schneider
20	Current Transformer (Cast Resin)	AE/ LK/ Kappa/ABB / SIEMENS
21	Digital Voltmeter/ Ammeter/ Multi-function meter	Schenider- conzerv/ AE/ LK/ABB/ SEIMENS
22	Rubber insulating Mat	Tata rubber/ Padam prabhu/ Voltech /India/Jyoti /Deep Jyoti/Vardhman
23	Capacitor /Reactor/ Thyristors	LK/ Schneider/ Siemens/ Ducati
24	APFC Relay	LK/ Siemens/ Schneider/ Ducati
25	Ceiling fan/Exhaust fan/kitchen fresh air/wall fan	Crompton/ Khaitan/ Usha/ Orient/ Bajaj / Atomberg
26	Exit Sign	Prolite/ Autoglo/ Cooper/ Lifeguard/Valantino
27	LED Indoor Luminaries	Wipro / Regent / LT / Signify
28	LED Decorative light Luminaries/ Wall bracket	Wipro / Regent / LT / Signify
29	LED Street Light/Outdoor Fittings/ Bollards	LT / Kesslec/ Twinkle Lux-Max/ Klite/Wipro
30	Octagonal GI Pole	Bajaj/ Volmont/ Transrail/Philips
33	Occupancy Sensors for Light control	ABB/ Honey Well/ Schneider/ Siemens/Lutron / Legrand
34	Lightning protection system	CAPE Electric / ABB-FURSE /OBO/DEHN
41	PVC conduit	Supreme/Prince/AKG/OBO Betterman/Astral
2	LT Bus Trunking, Rising Mains, Tap off Boxes and accessories	LK/Schneider/ Legrand /C&S
5	Air Circuit Breaker	LK (U-Power Omega)/ABB (EMAX2)/ Siemens (3WL)/ Schneider Electric (Master Pact NW)/ Legrand (Dmx3)/BCH
6	Overload Relay/ Timer/ Power Contactor – AC 3 rating / capacitor duty contactor/ starter / Thyristor module / Harmonic reactors.	Siemens/Schneider/ABB/LK
7	Protection Relays	GE/Schneider/ABB/LK
8	Indicators /Push Buttons	Schneider/ Siemens/ LK/ ABB

9	Panel Meters/other Accessories	Schneider/Siemens/LK/AE/ABB
10	Soft starters	Siemens/Schneider/ABB/Honeywell/LK
11	CT, PT	Kappa/AE/G&M/ABB /SIEMENS
12	Equipment Mounting Accessories for DG set/ Transformer	As per Equipment Manufacturer's Practice
13	MCB, RCCB	Legrand (DX3)/LK(AU)/Siemens (Beta gard)/Schneider (Acti-9)/ABB (SB-200M)/BCH
14	MCCB	ABB (T Max)/ Siemens (3VA) (3WL)/Schneider (Compact NSX)/ LK (D-Sine) /Legrand (DPX3)/BCH
15	MCB DB	Legrand (Ekinox3)/ LK(AU)/Siemens (Betagard)/ Schneider (Acti-9) /ABB(Itus)/BCH
16	MV Electrical Panels(TTA Panels)	Peaton Electrical Company Ltd / ABAK / Pristine / Adlec / Tricolite / Advance Panels & Switchgear Pvt Ltd Haridwar / Sterling Generator Pvt Ltd
17	Bus Bar aluminium/Copper	Hindalco/ Nalco
18	MV Electrical panel/Feeder Pillar/Distribution panel	Peaton Electrical Company Ltd / ABAK / Pristine / Adlec / Tricolite / Advance Panels & Switchgear Pvt Ltd Haridwar / Sterling Generator Pvt Ltd
19	Automatic Transfer Switch	ABB/Schneider/Eaton/Socomec
20	CSS/Packaged SS/ AHF	ABB/Schneider/Seimens Note-Panel shall be tested at OEM manufacturing plant.
Water Supply System		
1	**Water supply, STP, Drainage, Submersible pumps**	Kirlosakar/Beacon/KSB/Grundfoss/ Wilo/ Armstrong/Mather & Platt / Xylem
2	BALANCING VALVE /Ball Valve / CI Sluice Valve / Butterfly Valve/ Check Valve/ Non-Return Valve	Audco/Advance/Kirloskar/Tyco/Victaulic/ Belino/Castle
3	Hydro pneumatic system with control panels	Grundfoss / Xylem (Lowara)/ WILO
4	PLC System	Schneider/ Siemens/ ABB/ GE/ Honeywell/ Mitsubishi
5	Pressure Gauge	H Guru/ Wika/ Waree
6	Pressure Switch	Indfoss/ Switzer/wika

7	Level Switch	Sapcon/ Levcon/ Techtrol
Water Supply System		
1	**Water supply, STP, Drainage, Submersible pumps**	Kirloskar/Beacon/KSB/Grundfoss/ Wilo/ Armstrong/Mather & Platt / Xylem
2	BALANCING VALVE /Ball Valve / CI Sluice Valve / Butterfly Valve/ Check Valve/ Non-Return Valve	Audco/Advance/Kirloskar/Tyco/Victaulic/ Belino/Castle
3	Hydro pneumatic system with control panels	Grundfoss / Xylem (Lowara)/ WILO
4	PLC System	Schneider/ Siemens/ ABB/ GE/ Honeywell/ Mitsubishi
5	Pressure Gauge	H Guru/ Wika/ Waree
6	Pressure Switch	Indfoss/ Switzer/wika
7	Level Switch	Sapcon/ Levcon/ Techtrol
SH- II Solar Power Plant		
1	Material for Structure	Tata/Jindal Hissar/Sail
2	Power Conditioning Unit (PCU)	SMA(Germany)/Delta/Schneider Electric/ABB/Sungrow
3	Solar Pv Panel	Vikramsolar/Adani/Tata solar/BHEL
4	ACDB	As per OEM
5	Solar Module	Tatasolar/BHEL/Vikram/Adani/ Waaree
6	Solar inverters	Delta/SMA/Schneider/Sungrow
7	Data logger	Compatible to inverter
8	Industrial PC for data monitoring	HP/Dell/IBM
9	MCB	As per make list of Electrical Installations SH-1
10	MCCB	As per make list of Electrical Installations SH-1
11	DCDB	Hensel/Honeywell/Sungarner
12	DC cable (modules to inverter)	Finolex/Polycab/KEI/Havells/Anchor/Rallison
13	AC cable (inverter to MCCB)	As per make list of Electrical Installations SH-1
SH- III Lifts in Residential tower		
1	**Lifts**	The OEM shall be selected as per guidelines of CPWD vide OM no. महानिदेशक/अधी¢णअभियंता(वै)टास/ पीपीपी-एमआईआईऑड[र / 22 दिनांक28/09/2020.
		The agency have to give at least three options of the OEM as per above guidelines for lift

		and the department shall approve any one of them.
SH- IV Uninterruptible Power Supply (UPS)		
1	UPS	Liebert (Emerson)/ Schneider (APC)/ Fuji/ Numeric/Siemens/Eaton / Labotech
2	SMF Battery	Exide/ Amaron/ Okaya
3	Precision and Air conditioning system	Emerson/ Vertiv/Schneider/Clivet/Flakt
SH-V Firefighting, Sprinkler and Fire Extinguisher system		
1	Diesel Engine	Cummins / Kirloskar/ Ashok Leyland/ Mather platt/ Cater Pillar/Perkins
2	Diesel Engine Alternator	Siemens/ Kirloskar/ ABB/ Mather platt/ Stamford/Crompton/Leroy Somer
3	Fire water Main pump set– Hydrant system, Sprinkler system, Water curtain system	Kirloskar/ Wilo/Mather Platt/ Beaconweir/ Xylem/ KSB/ Grundfos
4	Electrical Motor	ABB, Bharat Bijlee/ Kirloskar Electric Co./Siemens India Ltd /Crompton Greaves Ltd/ Havells
5	Thermal insulation for exhaust pipe	UPTwiga/ Lloyd Insulation/Owens Corning/ Kimmco
6	M.S. Pipes	SAIL/Tata/ Jindal Hissar
7	M.S. Fittings	UNIK/Supreme/TATA
8	Anchor Fastener, Clamps, Pipe hangers support	As per civil make list
9	Welding Rods	Advani/LK/ESAB/Manglam /Ador/Essar
10	Structural Steel	Tata/ SAIL/ Jindal Hissar
11	Single/ Double Headed Landing valve/ First Aid Hose Reel and Drum/ Hose Box (External) Stainless steel	Safex/ Lifeguard/ Omex/ Tyco/ Ceasefire/ Minimax/ Getech/ Newage (surendernagar)/Kalpex
12	Installation Control Valve/ Deluge Valve	Safex/ Tyco/HD/ Victaulic/ Ceasefire/ Minimex/ Newage (surendernagar)/ Kalpex
13	FK-5-1-12 Or Equivalent Gas Cylinder	Dupont/ 3M/ Synergy/ Corpusa/
	Filled Listed And CCOE Approved	Honeywell/Siemens/Sevo/ Viking
	(Seamless Cylinders Duly Approved By PESO/CCOE)	Minimax/Kalpex
14	Sprinkler Heads	Tyco/ HD/ Victaulic/ Rapid Drop/ Lifeguard/ Viking/ Omex/ Newage (surendernagar)/

		Kalpex
15	Sprinkler Panel, Curtain system Panel	Tyco/ Honeywell / HD/ Victaulic/ Notifire
16	Stainless Steel Branch Pipe with nozzle	Safex / Lifeguard/ Omex/ Tyco / Ceasefire/ Minimex/ Getech/Newage (surendernagar)/ Kalpex
17	Sluice Valves	SANT/Advance/ Audco/ Kirloskar/ Zoloto
18	Butterfly (manual, gear operated) Valves	Audco/ Advance /Sant/Kirloskar/ Zoloto
19	Non-Return Valves	Audco/ Advance/ Sant / Kirloskar/ Zoloto
20	Tamper switch for Butterfly Valve	Honeywell/ Potter/ Rapid Control/ System Sensor /Pacific Fire
21	Ball Valves	Sant/ Castle/ Advance/ Audco /Leader
22	Globe Valve	Sant/ Honeywell/ Castle/Audco/Leader
23	Foot valve with strainer	Kirloskar/ Normex/ Kartar
24	Air Release Valve	Sant/ Leader/ Kartar/Zoloto
25	Y- type Strainer	Emerald/ Sant/ Kartar / Advance/ Audco/ Zoloto
26	Air vessel	Nema/ Zenith/ Lifeguard
27	Pressure Release Valve	Newage/ Cla-Val/ Tyco/Viking
28	Pressure Switch	Danfoss/ Indfos/ Viking/ Delta Control/ System Sensor
29	Pressure Gauge	Feibig/ H.Guru /Emerald
30	Flow Test Meter	Viking / Global Vision/ Eureka Forbes/ Fabri-Tek Equipments Pvt Ltd./ Gerand
31	Hose Coupling	Safex/ Minimax/ Lifeguard/ Omex/ Ceasefire/ Tyco/Kalpex
32	2-way/4-wayFirebrigade connection	Getech/ Safeguard/Omex/Lifeguard/Kalpex
33	Alarm Control Valve, Installation Control Valve	Tyco/HD/Viking/Omex
34	Zone Control Valve(ZCV)	Tyco/Viking/ HDFire/Reliable
35	Sprinkler flexible pipe(UL listed only)	HD Fire/ Tyco/ Safex / Minimax/ Lifeguard /Omex
36	Sprinkler annunciation panel	Minilec/ Alan/PCD Linovate Global/ Agni Fire
37	Water flow switch	Honeywell/Johnson Controls/ Siemens
38	Anti-Vibrating Mounting pads, Expansion Joints	Dulop/ Resistoflex/ Easy flex/ Flexionics/ Vimpa
39	Circuit integrity cables for fire alarm, voice evacuation,	Caliplast /KEI/ Beldon/Polycab

	suppression	
40	Anti Vibration Mounting	Dunlop /Resisto flex/ Easy flex
41	Sealing Compound	As per civil make list
42	Pipe Protection Pypcoat (AW4) Wrapping	IWL/Taxa/ Mac- poly coat
43	Rubber Bellow	Kanwal Industrial Corporation / Resistro flex / AIP Valves
44	Fire Sealant/ Fire Retardant Paint	As per civil make list
45	Control Valve (PID)/2way, 3way valve with proportionate thermostat	Danfoss /Honeywell/Johnsons Control /Belimo/ Flowcon
46	Motorized Butterfly Valve/ Modulating Valve/Solenoid Valve	Advance/ Danfoss /Belimo/Johnsons Control/ /Tyco/ Vicatulic/ Honeywell
47	Fire extinguishers	Safex/Ceasefire/Minimax/Lifeguard/
		Omex/Kalpex
48	Gas suppression system integrator (All components shall be UL listed)	Ceasfire/Minimax/Lifeguard/Newage/Kalpex
49	MS Forged fitting/accessories	VS/Sant
Sub-Head-VI, Addressable Fire Alarm System		
1	Addressable Fire Alarm Control Panel	Edwards-EST4/Honeywell-Notifier / Siemens-Desigo/ Bosch – Avenar
2 2	Addressable Multi criteria Smoke Detectors With base / Addressable Duct Type Smoke Detectors With base/ Fault Isolator with base/ Addressable Heat Detectors with base/ Addressable beam detector/ Addressable Manual Call points / Addressable Control Module / Addressable Monitor Module / Sounder/ Hooter cum Strobe/ Fire Alarm Control Panel/ PA System Panel/ Telephone Jack / Hand Set/ Software/ Speaker	Edwards-EST4/Honeywell-Notifier / Siemens-Desigo/ Bosch – Avenar
3	Public address components like Amplifiers, Gooseneck microphone, speakers.	Bosch/ Honeywell / Harman -JBL / Bose

4	Computer and server for BMS/FAS/CCTV/SCADA etc	IBM/HP/Lenovo/Dell
5	Monitor stand TV	LG/Samsung/Sony/Panasonic
6	Printer	TVS/ Epson/HP /Canon /Brother.
Intercom System		
1	IP-PBX/EPABX system/IP Phone(whichever applicable)	Tadiran/ Polycom/ Avaya/Alcatel/ Cisco/MATRIX
2	Server	Dell/HP/IBM/Lenovo
3	Cat 6A UTP Cable/ UTP patch cord/CAT 6A/I/o/ Jack panel/LIU/ Faceplate/ Fiber cables	Siemon/ Systimax/ Commscope/ Beldon/ Molex Panduit/ Derwiser/Genius Network/legrand
4	Rack	Rittal/ APC/APW/ Valrack/Netrack
5	Wi-Fi System	Cisco/Juniper / Extreme/ Alcatel/Ruckus /Netgear
6	Telephone wire	Legrand / Delton / Panduit/ Molex/Commscope/Belden/Systimax
SH-VII Diesel Generating Set		
1	Power Generating Engine	Cummins / Caterpillar/ Perkins
2	Alternator	Stamford/Crompton/Leroy Somer
3	AMF Panel	OEM/ OEA of Gen Set
4	Protection Relays & CT'S	As per main equipment Manufactures standard/ AE/ Crompton/LK/ Siemens/ Salzer
5	Battery	Exide/ Amaron/ Okaya
6	Sound Proof Enclosure	OEM of DGSET
7	Anti Vibration Pad	Cori/ Dunlop / Easy flex/ Flexionics / Resisto flex / Emerald
8	IP 68 Bus trunking	EAE/Legrand/Schneider
9	PLC system	ABB/Siemens/Schnieder
SH-VIII HVAC System		
1	Split Type AC	Daikin/ Mitusbishi/ O-General
3	Refrigerant Piping	Mandev / Mexflow/ Rajco/ RR Shramik
4	Nitrile Rubber	Armaflex/ Aerocell/ ALP
5	PPR Pipe	Jindal/ Astral/Apollo/Supreme
SH- IX CCTV and Intercom System		
1	CCTV cameras (All the cameras must have STQC Certificate)	Avigilon/ Axis/ Mobitix/ Bosch/Impulse/matrix

2	NVR	Avigilon/ Axis/ Mobitix/ Honeywell Enterprises / Bosch/Impulse/MATRIX
3	PoE Switches Layer 2/3	Cisco/ Juniper/ Arista/ Alcatel/ Netgear
4	Work stations	IBM/ Lenovo/ Dell/ HP
5	LED Display	Sony/ Samsung/ LG
6	VMS Software, ANPR software, Face recognition software	Avigilon/ Axis/ Mobitix/ Honeywell Enterprises / Bosch/Impulse
7	VMS Server/ Network video Recorder/ ANPR & FRS storage	Avigilon/ Axis/ Mobitix/ Matrix / Bosch/Impulse
8	Data Racks	Rittal/ APC/APW/ Valrack
9	Computer and server for BMS/FAS/CCTV/SCADA etc	IBM/HP/Dell
10	Monitor stand TV	LG/Samsung/Sony
11	Printer	Epson/HP /Canon /Brother.
12	Face Plate	Siemon/Systimax/ Beldon/Molex/Panduit/ Derwiser
13	Video door phone	Panasonic/ Alba urmet/CISCO
14	Fiber Equipment (Cable, Patch Cord & LIU.)	Siemon/Systimax/ Beldon/Molex/Panduit/ Derwiser
15	Networking rack	Rittal/APC/APW/Valrack/ Derwiser
16	AccessLANSwitchL-3/2	Cisco/ Juniper/ Arista/ Alcatel/ Netgear
17	SFP+ Modules	Cisco/ Juniper/ Arista/ Alcatel/ Netgear
18	Work stations and Servers for ITAM/ IP-PBX etc	IBM/Dell/HP
19	ITAM (for asset inventory management)	Arista/Juniper /Palo-alto/ F5 Networks/Cisco/ Nexxus
20	OFC Cable	Siemon/Systimax/Beldon/Molex/Panduit/ Derwiser
SH-X EV charging system		
1	AC/DC Electric Vehicle Charger	Panasonic / Legrand/ABB/SCHNEIDER/ SIEMENS/Servotech / Havells

NOTE:-

- The model numbers mentioned, If any, are only indicative. The firm will be required to provide items/material as per the specifications indicated herein. The department reserves the right to accept items/materials with richer specifications as available in the market/ with manufacturer due to technological upgradations/ model updation, without any extra cost implication with the approval of Engineer in charge.
- If any make is not mentioned in list of makes of a particular Sub Head, makes mentioned in any other sub head shall be applicable.

- Material bearing ISI/BIS certifications BEE mark shall be used in the work, where articles of different designs/ makes bearing ISI/BIS certifications are available
- Where material bearing ISI/BIS certifications marks are not available, material conforming to relevant BIS/ISI/international standard shall be used with prior approval of Engineer-in-Charge. The decision of Engineer-in-Charge about the design/ make to be used in the work shall be final & binding on the agency.
- If the specifications and preferred make of any item are not available then the decision of the Engineer-in-Charge regarding quality standard and make shall be final & binding on the agency. All materials to be used at site shall be got approved from Engineer-in-Charge (Electrical) before using at site.
- It is presumed that all OEM's included in the preferred make list must possess valid CM/L No. from the appropriate authority. Additionally all products and makes must be BIS compliant, wherever applicable as per relevant IS code and specifications. In absence of this requirements no product shall be allowed to be used in this work.
- Prior approval of the NIT approving authority is mandatory for use of any of the product/make at this work irrespective of their inclusion in the above preferred make list.

SCHEDULE OF QUANTITIES

Name of Work :- Construction of 58 nos.Type -III & 30 nos. Type-IV Residential Quarters and 28 nos. Guest Rooms including all internal & external Civil, Electrical & Mechanical Services, Development Works etc. for SIB at Mahim, Mumbai.

Sr.N	Description of Items	Unit	Qty	Rate	Amount
	SH-I - Internal EI				
1	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS/HFFR PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm. FRLS/HFFR PVC insulated copper conductor single core cable etc as required.				
1.1	Group A	Each	3078.00	1189.00	3659742.00
1.2	Group B	Each	1380.00	1362.00	1879560.00
2	Wiring for twin control light point with 1.5 sq.mm FRLS/HFFR PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, 2 way modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm. FRLS/HFFR PVC insulated copper conductor single core cable etc as required.	Each	97.00	1803.00	174891.00
3	Wiring for light/ power plug with 2X4 sq. mm FRLS/HFFR PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit along with 1 No 4 sq. mm FRLS/HFFR PVC insulated copper conductor single core cable for loop earthing as required.	Mtr	9300.00	373.00	3468900.00
4	Wiring for light/ power plug with 4X4 sq. mm FRLS/HFFR PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit along with 2 Nos 4 sq. mm FRLS/HFFR PVC insulated copper conductor single core cable for loop earthing as required.	Mtr	4020.00	587.00	2359740.00
5	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FRLS/HFFR PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required				

5.1	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	Mtr	4900.00	267.00	1308300.00
5.2	2 X 6 sq. mm + 1 X 6 sq. mm earth wire	Mtr	400.00	482.00	192800.00
5.3	2 X 10 sq. mm + 1 X 6 sq. mm earth wire	Mtr	100.00	621.00	62100.00
5.4	2 X 16 sq. mm + 1 X 6 sq. mm earth wire	Mtr	100.00	832.00	83200.00
5.5	4 X 6 sq. mm + 2 X 6 sq. mm earth wire	Mtr	200.00	813.00	162600.00
6	Supplying and drawing following sizes of FRLS/HFFR PVC insulated copper conductor, single core cable in the existing surface/ recessed steel/ PVC conduit as required.				
6.1	3 x 1.5 sq. mm	Mtr	300.00	104.00	31200.00
6.2	6 x 1.5 sq. mm	Mtr	300.00	195.00	58500.00
6.3	3 x 4 sq. mm	Mtr	500.00	222.00	111000.00
6.4	6 x 4 sq. mm	Mtr	500.00	424.00	212000.00
7	Supplying and drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in the existing surface/ recessed steel/ PVC conduit as required.	Mtr	8800.00	54.00	475200.00
8	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
8.1	20 mm	Mtr	21200.00	151.00	3201200.00
8.2	25 mm	Mtr	800.00	168.00	134400.00
8.3	32 mm	Mtr	500.00	209.00	104500.00
8.4	40 mm	Mtr	500.00	257.00	128500.00
9	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
9.1	TV antenna socket outlet	Each	116.00	168.00	19488.00
9.2	Bell push	Each	116.00	159.00	18444.00
10	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required.	Each	698.00	402.00	280596.00
11	Supplying and fixing modular blanking plate on the existing modular	Each	500.00	47.00	23500.00

	plate & switch box excluding modular plate as required.				
12	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 amps modular socket outlet and 5/6 amps modular switch, connection etc. as required. (For light plugs to be used in non residential buildings).	Each	1408.00	545.00	767360.00
13	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 & 15/16 amps modular socket outlet and 15/16 amps modular switch, connection etc. as required.	Each	1611.00	659.00	1061649.00
14	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providng and fixing 2 Nos. 3 pin 5/6 A modular socket outlet and 2 Nos. 5/6 A modular switch, connections etc. as required. (For light plugs to be used in non residential buildings).	Each	413.00	757.00	312641.00
15	Supplying and fixing extra down rod of 10 cm length G.I. pipe, 15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	Each	500.00	53.00	26500.00
16	Supply of exhaust fan of following sizes of Minimum 1200 RPM etc complete as required				
16.1	225-250 mm PVC Body	Each	269.00	1768.00	475592.00
16.2	300 mm Metal body	Each	123.00	2652.00	326196.00
17	Installation of exhaust fan in the existing opening, including making good the damage, connection, testing, commissioning etc. as required.				
17.1	Upto 450 mm sweep	Each	392.00	556.00	217952.00
18	Supplying & fixing suitable size GI box wih modular plate and cover in front on surface or in recess including providing and fixing 25 A modular socket outlet and 25 A modular SP MCB, “C” curve including connections, painting etc. as required.	Each	702.00	807.00	566514.00
19	Supplying and fixing PVC batten/ angle holder including connections etc. as required.	Each	470.00	132.00	62040.00

20	Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 volts, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)				
20.1	4 way (4 + 12), Double door	Each	141.00	4377.00	617157.00
20.2	8 way (4 + 24), Double door	Each	141.00	6337.00	893517.00
21	Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 volts, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 amps tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCB's (but without MCB's and incomer) as required . (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.)				
21.1	8 way (4 + 24), Double door	Each	7.00	10724.00	75068.00
21.2	12 way (4 + 36), Double door	Each	7.00	13512.00	94584.00
22	Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
22.1	Single pole	Each	5076.00	285.00	1446660.00
23	Providing and fixing following rating and breaking capacity and pole MCCB in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required.				
23.1	100 Amp, 16 KA, TPMCCB	Each	14.00	4003.00	56042.00
24	Supplying and fixing following rating, four pole, 415 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
24.1	40 amps	Each	213.00	1049.00	223437.00
24.2	63 amps	Each	249.00	1115.00	277635.00
25	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	Each	400.00	14.00	5600.00
26	Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following triple pole and neutral, sheet steel, MCB distribution				

	board, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.				
26.1	For 4 way, Double door TPN MCBDB	Each	141.00	1177.00	165957.00
26.2	For 8 way, Double door TPN MCBDB	Each	148.00	1448.00	214304.00
27	Supplying of XLPE insulated and PVC sheahed / XLPE power cable of 1.1 KV grade as per IS 7098 of following size etc complete as required				
27.1	3.5 X 300 sq.mm Al. Armoured cable	Mtr	750.00	4405.00	3303750.00
27.2	3.5 X 240 sq.mm Al. Armoured cable	Mtr	375.00	3552.00	1332000.00
27.3	3.5 X 120 sq.mm Al. Armoured cable	Mtr	500.00	1889.00	944500.00
27.4	3.5 x 50 Sq. mm Al. Armoured cable	Mtr	500.00	873.00	436500.00
27.5	3.5 x 35 Sq. mm Al. Armoured cable	Mtr	1125.00	655.00	736875.00
27.6	3.5 x 25 Sq. mm Al. Armoured cable	Mtr	1125.00	507.00	570375.00
27.7	4 x 10 Sq. mm Copper Armoured cable	Mtr	2912.00	1852.00	5393024.00
27.8	4 x 6 Sq. mm Copper Armoured cable	Mtr	6422.00	1113.00	7147686.00
28	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL pipe as required.				
28.1	Upto 35 sq. mm	Mtr	50.00	47.00	2350.00
28.2	Above 35 sq. mm and upto 95 sq. mm	Mtr	50.00	72.00	3600.00
28.3	Above 95 sq. mm and upto 185 sq. mm	Mtr	50.00	97.00	4850.00
28.4	Above 185 sq.mm and upto 400 sqmm.	Mtr	50.00	170.00	8500.00
29	Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on wall surface as required.				
29.1	Upto 35 sq. mm (clamped with 1mm thick saddle)	Mtr	11534.00	64.00	738176.00
29.2	Above 35 sq. mm and upto 95 sq. mm (clamped with 25x3mm MS flat clamp)	Mtr	450.00	151.00	67950.00
29.3	Above 95 sq. mm and upto 185 sq. mm (clamped with 25/40x3mm MS flat clamp)	Mtr	450.00	180.00	81000.00
29.4	Above 185 sq. mm and upto 400 sq. mm (clamped with 40x3mm MS flat clamp)	Mtr	1075.00	271.00	291325.00

30	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.				
30.1	3½ X 25 sq. mm (28mm)	Each	30.00	371.00	11130.00
30.2	3½ X 35 sq. mm (32mm)	Each	30.00	437.00	13110.00
30.3	3½ X 50 sq. mm (35mm)	Each	20.00	484.00	9680.00
30.4	3½ X 120 sq. mm (45mm)	Each	10.00	710.00	7100.00
30.5	3½ X 240 sq. mm (62mm)	Each	10.00	1160.00	11600.00
30.6	3½ X 300 sq. mm (70mm)	Each	10.00	1336.00	13360.00
30.7	4 X 10 sq. mm (25mm)	Each	90.00	325.00	29250.00
31	Supply,Installation , testing and Commissioning of Octagonal Pole 7.5 M hot dip galvanized with double arm tilted bracket at 120 degree / 90 degree / linear etc as per decision of engineer incharge The pole top dia shall be 70mm and bottom dia to be 130mm with sheet thickness of 3mm. The base plate to be 220x220x16mm. There shall be no circumferential welds or joints, and the complete pole must in a tapered manner. The pole shaft structure shall be hot dip galvanized through single dip process as per ASTM A123 and minimum average coating shall not be less than 65 microns. No mechanical operation, such as welding, drilling, etc. should be carried out on the pole structure post hot dip galvanizing. The poles shall have door of about 300 mm length and shall be vandal resistance and shall be weather proof to ensure safety of inside connection as approved by the Depts. The door shall be flush with the exterior surface and shall have suitable locking arrangement with provision for connectors, MCB, etc. The pole shall be of 'composite' construction designed to withstand specified 'dead load' pertaining to the luminaire and its mounting accessories and 'wind load' corresponding to a basic wind speed of 169 kmph without any deformation or damage to the structure as per IS 875 Part 3.The pole manufacture must have ISO 9001/14001/45001 and CE certification and the same shall be attached along with tender submission.**(The Guarranty of Five years of whole item is required from OEM only)**	Each	10.00	25391.00	253910.00

32	Erection of metallic pole of following length in 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.				
32.1	Above 6.5 metre and upto 8.0 metre	Each	10.00	7178.00	71780.00
	LT panels				
33	**Non-Essential Panel**				
	Fabrication, Supplying, Installation, testing and commissioning of TTA Indoor MV Cubical Panel (IP-42) suitable for operation on 3 phase 4 wire 415 Volts 50 HZ AC supply ,floor cum wall mounted type fabricated from 2 mm thick CRCA sheet with hinged doors with knobs & locking arrangement separate compartmentalised for switch gears & rubber gasket, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade , four strip Copper bus bars of 2000 Amps rating PVC colour coded, dust and vermin proof, suitable size rain shed at top, ventillation louver covered with wire mesh, earth studs with a common copper earth bar of size 50 mm x 6 mm through out the panel at the rear, lifting hooks, suitable size angle iron stand , detachable gland plate, mounting bolt, powder coated painting with approved quality & shade synthetic enamelled paint i/c provision for connection & interconnection with suitable size & rating copper strip or single core copper conductor cable including fixing following switchgears there-in as required.				
	INCOMER				
	R/Y/B Phase Indication Lamp 230V AC - 1 No				
	Digital Multi-Function Meter, Class:1 with RS485 - 1No				
	1600/5A 15VA Class:1 CT's - 3 Nos				
	2A SP 10KA MCB - 6 Nos				
	Breaker Control Switch (TNC Switch) - 1 No				
	ON-Delay Timer - 1 No				
	Auto/Manual Selector Switch - 1 No				
	6A DP 10KA MCB - 1 No				
	1600 A FP 50KA EDO ACB Microprocessor Based Release O/L, S/C & E/F Protection, Under Voltage Release - 1 NO				

	BUS BAR				
	TPN copper bus bars of minimum of 2000 Amps. , Designed to accommodate a current carrying capacity of 1.6/Sqmm. Capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of 35 MVA (minimum)for 1 Sec. - 1 Set.				
	OUTGOING				
	5 Nos - 630A FP 50KA MCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	2 Nos - 400A FP 36KA MCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	2 Nos - 250A FP 36KAMCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	2 Nos - 63A FP 25KAMCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM	Mtr	1.00	3483252.00	3483252.00
34	**Essential Panel**				
	Fabrication, Supplying, Installation, testing and commissioning of TTA Indoor MV Cubical Panel (IP-42) suitable for operation on 3 phase 4 wire 415 Volts 50 HZ AC supply ,floor cum wall mounted type fabricated from 2 mm thick CRCA sheet with hinged doors with knobs & locking arrangement separate compartmentalised for switch gears & rubber gasket, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade , four strip Copper bus bars of 800 Amps rating PVC colour coded, dust and vermin proof, suitable size rain shed at top, ventillation louver covered with wire mesh, earth studs with a common copper earth bar of size 32 mm x 6 mm through out the panel at the rear, lifting hooks, suitable size angle iron stand , detachable gland plate, mounting bolt, powder coated painting with approved quality & shade synthetic enamelled paint i/c provision for connection & interconnection with suitable size & rating copper strip or single core copper conductor cable including fixing following switchgears there-in as required.				
	ATS Switch				

	R/Y/B Phase Indication Lamp 230V AC - 1 No				
	Multifunction Meters with 3line LED display - 1No				
	630A FP Automatic Transfer Switch with In-Built Controller				
	INCOMER				
	R/Y/B Phase Indication Lamp 230V AC - 1 No				
	Digital Multi-Function Meter, Class:1 with RS485 - 1 No				
	630/5A 15VA Class:1 CT's - 3 Nos				
	2A SP 10KA MCB - 6 Nos				
	630A FP 50KA MCCB Micro-processor Based Release O/L, S/C, EF Protection with Spreader Link, ROHM - 1 NO				
	BUS BAR				
	TPN copper bus bars of minimum of 800 Amps. , Designed to accommodate a current carrying capacity of 1.6/Sqmm. Capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of 35 MVA (minimum)for 1 Sec. - 1 Set.				
	OUTGOING				
	1 No - 315A FP 36KA MCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	4 Nos - 100A FP 25KA MCCB Thermal Magnetic Release O/L, S/C Protection with Spreader Link, ROHM				
	1 No - 80A FP 25KA MCCB Thermal Magnetic Release O/L, S/C Protection with ROHM				
	10 Nos - 63A FP 25KA MCCB Thermal Magnetic Release O/L, S/C Protection with ROHM	No	1.00	1580154.00	1580154.00
35	**Drinking water pumps Panel**				

	Fabrication, Supplying, Installation, testing and commissioning of Indoor MV Cubical Panel suitable for operation on 3 phase 4 wire 415 Volts 50 HZ AC supply ,floor cum wall mounted type fabricated from 2 mm thick CRCA sheet with hinged doors with knobs & locking arrangement separate compartmentalised for switch gears & rubber gasket, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade , four strip Copper bus bars of 150 Amps rating PVC colour coded, dust and vermin proof, suitable size rain shed at top, ventillation louver covered with wire mesh, earth studs with a common copper earth bar of size 20 mm x 5 mm through out the panel at the rear, lifting hooks, suitable size angle iron stand , detachable gland plate, mounting bolt, powder coated painting with approved quality & shade synthetic enamelled paint i/c provision for connection & interconnection with suitable size & rating copper strip or single core copper conductor cable including fixing following switchgears there-in as required.				
	INCOMER				
	R/Y/B Phase Indication Lamp 230V AC - 1 No				
	Digital Multi-Function Meter, Class:1 with RS485 - 1No				
	100/5A 5VA Class:1 CT's - 3 Nos				
	2A SP 10KA MCB - 6 Nos				
	100A FP 25KA MCCB Thermal Magnetic Release O/L, S/C Protection with Spreader Link, ROHM- 1 No				
	BUS BAR				
	TPN copper bus bars of minimum of 150 Amps. , Designed to accommodate a current carrying capacity of 1.6/Sqmm. Capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of 35 MVA (minimum)for 1 Sec. - 1 Set.				
	OUTGOING				
	3 Nos -7.5KW/10HP SDS STARTER (BOOSTER PUMP I& II)				
	3 Nos -40A TP MPCB				

	6 Nos -40A TP Contactor 230V AC with ADD-ON Block				
	3 Nos -18A TP Contactor 230V AC with ADD-ON Block				
	3 Nos - 6-10A TP Overload Relay 230V AC				
	3 Nos - Star/Delta Timer 230V AC				
	3 Nos - ON/OFF/TRIP Indication Lamp 230V AC				
	3 Nos -Start/Stop Push Button				
	3 Nos - Auto/Manual Selector Switch				
	3 Nos - 2A SP 10KA MCB				
	1 No- 63A FP 25KA MCCB				
	1 No- 63A FP 25KA MCCB Thermal Magnetic Release O/L, S/C Protection with ROHM	No	4.00	278778.00	1115112.00
	METER BOARD Panels				
36	**Meter Panel 1**				
	Fabrication, Supplying, Installation, testing and commissioning of Indoor Meter Panel suitable for operation on 3 phase 4 wire 415 Volts 50 HZ AC supply ,floor cum wall mounted type fabricated from 2 mm thick CRCA sheet with hinged doors with knobs & locking arrangement separate compartmentalised for switch gears & rubber gasket, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade , four strip Copper bus bars of PVC colour coded, dust and vermin proof, suitable size rain shed at top, ventillation louver covered with wire mesh, earth studs with a common copper earth bar of size 25 mm x 5 mm through out the panel at the rear, lifting hooks, suitable size angle iron stand , detachable gland plate, mounting bolt, powder coated painting with approved quality & shade synthetic enamelled paint i/c provision for connection & interconnection with suitable size & rating copper strip or single core copper conductor cable including fixing following switchgears there-in as required.				
	A)INCOMER				
	1 No. - R/Y/B Phase Indication Lamp 230V AC				
	1 No. - Digital Multi-Function Meter, Class:1 with RS485				
	3 Nos. - 250/5A 5VA Class:1 CT's				

	6 Nos. 2A SP 10KA MCB				
	1 No. - 250A FP 36KA MCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	BUS BAR				
	TPN copper bus bars of minimum of 350 Amps. Capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of 36 KA (minimum)for 1 Sec. - 1 Set.				
	OUTGOINGS				
	i) 15 Nos. - 40 Amps. 10 KA,TPN four Pole, MCB.				
	ii) 15 Nos- Three Phase Meter Space (Client Scope)	No.	1	480293.00	480293.00
37	**Meter Panel 2**				
	Fabrication, Supplying, Installation, testing and commissioning of TTA Indoor Meter Panel suitable for operation on 3 phase 4 wire 415 Volts 50 HZ AC supply ,floor cum wall mounted type fabricated from 2 mm thick CRCA sheet with hinged doors with knobs & locking arrangement separate compartmentalised for switch gears & rubber gasket, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade , four strip Copper bus bars of PVC colour coded, dust and vermin proof, suitable size rain shed at top, ventillation louver covered with wire mesh, earth studs with a common copper earth bar of size 25 mm x 5 mm through out the panel at the rear, lifting hooks, suitable size angle iron stand , detachable gland plate, mounting bolt, powder coated painting with approved quality & shade synthetic enamelled paint i/c provision for connection & interconnection with suitable size & rating copper strip or single core copper conductor cable including fixing following switchgears there-in as required.				
	A)INCOMER				
	1 No. - R/Y/B Phase Indication Lamp 230V AC				
	1 No. - Digital Multi-Function Meter, Class:1 with RS485				
	3 Nos. -600/5A 5VA Class:1 CT's				
	6 Nos. 2A SP 10KA MCB				

	1 No. - 630 A FP 50KA MCCB Micro-processor Based Release O/L, S/C Protection with Spreader Link, ROHM				
	BUS BAR				
	TPN copper bus bars of minimum of 800 Amps. Capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of 50 KA (minimum)for 1 Sec. - 1 Set.				
	OUTGOINGS				
	i) 40 Nos. - 63 Amps. 10 KA,TPN four Pole, MCB.				
	ii) 40 Nos- Three Phase Meter Space (Client Scope)	Nos.	2	1845264.00	3690528.00
	Drinking water pumps				
38	Design, Supplying, installation, testing and commissioning of Pump sets for domestic and flushing water supply, dewatering pumps including panel board and power supply& control cable, connection ,pipes valves, cabling, earthing etc. complete as required i/c control panels for automatic ON/OFF operation along and other incidental items required for satisfactory completion The work shall be executed complete as required to run the lift as per CPWD specifications and scope of work mentioned in NIT whichever is higher/ richer complete as required.				
38.1	Domestic vertical multistage water (10 HP/120m Head) (One set of Two pumps , 1 working + 1 stand by)	Set	2.00	288134.00	576268.00
38.2	Flushing water vertical multistage water (10 HP/120m Head) (One set of Two pumps , 1 working + 1 stand by)	Set	2.00	288134.00	576268.00
38.3	Dewatering Pump (2 HP/15m Head) (One set of two pumps , 1 working + 1 stand by) with STARTER for Both Pumps	Set	2.00	91071.00	182142.00
38.4	Terrace booster Pump(1 HP/25m Head) (One set of Two pumps , 1 working + 1 stand by) with STARTER with STARTER for Both Pumps	Set	2.00	101661.00	203322.00
	CABLE TRAYS				
39	Supplying and installing following size of perforated pre-painted M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
39.1	100 mm width X 50 mm depth X 1.6 mm thickness	Each	450.00	623.00	280350.00

39.2	200 mm width X 50 mm depth X 1.6 mm thickness	Each	450.00	775.00	348750.00
39.3	300 mm width X 50 mm depth X 1.6 mm thickness	Each	450.00	866.00	389700.00
	E A R T H I N G				
40	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	Each	16.00	8351.00	133616.00
41	Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	Each	8.00	15004.00	120032.00
42	Providing and fixing 25 mm X 5 mm copper strip in 40 mm dia G.I. pipe from earth electrode including connection with brass nut, bolt, spring, washer excavation and re-filling etc. as required.	Each	500.00	1638.00	819000.00
43	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.	Each	500.00	755.00	377500.00
44	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	Each	500.00	1246.00	623000.00
45	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	Each	500.00	287.00	143500.00
46	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.	Each	600.00	84.00	50400.00
	LIGHTNING CONDUCTOR				
47	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.	Each	6.00	609.00	3654.00
48	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)	Each	270.00	148.00	39960.00
49	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)	Each	560.00	238.00	133280.00

50	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.	Each	6.00	140.00	840.00
51	Providing and laying G.I. tape 32 mm X 6 mm from earth electrode directly in ground as required.	Each	150.00	221.00	33150.00
	Fittings and Fan				
52	LED Down lighter (SMD Type) (System lumen efficacy ≥ 120 < 135 lm/Watt) Supplying, installation, Testing & Commissioning of LED Recessed/ surface Down lighter (Round/ square/ Rectangular) SMD type of following body material with PMMA and prismatic diffuser and construction as per IS: 10322 with driver as per the requirement with Driver efficiency >85%, Operating voltage AC 140-270 Volt, frequency 50/60 hz, Operating temp range -5 deg to 40 deg centigrade, internal surge protection of 2.5 KV with Short & Open circuit protection, THD < 10% , P. F.≥0.95, IP20, CRI ≥80 , UGR (Unified Glare Rating) < 19, Flicker free (flicker should be below 5%), life time (LED, Driver & electrical circuitry), of minimum 50000 Burning Hours with 70% of initial Lumen maintained till life ends, CCT 3000°K / 4000°K / 5700°K / 6500°K (As per ANSI Bin), SDCM (Standard Deviation Colour Matching) <3, Maximum power consumption should not more than the specified rating and Fixture shall be confirming to relevant BIS standards and trade mark certificate (T.C.). Manufactures Word Mark/ Name Engraved/ Embossing/ Screen printing on housing Complete in all respect i/c external connections with 1.5 sq. mm FRLS/HFFR, PVC insulated copper conductor single core cable and earthing etc. as required with Minimum 5 year OEM warranty. System lumen efficacy ≥120 <135 lm/Watt output. LM79 & LM80 Test report and all testing required for LED fixtures as per BIS shall be submitted. Shape size and CCT shall be as approved by Engineer-in-Charge as per requirement. (Thermal management: heat sink of aluminium housing such that LED junction temperature shall not rise above 90°C). Powder coated die cast/ Extruded aluminium Body including trim				
52.1	12 -15 watt	Each	1310.00	715.00	936650.00

53	LED Batten light (System lumen efficacy ≥120 <135 lm/Watt) Supplying, installation, Testing & Commissioning of LED surface mounted Batten light of following body material and construction as per IS: 10322 with driver (Replaceable) as per the requirement with Driver efficiency >85% ,Operating voltage AC 140-270 Volt, freq 50/60 hz, Operating temp range -5 deg to 40 deg centigrade, internal surge protection of 2.5 KV with Short & Open circuit protection, THD < 10% , P. F.≥0.95, IP20, CRI ≥80, Flicker free, (flicker should be below 5 %), life time (LED, Driver & electrical circuitry), of minimum 50000 Burning Hours with, 70% of initial Lumen maintained till life ends, CCT 3000°K / 4000°K / 5700°K /6500°K (As per ANSI Bin), SDCM (Standard Deviation Colour Matching) <3, Maximum power consumption should not more than the specified rating and Fixture shall be of relevant BIS standard and trade mark certificate (T.C.). Manufactures Word Mark/ Name Engraved/ Embossing/ Screen printing on housing. complete in all respect i/c external connections with 1.5 sq. mm FRLS/HFFR, PVC insulated copper conductor single core cable and earthing etc. as required with Minimum 5 year OEM warranty. System lumen efficacy ≥120 <135 lm/Watt output. LM79 & LM80 Test report and all testing required for LED fixtures as per BIS shall be submitted. Shape size and CCT shall be as approved by Engineer-in-Charge as per requirement. (Thermal management: heat sink of aluminium housing such that LED junction temperature shall not rise above 90°C).				
	Powder coated die cast /Extruded aluminium Body (Thickness ≥ 1.20 mm)				
53.1	24-26 watt	Each	1124.00	745.00	837380.00

54	LED Street light fixture, powder coated pressure die cast aluminium body (System lumen efficacy ≥105 <120 lm/Watt) Supplying, installation, Testing & Commissioning of Street light LED fixture powder coated pressure die cast aluminium body with driver as per the requirement with Driver efficiency >85%, Input voltage: 140-270 Volt AC, freq 50/60 hz, Operating temp range -5 deg to 50 deg centigrade, internal surge protection of 5 KV L,N,E as per IEC 61000-4-5, Driver efficiency >85%, THD < 10% as per IEC 61000-3-2, P. F.≥0.95, IP-66, IK-10, CRI ≥70, under voltage and over voltage protection, EMI-EMC As per CISPR -15, lenses for beam angle as per IESNA type I/II/III as per the width of the road and the project requirement., suitable to fit in up to 65mm dia pipe, life time (LED, Driver & electrical circuitry) of minimum 50000 Burning Hours with 70% of initial Lumen maintained till life ends as per LM80 extrapolation IES TM- 21-11 report, CCT 3000°K/ 4000°K/ 5700°K/ 6500°K (As per ANS Bin), SDCM (Standard Deviation Colour Matching) <5, Maximum power consumption should not more than the specified rating and Fixture shall be of relevant BIS standard complete in all respect i/c external connections with 1.5 sq. mm FRLS/HFFR, PVC insulated copper conductor single core cable and earthing etc. as required with Minimum 5 year OEM warranty. System lumen efficacy ≥105 <120 lm/Watt output. LM79 & LM80 Test report and all testing required for LED fixtures as per BIS shall be submitted. Shape size and CCT shall be as approved by Engineer-in-Charge as per requirement. (Thermal management: heat sink of aluminium housing such that LED junction temperature shall not rise above 90°C).				
54.1	72 watt	Each	10.00	1920.00	19200.00
55	Brush Less Direct Current (BLDC) Fan without Remote Supply, Installation, Testing and Commissioning of ceiling fan with Brush Less Direct Current (BLDC) Motor, class of insulation: B, 3 nos. metal(Aluminium alloy) blades, 30 cm long down rod, 2 nos. canopies, shackle kit, safety rope, copper winding, steel/Al body Power Factor not less than 0.9, Service Value (CM/M/W) minimum as below, 350 RPM (tolerance as per IS : 374-2019), THD (Total Harmonic Distortion) less than 10%, suitable for operation with regulator for speed control and all				

	remaining accessories including safety pin, nut bolts, washers, temperature rise=75 degree C (max.), insulation resistance more than 2 mega ohm, suitable for 230 V, 50 Hz, single phase AC Ceiling Fan compliant to IS 374:2019 fan Supply, earthing etc. complete as req.				
55.1	900mm, service value ≥ 5.1 CM/Min/Watt, air delivery 130 CM/Min (Minimum)	Each	93.00	2560.00	238080.00
55.2	1200mm, service value ≥ 6.0 CM/Min/Watt, air delivery 210 CM/Min (Minimum)	Each	605.00	2695.00	1630475.00
	SH-II - Solar PV Power Generation				
	Solar Photovoltaic Power Plant				
56	Supply, Installation, Testing and Commissioning of on-grid Solar Photovoltaic Power Plant conforming to various applicable standards BIS, IEC, MNRE guidelines, the Central Electricity Authority Regulations and CPWD Specifications as amended up to date, consisting of Mono/Poly Crystalline silicon solar cells module, net metering facility, necessary control, protections, earthing, cabling, mounting structure, junction boxes, power conditioning units, Real time online web interfaced Data Monitoring System, Distribution panels, grid connecting arrangement, conduits, pipes, cable trays and other accessories etc. as required. a) High Energy Efficiency Solar Photovoltaic Module of capacity 330 Wp or above, manufactured in India, conforming to IS 14286/IEC 61215, IS/IEC 61730-Part-1, IS/IEC 61730-Part-2. Solar Photovoltaic Module conversion efficiency shall not be less than 23% at STC with temperature coefficient of Pmax better than -0.30% per degree Celsius. PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years. Solar Modules shall be designed to operate in relative humidity upto 100% with temperature between -10 Deg C and +85 Deg C. Further, each PV module used in				

	any solar power project must have Radio frequency identification tag with information such as name of manufacturer, month and year of manufacturing, country of origin (separately for Solar cell and module), I-V curve, Unique Serial No and Model No of the module, Wattage, Im, Vm and FF, name of test lab issuing IEC certificate. b) Power Conditioning Unit (PCU) of 350-800 V DC Input voltage range and 415 V AC, three phase, 4 wire, 50Hz +/- 2.5 Hz, output voltage suitable to generate AC with a variation of 10% at nominal voltage. Power with efficiency not less than 97%, total harmonic distortion less than 3% and suitable for ambient temperature from 0 to 50 degree C , Minimum IP-65 for outdoor and Minimum IP 21 for indoor, Built-in meter and data logger, MPPT, switching devices IGBT/MOSFETs and controller Microprocessor /DSP . PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown. The PCU shall be able to withstand unbalanced load conforming to IEC standard with shutdown/standby mode. It must be provided with grid islanding along with manual disconnect pole isolation switch besides automatic disconnection. Minimum protections: Mains Under/ Over Voltage, Over current, Over/Under grid frequency, Over temperature, Surge voltage induced at output due to external source, Short circuit, Lightening, Anti Islanding (for grid synch. Mode) and other protections as per applicable standards. LCD/LED display of minimum parameters: DC input voltage, DC current, AC Voltage and current (all 3 phases, in case of 3 phase), Instantaneous & cumulative AC output power, Daily DC energy produced and other parameters applicable standard. Communication interface RS 485/ RS 232.				

	c) Module mounting structure: The roof top solar plant generation units shall be installed by using supporting Aluminium/Galvanized MS structure (mass of zinc coating shall be as per IS4759) having minimum head room clearance of 2.4 meter above the terrace level / ground level. The mounting structure would be designed to sustain wind load and seismic parameter of the site of installation. All the structure shall be design as per applicable BIS code and the material shall also confirm the applicable BIS Code. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. The suitable arrangements for maintenance and cleaning shall be provided. d) Real time online web interfaced Data Monitoring System complete with accessories for various parameters such as Solar Irradiance, temperature, AC Output Voltage and current, Output Power, Power factor, DC Input Voltage and Current, Time Active, Time disabled, Time Idle, Power produced and other parameters as per standard practices.e) Array junction box & Main junction box with IP 65 protection and termination arrangement for incoming and outgoing cable along with glands, lugs and other accessories etc. as required. Each junction box shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement with High quality Suitable capacity Metal Oxide Varistors(MOVs) (semiconductor diode with resistant applied voltage)/ surge arrestors and suitable Reverse Blocking Diodes, isolation switches isolate the DC input to Inverter, copper bus bar etc.f) Lightning ,surge voltage protection, earthing protection and grid islanding.g) Cables: Connections & Interconnections by required size IR/UV protected XLPE insulated copper conductor 1.1 kV grade armoured power and control cables(ISI Marked) along with supplying & fixing of necessary channel/conduit, GI cable trays, supports, lugs, thimble and other accessories etc. as required.h) DC Distribution Board And AC Distribution Panel Board: IP65, free standing, metal cladded, having copper bus bar, having required protection and control gears, connection interconnection, etc. as required.	kWp	25	54280.00	1357000.00

	SH-III - Lifts				
57	Supplying, Installation, Testing & Commissioning of following capacity passenger With machine room /Machine room less (MRL) lift with regenerative drive as per CPWD General Specification for Electrical Works (Part-III Lift & Escalator) 2003, BIS Codes, NBC 2016 as amended upto date having provision for barrier free access as per Harmonised Guidelines & Standards for Universal Accessibility in India - 2021 of MoHUA, serving different floors in the lift shaft as per detailed specifications enclosed and as under including all other equipment and accessories complete as required :- (i) Speed-2.5 MPS (ii) Floors- 20 (Basement + G+18) (iii) Travel - 70 Meters (approx.) (iv) Stops & opening- 20 stops and 20 openings (v) Controller: A.C. variable voltage & variable frequency (vi) Automatic rescue device (ARD) complete with dry maintenance free batteries as required. (vii) Operation: Microprocessor based single automatic push button/simplex selective collective/ duplex collective selective with/without attendant (viii) Power-415 Volts+10%, 3 phase, 50 Hz, 4 wires system (ix) Car Enclosure: Stainless steel scratch proof (Moon Rock/Honeycomb/ Hairline Finish) on all sides and stainless steel decorative ceiling with fans (indirect throw) and LED fitting. (x) The car flooring should be smooth and antiskid as approved by engineer-in-charge.				

	(xi) Type of doors a) Car: Power operated, centre opening horizontal sliding stainless steel scratch proof (Mirror / Honeycomb / Moonrock Finish And Combination). (b) Landing doors: stainless steel scratch proof. (xii) A hand rail not less that 600mm long at 900mm above floor level to be fixed adjacent to control panel in the lift car. (xiii) Voice announcement system in the car to announce the position of the elevator in the hoist way as the car passes or stops at floor served by the elevator. (xiv) Closed loop Control System, protection against power fluctuation, self diagnostic control, Landing doors 2 hours Fire rated, Overload detection and protection, Over speed Governor, Dot Matrix LED D & P Indicators In Car &Landings, BMS Compatibility, tamper proof infrared curtain covering almost the entire height of the lift car door, Alarm horn, Anti Nuisance Operation, CCTV camera system with 4 MP IP camera, suitable NVR and HDD for 30 days storage backup , Firemen switch, 2/3 way intercom, Emergency Stop Switch with battery backup for fan and light fitting for 1 hour, pit ladder. (xv) The lift doors shall have a vision panel to enable persons with hearing impairment to signal for help or assistance in the event of an emergency. (xvi) An appropriate technological support be provided (Through emergency messaging |services or alarms etc.) to respond to the emergency requirements of person with hearing impairment or deafness. (xvii) In case of failure of ARD or other electronic devices, a provision of manual rescue be provided				
	16 passenger (1088kg)	Each	6.00	4487164.00	26922984.00
	SH-IV - Uninterruptible Power Supply (UPS) system				

58	Online UPS- Input supply: Three Phase, Output supply: Three Phase Supplying, installation, Testing & Commissioning of of following capacity at full load (Unity Power Factor) at operating temperature 0 to 40 deg C, Relative humidity 0 to 95%, Online double conversion true sine wave Uninterrupted hot swappable(allow for the replacement or addition of battery modules without shutting down the entire system) modular Power Supply (UPS)system with N+1 modules (N denotes total number of modules required for rated capacity). The UPS shall include a Rectifier, inverter, battery bank suitable for 30 minutes back up (Battery VAH capacity shall not be less than 1600 VAH per KVA of UPS rating per Hour backup time) on full load (Battery shall be VRLA, SMF in ABS Container) and Static Bypass switch along with provision for manual bypass, suitable isolation transformer for additional protection against neutral faults etc. UPS shall have inbuilt phase sequence correction. The UPS systems offered are to be of the latest technology with Digital Control Microprocessor based for reliable operation using Insulated Gate Bipolar Transistor (IGBT)'s both for the rectifier & inverter(3 Level) with PWM (Pulse Width Modulation). The quality of design, manufacturing and inspection process should confirm to the relevant Inter-national standards such as IEC/EN/VDE. The operating efficiency of the UPS systems shall be >96% while operating on battery mode and delivering quality power to the100% non-linear loads. Current total harmonic effect(ITHD) on the input grid shall be < 5% at 50 %load. (The required LC (inductor (L) and a capacitor (C)) filters shall be included in UPS cost), extreme power factor kit to be included to limit the input power factor (PF) to 0.99 and output power factor shall be unity (i.e. kw rating of the UPS shall be kva rating x 1), however UPS				

	shall be suitable to take load at 0.7 lagging to 0.7 leading power factor loads. UPS shall be suitable for incoming supply AC :3Phase 400V +/- 20%, 50 Hz +/-5 Hz, AC Output voltage:3Phase 415 Volt, 50 Hz +/- 0.2Hz, Overload capacity of 120%for 10 mins, Sine wave output. Non condensing, noise level less than 60db at 1 meter distance, protections: Input Under voltage over voltage, abnormal out voltage, battery overcharging, output over current, short circuit protection, battery deep discharge protection, 10KV surge. UPS must comply with low voltage electromagnetic compatibility (EMC) achieved asper EN 6204, EN6204 Part I and Part 2, it shall be a Voltage and Frequency Independent (VFI)-type UPS. Communication RS232/RS485/SNMP port open protocol for BMS integration, all hardware & software for iOT Communication as per approved by Engineering in charge. Required battery racks and interconnecting copper conductor cables of suitable size and connectors and all required accessories are inclusive of the cost).This system must provide a means for logging and alarming of all monitored points plus email notification. Forced air-cooling with integral inbuilt fans with redundancy (if one fan fail UPS should be able to handle at least 80% of the load, Noise Level65 DB at 1 meter distance. The system shall be in compliance IEC 62040- 1,2 & 3, IS: 16242 and CPWD Specification. Display Panel (minimum) (In-build 5 inch or more LC Display / LED) to display : a) Input: Voltage, current, Frequency. b) Bypass: Voltage, Frequency. c) Output: Voltage, frequency, Current. d)Battery: Voltage, Capacity. . e) Load: KVA, KW, Percentage. f)Temperature: STS, Inverter, PFC. g) Event Logging &Statistical Data (On LCD/LED): UPS should capture and display up to 3000 events like: Over temperature / DC Bus Fail / Fan Fail / Fuse Fail / Overload / Short-circuit / Device Fail / Inverter Fail / Rectifier Fail / Bypass Fail, etc. h) Statistical Data: No. of power failures / Transfers to Bypass / Total Running time, etc i)Mains Mode of Operation /Battery Mode of Operation / Bypass feeding the load / UPS Fault /Battery charging and discharging, overload, battery voltage and battery capacity. j) Audible Alarms: Mains Failure, Battery Low Alarm, UPS Overload, Fault, Shutdown, Input Over, Under Voltage, Output Over, Under Voltage, Battery Over, Under Voltage, Over Load and				

	short-circuit, Over Temperature. The UPS should have QR code which should contain drawing, test report OEM manual, Geo-Tag of manufacturing location etc.				
58.1	20 KVA (Each Power module shall be ≤ 10 KVA)	Each	1.00	341772.00	341772.00
	SH-V - Firefighting, Sprinkler and Fire Extinguisher system				
59	(A) Supplying, installation, testing and commissioning of Electric driven Main Fire Pump suitable for automatic operation and consisting of following, complete in all respects, as required: (B) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical seal conforming to IS 1520. (C) Suitable HP Squirrel cage induction motor, TEFC, synchronous speed 1500 RPM, suitable for operation on 415 volts, 3 phase 50 Hz, AC supply with IP 55 protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325. (D) M.S. fabricated Common base plate, coupling, coupling guard, foundation bolts etc. as required. (E) Suitable cement concrete foundation duly plastered with anti vibration pads.				
59.1	2850 lpm at 110 m Head	Each	2.00	475390.00	950780.00
60	(A) Supplying, installation, testing and commissioning of diesel engine driven main fire pump suitable for automatic operation and consisting of following, complete in all respects, as required: (Diesel Driven Pump)(B) Horizontal type, multistage, centrifugal pump of cast of iron body and bronze impeller with stainless steel shaft, mechanical seal conforming to IS 1520.(C) Suitable HP, 1500 RPM water cooled with radiator, diesel engine conforming to relevant IS standard complete with auto starting mechanism, 12 /24 volts electric starting equipment, diesel tank, exhaust pipe extended upto 10 m outside pump house duly insulated with 50 mm thick glass wool with 1.0 mm thick aluminium sheet cladding, residential silencer, instruments and protection as per standard specification, stop solenoid for auto stop in the event of fault with audio indications, painted with post office red colour etc. as				

	required.(D) M.S fabricated, common base plate, coupling, coupling guard, foundation bolts etc. as required.(E) Suitable cement concrete foundation duly plastered and with anti vibration pads.				
60.1	2850 lpm at 110 m Head	Each	1.00	718247.00	718247.00
61	(A) Supplying, installation, testing and commissioning of electric driven pressurisation pump suitable for automatic operation and consisting of following, complete in all respects, as required: (Jockey Pump) (B) Horizontal type, multistage, centrifugal pump of cast iron body and bronze impeller with stainless steel shaft, mechanical seal conforming to IS: 1520. (C) Suitable HP squirell cage induction motor TEFC type suitable for operation on 415 volts, 3 phase 50 Hz AC supply with IP 55 class of protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS: 325. (D) M.S.fabricated Common base plate, coupling, coupling guard, foundation bolts etc. as required. (E) Suitable cement concrete foundation duly plastered and with anti vibration pads.				
61.1	300 lpm at 110 m Head	Each	2.00	175699.00	351398.00
62	(A) Supplying, installation, testing and commissioning of electric driven terrace pump suitable for automatic operation and consisting of following, complete in all respects, as required: (Terrace Pump) (B) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical confirming to IS: 1520 (C) Suitable HP squirell cage induction motor TEFC type suitable for operation on 415 volts, 3 phase, 50 Hz, AC supply with IP55 class of protection for enclosure, horiziontal foot mounted type with Class-'F' insulation, conforming to IS-325. (D) M.S. fabricated common base plate, coupling, coupling guard, foundation bolts etc. as required. (E) Suitable cement concrete foundation duly plastered and with anti vibration pads.				
62.1	900 Ipm at 35 m Head	Each	2.00	107744.00	215488.00

63	INCOMING 630A, 50kA 4 Pole MCCB, Ics=100% Icu rating Digital Voltmeter 0-500V with selector switch Ammeter (0-630 A) with selector swtich & CTs etc. LED type RYB phase indicating lamps, ON, OFF, trip indicating lamps Set of Copper Bus Bar 800Amps OUTGOING (Note: All outgoing feeders for pumps should have digital Ammeter with selector switches, and LED type ON, OFF, trip indicating lamps) MAIN FIRE PUMP 250 A, 50kA TPN MCCB, Ics=100% Icu, with fully automatic Star/Delta starter suitable for 100 hp pump with overload protection, current sensing type single phase preventor complete with all acceessories and internal wiring required for automatic operation, selector switch for local/remote, auto/manual/OFF operation. JOCKEY PUMP125 A, 50kA TPN MCCB, Ics=100% Icu, with Suitable HP fully automatic Star/Delta starter with overload protection, current sensing type single phase preventor complete with all acceessories and internal wiring required for automatic operation, selector switch for local/remote, auto/manual/OFF operation.DIESEL ENGINE CONTROLControl for diesel engine comprising -Automatic/Manual selctor switch & 3 attempts starting device, timers and relays as required, push buttons, start/stop in manual mode Indicating lamp for high/ Low Lub. Oil pressure, High Water Temp and Engine on indicationBattery charger suitbale for 12V/24 V DC with boost and trickle selector switch, 0-30 V DC volt meter, and 0-20 A DC Ammeter All standard relays and accessories for automatic operation of diesel engineSYSTEM CONTROLLERDesigning, Supply, Installation, Testing and commissioning of system controller to control operation of main electric fire pump, diesel pump, Pressurization pump, Terrace pump in sequence as per specification consisting relays, timers. Sensors, annunciation window for fault indication, complete as per specification	Each	2.00	337486.00	674972.00

64	Providing laying, testing & commissioning of 'C' class heavy duty MS Pipe conforming to IS 1239/3589 i/c fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. in ground including welding, excavation & providing cement concrete blocks as supports, anticorrosive treatment with coaltar/asphalt tape as per IS 10221, refilling the trench etc. of following sizes complete as required.				
64.1	200 mm. dia (wall thickness = 6.3 mm)	Metre	240.00	7251.00	1740240.00
64.2	150 mm. Dia	Metre	200.00	5104.00	1020800.00
65	Providing, laying, testing & commissioning of 'C' class medium duty G.I. pipe conforming to IS 1239 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 :				
65.1	25 mm	Metre	2550.00	711.00	1813050.00
65.2	32 mm	Metre	850.00	785.00	667250.00
65.3	40 mm	Metre	850.00	966.00	821100.00
65.4	50 mm	Metre	300.00	1066.00	319800.00
65.5	65 mm	Metre	850.00	1330.00	1130500.00
65.6	80 mm	Metre	1510.00	1514.00	2286140.00
65.7	100 mm	Metre	300.00	1925.00	577500.00
65.8	150 mm	Metre	520.00	2633.00	1369160.00
66	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 :				
66.1	80 mm dia	Each	36.00	5406.00	194616.00
66.2	100 mm dia	Each	36.00	7271.00	261756.00
66.3	150 mm dia	Each	7.00	9737.00	68159.00
66.4	200 mm dia	Each	2.00	16248.00	32496.00
67	Supplying, fixing, testing & commissioning of double flanged sluice valve of rating PN 1.6 with non rising spindle, bronze/gun metal seat,				

	ISI marked complete with nuts, bolts, washers, gaskets and conforming to IS 780 of following sizes as required:				
67.1	100 mm dia	Each	7.00	15483.00	108381.00
67.2	150 mm dia	Each	2.00	23968.00	47936.00
68	Providing, installation, testing and commissioning of stainless steel Y-strainer fabricated out of 1.6 mm thick stainless steel, Grade 304, sheet with 3 mm dia holes with stainless steel flange.				
68.1	150 mm dia	Each	3.00	11682.00	35046.00
68.2	200 mm dia	Each	2.00	23571.00	47142.00
69	Supplying and fixing 63 mm dia, 15 m long RRL hose pipe with 63 mm dia male and female couplings duly bound with Gl wire, rivets etc. conforming to IS 636 (type-A) as required:				
69.1	Stainless Steel (Grade 304)	Each	36.00	4667.00	168012.00
70	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.20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 1258520 mm nominal internal dia gun metal globe valve & nozzle.Drum and brackets for fixing the equipmets on wall.Connections from riser with 25 mm dia stop gun metal valve &M.S. Pipe and socket.				
70.1	30 m	Each	36.00	9440.00	339840.00
71	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:				
71.1	Stainless Steel (Grade 304)	Each	36.00	3402.00	122472.00
72	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:				
72.1	4 way - 150 mm dia M.S. Pipe	Each	2.00	14820.00	29640.00
73	Providing, fixing, testing & commissioning of 15mm dia quartzoid bulb type sprinklers of rating 68 degree centigrade with required accessories :				

73.1	Pendent Sprinkler	Each	1150.00	599.00	688850.00
73.2	Horizontal side wall sprinkler	Each	702.00	699.00	490698.00
74	Providing & fixing of pressure switch in M.S. pipe line including connection etc. as required.	Each	7.00	1670.00	11690.00
75	Providing & fixing flow switch in following sizes M.S. pipe including connection etc as required.				
75.1	100mm dia	Each	5.00	8069.00	40345.00
75.2	150mm dia	Each	5.00	9644.00	48220.00
76	Providing, fixing, testing & commissioning of installation control valve of cast iron body, brass/bronze working parts comprising of water motor alarm, bronze seat clapper, clapper arm and hydraulically driven mechanical gong bell to sound continuous alarm when the wet riser/sprinkler system activates, pressure gauges, emergency releases, strainer, pressure switch, cock valve complete with drain valve and bypass, test control box, ball valves, MS pipe of required size, flanges, orifice plate, gasket etc of follwing sizes as required				
76.1	150mm dia	Each	2.00	50805.00	101610.00
77	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.				
77.1	700mm	Each	230.00	1495.00	343850.00
77.2	1000mm	Each	230.00	1703.00	391690.00
	Fire Extinuigsher				
78	Supplying, installation, testing and commissioning of CO2 type 9kg confirming to IS: 2878	Each	137.00	23096.00	3164152.00
79	Supplying, installation, testing and commissioning of ABC type 6 kg confirming to IS: 15683	Each	137.00	4069.00	557453.00
80	Supplying, installation, testing and commissioning of ABC type 9 kg confirming to IS: 15683	Each	137.00	4509.00	617733.00

81	Supplying, installation, testing and commissioning of Mechnical foam type 9 ltr confirming to IS: 15683	Each	10.00	3189.00	31890.00
	SH-VI - INTELLIGENT FIRE ALARM SYSTEM				
82	Supplying, installation, testing and commissioning of micro processor based intelligent addressable main fire alarm panel, central processing unit with the following loop modules and capable of supporting not less than 240 devices (including detectors) and minimum 120 detectors per loop and loop length up to 2 km, network communication card, minimum 320 character graphics/ LCD display with touch screen or other keypad and minimum 4000 events history log in the non volatile memory (EPROM), power supply unit (230 ± 5% V, 50 hz), 48 hrs back-up with 24 volt sealed maintenance free batteries with automatic charger. The panel shall have facility to connect printer to printout log and facility to have seamless integration with analog/digital voice evacuation system (which is part of the schedule of work under SH: PA System) and shall be complete with all accessories. The panel shall be compatible for IBMS system with open protocol BACnet/ Modbus over IP complete as per specifications.				
82.1	Ten Loop Panel.	Each	1.00	476893.00	476893.00
83	Supplying, installation, testing & commissioning of repeater panel wih 320 character/ Touch screen LCD display with inbuilt reset, acknowledge and silence switches complete as required.	Each	7.00	113734.00	796138.00
84	Supplying, installation, testing & commissioning of intelligent analog addressable photothermal detector with inbuilt isolator complete with mounting base complete as required.	Each	207.00	3004.00	621828.00
85	Supplying, installation, testing & commissioning of response indicator on surface/recessed MS Box having two LED, metallic cover complete with all connections etc as required.	Each	58.00	306.00	17748.00
86	Supplying, installation, testing & commissioning of addressable fire control module with inbuilt isolator complete as required.	Each	55.00	3156.00	173580.00
87	Supplying, installation, testing & commissioning of addressable manual call point with inbuilt isolator complete as required.	Each	55.00	4063.00	223465.00
88	Supplying, installation, testing & commissioning of addressable horn cum strobe with inbuilt isolator complete as required.	Each	55.00	3682.00	202510.00

89	Supplying & laying of 2x1.5 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.	Meter	3200.00	386.00	1235200.00
	PUBLIC ADDRESS SYSTEM				
90	Supplying, installation, testing & commissioning of 6 zone, voice alarm controller with USB, MP3 player (including 6 zone button paging station) with seamless integration facility with main fire alarm panel for voice evacuation complete as required.	Each	1.00	132115.00	132115.00
91	Supplying, installation, testing & commissioning of 1.5/3/6W ceiling speaker complete as required.	Each	149.00	1025.00	152725.00
92	Supplying, installation, testing & commissioning of 1.5/3/6W metal box ceiling/wall speakers complete as required.	Each	81.00	1891.00	153171.00
93	Supplying, installation, testing & commissioning of digital audio amplifier 75 Watt, 25V rms operating at 240 Volt AC Supply complete as required.	Each	18.00	152368.00	2742624.00
94	Supplying, installation, testing & commissioning of Voice command keypad 6 zone, with microphone assembly complete as required.	Each	1.00	85450.00	85450.00
95	Supplying and drawing of cable Fire Retardant PVC insulated copper conductor cable in the existing surface / recessed steel conduit of following pairs, cores and size including connections and interconnections etc. as required.				
95.1	Speaker cable Single pair, 2-core, 1.5 sqmm	Each	3600.00	61.00	219600.00
95.2	Speaker cable Two pair, 2-core, 1.5 sqmm	Each	3600.00	97.00	349200.00
	SH-VII - Diesel Engine Driven Generating Set				

96	Supply, installation, Testing & Commissioning of 'Silent Type Diesel Generating set as per CPCB IV + or better norms along with having Prime Power Rating of KVA as below, 415 volts at1500 RPM, 0.8 lagging power factor at 415 V suitable for 50 Hz, 3 phase system & for 0.85 Load Factor, including testing at factory and site with fuel, load for test and other necessary arrangements Complete as per CPWD specifications, should have QR code which should contain drawing, test report OEM manual, Geo- Tag of manufacturing location, rating plate as per relevant IS Code etc. and consisting of the followings: (A) Diesel Engine: Tourbo charged Diesel engine 4 stroke water cooled, multi cylinder, dynamically balanced fly wheel, electric start of suitable BHP at 1500 RPM suitable for above output of alternator at 40Degree C, 50% RH & at 1000 Meter MSL , capable of taking10% over loading for one hour after 12 hours of continuous operation. The engine will be with Electronic governor, Dry type Air filter with service indicator, first filling of engine fuel (after commissioning) lubricating Oil, Coolant and other consumables complete with all the required accessories, the Electronic governor shall be as per ISO 8528.The engine shall comply to the latest CPCB norms (CPCB IV + or better) and Conforming to BS 5514, BS 649, IS 10000, IS 10002, IS 13018 and as per CPWD specifications.				

	(B) Engine mounted Instrument Panel fitted with and having digital dis Plate for following: (i) Start-stop switch with key (ii) Water temperature indication (iii) Lubrication oil pressure indication (iv) Lubrication oil temperature indication (v) Battery charging indication and Voltage indication (vi) RPM indication (vii) Over speed indication (viii) Low lubrication Oil trip indication (ix) Engine Running Hours indication (x) Fuel Level (C) Alternator: Synchronous alternator rated of appropriate KVA, 415 volts at 1500 RPM, 3 phase 50 Hz, AC supply with 0.8 lagging power factor at 40 Degree C, 50% RH & at 1000 Meter MSL. The alternator shall be having Screen Protected Drip Proof (SPDP) enclosure IP23, brushless, continuous duty, dynamically balanced rotor, capable of taking 10% over loading for one hour after 12 hours of continuous operation, self cooled, self-excited and self-regulated through AVR conforming to IS13364(Part 2)/IS: 4722/BS 2613 suitable for tropical conditions and with class- H insulation.				

	(D) Base Frame & Foundation:Both the engine and alternator shall be mounted on suitable base frame made of MS channel with necessary reinforcement which shall be installed on suitable cement concrete foundation and vibration isolation arrangement as per recommendations of manufacturer.(E) FUEL TANK:Daily service fuel tank of suitable litres capacity as per CPWD Specifications, fabricated out of 3 mm thick M.S. sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS class 'C' pipes of suitable dia. Complete with valves, level indications & accessories as required as per specifications.(F) Exhaust System:Dry exhaust manifold with hospital type exhaust silencer and catalytic convertor.(G) Starting System:12V/24V DC starting system comprising of starter motors: voltage regulator and arrangement for initial excitation complete with suitable numbers of batteries (180 AH capacity lead acid SMF type) as required as per specifications. The battery shall be housed inside the acoustic enclosure of DG Set. (H) Acoustic and weather proof enclosure with arrangement for fresh air intake for cooling of the engine & alternator, extraction, discharging hot air in to the atmosphere and the temperature rise inside the enclosure, noise level outside enclosure. The acoustic enclosure should be suitable for cable connection/connection through bus-trunking. Such arrangements on acoustic enclosure should be water proof &dust-proof conforming to IP-65 protection. The enclosure shall be as per CPCB IV + or better norms etc. and as per CPWD specifications.				

	(I) AMF Panel: Free standing floor mounted IP 42 automatic mains failure control panel including auto by-pass, suitable for KVA as below for silent type DG set complete with relays, timers, set of CTs for metering & protection and energy analyser to indicate currents, phase and line voltages, frequency, power factor, KWH, Kilo Volt Ampere Reative Hour (KVARH), KVA (Phase & Total), KW & provision for overload, short circuit, restricted earth fault, under frequency, power (aluminium) and control (copper) cabling of suitable size upto 15 meter between AMF panel, LT Panel and DG Set including connection interconnection etc. as required, all complete and inter locking and communication/ Ethernet /RS485/SNMP port open protocol for BMS integration including suitable software, the panel shall be of DG Set OEM make etc. as per approved by Engineering in charge and including the following: 1. Suitable numbers and appropriate capacity 4 pole motorised electrically operated draw out with cradle type 3 position ACB/ MCCB with electronic release for O/C & E/F and shunt trip. 2. Auto/Manual/Test/Off selector switch 3. Protection for under and over voltage phase reversal (2 nos Over voltage relay, 2 Nos. reverse power relay and 2 Nos. under voltage relay). 4. 3 Sets of current transformers 15 P 10 accuracy for protection and 15 VA class-I for metering 5. Energy analyser unit to indicate current, Voltage(L-N & L_L), kW, kVA (Phase & Total), Frequency, KWH, PF. 6. LED Indicating lamps for load on mains and load on set 7. Fuse/ MCB for instruments				

	8. Battery charger, complete with transformer/ rectifier, D.C. voltmeter and ammeter, selector switch for trickle, off and boost and current adjustment.9. Main supply failure monitor10. Supply failure timer11. Restoration timer12. Control unit with three impulse automatic engine start/stop and failure to start lockout.13. Impulse counter with locking and reset facility.14. ON/OFF/Control circuit switch with indicator15. Audio/Video annunciation for(i) High water temperature(ii) Low lubricating oil pressure(iii) Engine over speed(iv) Engine fails to start(v) Full load/maximum load warning16. Protection for over/under Frequency, Loss of AC sensing, Over Current, Unbalancing load with suitable number of relays and accessories17. Maintenance notification based on Engine Run Hour & due date. 18. Load Management through PLC to achieve auto opening and closing of incomer breakers, bus coupler switching of essential panel, interlocking providing signal to AMF Panel for load status and AMF shall give command to DG Set to auto start / auto stop depending upon load status and requirement etc. and necessary hardware and software required to perform the operation shall be provided by the contractor including all control wiring.				
96.1	250 KVA	Each	1.00	1871541.00	1871541.00
	SH-VIII - HVAC system				
97	Supply, Installation, Testing and Commissioning of Air Cooled HI Wall split type Air conditioners complete with Indoor unit (IDU), Out door unit (ODU), surface / concealed copper Refrigerant piping with insulation (closed cell elastomeric nitrile rubber tubular pipe section) upto 3 Mtr (IDU to ODU), copper power cable upto 3.5 Mtr (IDU to ODU) i/c drain pipe R-32/R-410/ R-407 Green Refrigerant, wireless Remote control, suitable for working between 180-260V with low & high voltage cut off and50 hz ,1 phase AC supply capable of performing cooling, dehumidification, air circulation of following capacity with Scroll /rotary compressor. The system shall be able to deliver 100% of the rated capacity upto 42 Degree Celsius. Min 5 year Original Equipment Manufacturer (OEM) warranty both compressor and Printed Circuit Board (PCB). Must comply : Electrical cable IS694 or IS 9968 temperature sensing control IS/ International Electro technical				

	Commission (IEC) 60730, hermetic compressor IS 10617, heat exchanger IS 11329, capacitor IS 2993 and motor IS 12615. Complete as per CPWD specification and IS :1391 Part II 2023. The system shall be able to operate up to 50 Degree C (out door ambient temperature).				
97.1	1.5 TR with 5 Star BEE Rating	Each	28.00	43539.00	1219092.00
97.2	2.0 TR with 5 Star BEE Rating	Each	28.00	57396.00	1607088.00
	SH-IX - CCTV and Intercom System				
98	Supplying, installation, Testing and commissioning of following capacity 24 port Layer 2 indoor Network Switch having features and specifications etc. as mentioned here under: At least 24 X RJ-45 Gigabit Ethernet Ports and additional 2 X 10GBase -T with 4 X SFP Ports with non-blocking architecture by having Switching capacity of min. 168Gbps and packet forwarding rate of 125Mpps or higher, 16K MAC table. Console Port, USB port, Stacking support of min. 8 units per stack. Internal dual AC Power supply, STP, RSTP, MSTP, BPDU Filter, BPDU Restriction, Min. 9K Jumbo Frame, LBD, IGMP Snooping V1/V2/V3, MLD Snooping V1/V2. IGMP/ MLD Groups 1K or more, IPv4/ IPv6 Loopback Interface, 16 L3 IP Interface, Ipv6 ND, VRRPv3, UDP Helper, ECMP. VLAN:802.1Q, Port based, Q-in-Q, Multicast VLAN, Protocol VLAN,VLAN Trunking, DHCP Snooping, Server, server Screening. RADIUS , TACACS+ Authentication, QoS: 802.1P, 8 queues per port, QoS : WRR, Strict + WRR, WRED, 802.1p. ACL: MAC based, IPv4C IPv6, TCP/ UDP Port number, time based ACL, TFTP Client, SNMP V1, v2c, v3, SNMP traps, RMON, DHCP server, relay, client, LLDP, LLDP-MED, OAM, Dying Gasp,802.3ah, sflow, RIP, OSPF v2/v3, policy based route, SSL,SSH. 6 kV surge protection on all Gigabit Ethernet ports and on all GE RJ-45 access ports. Certifications: UL, CE, FCC, RoHS, MTCTE, OEM/Product must be on Trusted Telecom Portal of Department of Telecommunication, Government of India etc. complete as required.				
98.1	24 port PoE Layer 2 Network Switch with PoE Support of 370W or higher with each cooper port supporting 802.3at PoE+ min.	Each	20.00	125393.00	2507860.00
98.2	24 port Layer 2 Non-PoE Network Switch	Each	2.00	86163.00	172326.00

99	Supplying, installation, Testing and commissioning of 10 Giga Bandwidth Data Centre Network Switch of 48 port Layer 3 having features and specifications etc. as mentioned hereunder: - ToR/EOR/Core Network Switch 48x 10GbE SFP+, 6x100GbE QSFP28, RPS, with Console Port, Management Port and 1 x USB 2.0 Type A port, The switch must provide as witching capacity of no less than 2.16 Tbps and a forwarding rate of at least 1600 Mpps, ensuring non-blocking performance for high-bandwidth applications. It should support hot-swappable dual power supply modules (AC or DC) for 1+1redundancy and load sharing, as well as hot-swappable, front to-back airflow fan trays with N+1 redundancy to ensure continuous availability. IEEE 802.1X support for port-based and MAC-based authentication should be available, along with integration for RADIUS and TACACS+ authentication services. Guest VLANs, DoS prevention, and management access restrictions are essential. SNMP v1/v2c/v3, syslog, sFlow, and support for auto-configuration via DHCP. Support for Open Flow v1.4, Netconf/YANG, and LLDP is required for modern network automation. Support ONIE (Open Network Install Environment), IEEE 802.1Q bb Priority-based Flow Control (PFC), Open Flow v1.4, ERPS, IPv6 Tunneling, IP interfaces and supported, VXLAN, Private VLAN, Multicast VLAN, Guest VLAN Double VLAN (Q-in-Q), RoCEv2, PIMSSM/SM, MSDP. Support High Availability with MLAG/VSS and Layer 2/3 VPNs Critical for Multi-tenant, Virtualized, and Containerized Environments. BGPv4/v6, OSPFv2/v3, IS-IS, RIPng. VRRP, ECMP, BFD, and route redistribution for high availability routing. Support flexible routing domains and secureinter-segment traffic flow. Certifications: CE, FCC, MTCTE, OEM/ Product must be on Trusted Telecom Portal of Department of Telecommunication, Government of India etc. complete as required.	Each	2.00	1055981.00	2111962.00
100	Supplying, drawing, Installation, Testing and commissioning ofCat6A UTP 4 pair, 23 AWG solid copper cable in existing conduit/ on surface, U/FTP, LSZH, Non-Plenum, Horizontal(solid) Cable suitable for high speed data networking application supporting upto 10Gbps over a 100 meter channel. The 4 Unshielded Twisted Pairs (UTP) cable with color coded insulation for easy identification should have				

	FLAMEPROPERTIES i.e. Flammability Test - IEC 60332-1, Smoke Density - IEC 61034, LSZH standards compliance: ANSI/TIA-568 C.2, ISO/IEC 11801, IEEE 802.3an, RoHS. Delay Skew should be < 45NS. The outer Cable Diameter should be 7.5 +2 mm. Cable should have been tested and verified by UL/ ETL.				
100.1	1 Run of cable	Each	3750.00	74.00	277500.00
100.2	2 Run of cable	Each	2250.00	124.00	279000.00
100.3	3 Run of cable	Each	1500.00	174.00	261000.00
100.4	4 Run of cable	Each	750.00	224.00	168000.00
101	Supplying and drawing following core Fibre Optic Cable having corrugated steel armouring. The Fibre should be SM Fibre Central - loose tube filled with Thixotropic jelly, duly following Standards: ISO 11801, IEC 60793-1/60794-1-2, ITU-T-RECG.652D and Telecordia GR-20-core, High quality Electro Chromium Coated Corrugated Steel tape (ECCS) and HDPE Sheath, Operating ambient Temperature should be – 5 deg C to +50 deg C and Storage Temperature shall be - 5 deg C to+50 deg C, Max Attenuation ± 0.36 (db / km) at Operational Wavelength 1310 nm and ± 0.22 db / km at Operational Wavelength 1550 nm. type of fibre should be 9/125 / G.652D& Refractive Index should be 1.4670/1.4675. The value for Mode-filed, Cladding Diameter 9.2 ± 0.4 µm and 125 ± 0.7 µm correspondingly. The Dispersion value ≤ 3.5 ≤ 18 ps/nm-km and PMD value ≤ 0.2 ps/km and Cable Cut-off wavelength ≤ 1260 nm etc complete as required.				
101.1	Single Mode 6 Core Optical fibre cable	Mtr.	1000.00	64.00	64000.00
102	Supply and fixing 24U Rack with 4 inch Castor wheels and front brake Floor Standing Rack with Main Frame Pillar of1.25mm CRCA Sheet with removable side panels, L- Shape adjustable Vertical Mounting Rail of 2mm with 'U' Marking completely knocked-down condition (CKD) Shape, fitted with 4number cooling fans, minimum 5nos two line cable entry/exit provision at top and bottom with rubber protection, Front door 5mm Toughened Glass with MS frame or MS perforated with lock, Rear MS vented or perforated door, Powder coated Color- RAL- 7035 or black, complied with UL & RoHS, 2 x 6sockets 16A power distribution	Each	1.00	21201.00	21201.00

	units, 3 numbers closed cable organizer, Hardware mounting screws packet of 20 x 1number, etc. complete as required.				
103	Supply and fixing of following size Wall Mount Rack having Fixed Structure with 0.8mm CRCA Sheet, completely knocked-down condition (CKD) Shape, Vertical Mounting Rail 1.6 mm with 'U' Marking, Minimum 2 cable entry/exit provision at Top and bottom with rubber protection, Front 5mm Toughened Glass with lock, wall mounting kit, Powder coated Color- RAL- 7035, complied with UL & RoHS, 2 x 6 sockets 16A power distribution units, 3 numbers closed cable organizer, Hardware mounting screws packet of 20 x 1 number, etc. complete as required.				
103.1	6U Rack	Each	10.00	6939.00	69390.00
104	Supplying Installation Testing and Commissioning of 5/6MP IP IR Dome Camera having following specifications and features etc :-1) Type of Camera: Dome Camera2) Image Sensor: 1/2.8" or better progressive Scan CMOS get color image even at night condition3) Signal System: PAL/NTSC4) Minimum Illumination: 0.008Lux@ F1.4, AGC ON, 0 lux with IR or better5) Imaging: 1/3s to 1/30000s Shutter Support, Auto Gain Control , White Balance- Auto, Back Light Compensation, Multi zone Privacy Masking, HLC, Digital Watermarking.6) On Screen Display: Camera should display Camera title, Date & Time in live & recorded video both.7) Signal to Noise Ratio: > 50 dB8) Day & Night: True Day & Night High Performance Mechanical IR cut filter with auto switch, IR Source- Inbuilt IR LED's with effective distance upto 50 Mtrs integrated IR 30 Mtrs for colour view in night.9) Video Compression (Minimum): H.265 or better, H.265, H.264H, H.264, Audio:- G.711U/A, G.711Mu, G.726, AAC, G.72310) Wide Dynamic Range: WDR (120db or more)11) Digital Noise Reduction: DNR (2D/3D) On/Off				

	12) Streaming: Triple streaming, configurable 13) Video Streaming & Frame Rates: Triple streaming, configurable Main stream: 5/6MP @25/30 fps, Sub streams: D1@25/30 fps or better 14) Image Setting: Rotate Mode, saturation, brightness, contrast, sharpness adjustable through client software or web browser 15) Profile Management: User configuration import, export 16) Security: User Authentication, Water Marking					
	17) On board Storage: Camera should support built-in Micro SD/SDHC/SDXC Card slot upto 512 GB. It should be supplied with minimum 128GB memory Card. 18) Recording Management: Format SD, overwrite, storage management, video to NAS device, 19) Edge Analytics : Tripwire, Intrusion, Motion Detection 20) Alarm Trigger : Motion/tampering detection; network disconnection detection; IP conflict detection; memory card state detection; memory space detection 21) Alarm Support: It should have 1/1 Alarm In/ Out Port 22) Audio Support: It should have 1x Built-In Mic and 1/1 Audio In/ Out Port for external Mic. and Speaker (As per site requirement) with G.711U/A/ G.711Mu/ AAC/ G.726 audio compression 23) Network Protocol: SFTP, IPv6, IPv4, DNS,RTCP, NTP, RTP, HTTP, HTTPS, SNMP TCP/IP, PPPoE, NFS, UDP, ICMP, SSL, DHCP, SMTP, RTSPS, unicast, 24) System Capability: ONVIF 25) VMS: Camera shall support open source VMS 26) Cyber Security: trusted boot, AES 256-bit Encryption, Configuration encryption, trusted execution, Digest, security logs, , account lockout, video encryption, IP/MAC filtering, HTTPS, trusted upgrade.					

	27) Ethernet: 1 RJ 45 10/100 Ethernet port 28) Power Input: The camera should support simultaneous dual power input—12 VDC (via power adapter) and PoE - to ensure continuous operation in the event of a failure in one power source. 29) Power Requirement: 12VDC/24 VAC/PoE (802.3af)/ePoE 30) Enclosure: IP67 weather proof, IK10 31) Operating Condition: Ambient Temperature:- (-)05°C to 50°C, humidity 95% (max) (non-condensing) 32) IR life: 40000 hours or higher 33) Video Bit rate: 32 KBPS - 8 MBPS or better 34) Standards: BIS with ER, STQC Certified, CE, FCC and RoHS				
104.1	5/6MP ((3200 × 1800)@20 fps or better) IP IR 2.8/ 3.6/6/8/12 mm fixed lens (as per site requirement) Dome Camera.	Each	196.00	12800.00	2508800.00
105	Supplying Installation Testing and Commissioning of 5/6 MP IP IR Bullet Camera having following specifications and features etc :-1) Type of Camera: Bullet Camera2) Image Sensor: 1/2.8" or better progressive Scan CMOS get color image even at night condition3) Signal System: PAL/NTSC4) Minimum Illumination: 0.006Lux@ F1.4, AGC ON, 0 lux with IR or better5) Imaging: 1/3s to 1/30000s, Auto Gain Control, White Balance- Auto, Back Light Compensation, Multi zone Privacy Masking, HLC, Digital Watermarking.6) On Screen Display: Camera should display Camera title, Date & Time in live & recorded video both.7) Signal to Noise Ratio: > 50 dB8) Lens Type & Focus: 3.6mm/6mm fixed lens (optional as per site requirement)9) Day & Night: True Day & Night High Performance Mechanical IR cut filter with auto switch, IR Source- Inbuilt IR LED's with effective distance upto 50 Mtrs integrated IR and 30 Mtrs for colour view in night.10) Video Compression (Minimum): H.265 or better, H.265, H.264H, H.264, Audio:- G.711U/A, G.711Mu, G.726, AAC, G.72311) Wide Dynamic Range: WDR (120db or more)12) Digital Noise Reduction: DNR (2D/3D) On/Off13) Streaming: Triple streaming, configurable				

	14) Video Streaming & Frame Rates: Triple streaming, configurable Main stream: 5/6MP @25/30 fps, Sub streams: D1@25/30 fps or better 15) Image Setting: Rotate Mode, saturation, brightness, contrast, sharpness adjustable through client software or web browser 16) Profile Management: User configuration import, export 17) Security: User Authentication, Digital Water Marking 18) On board Storage: Camera should support built-in Micro SD/SDHC/SDXC Card slot upto 512 GB. It should be supplied with minimum 128GB memory Card.					
	19) Recording Management: Format SD, overwrite, storage management, video to NAS device, 20) Edge Analytics: Tripwire, Intrusion, Motion Detection 21) Alarm Trigger : Motion/tampering detection; network disconnection detection; IP conflict detection; memory card state detection; memory space detection 22) Alarm Support: It should have 1/1 Alarm In/ Out Port 23) Audio Support: It should have 1x Built-In Mic and 1/1 Audio In/ Out Port for external Mic. and Speaker (As per site requirement) with G.711U/A / G.711Mu/ AAC/ G.726 audio compression 24) Network Protocol: SFTP, IPv6, IPv4, DNS,RTCP, NTP, RTP, HTTP, HTTPS, SNMP TCP/IP, PPPoE, NFS, UDP, ICMP, SSL, DHCP, SMTP, RTSPS, unicast, 25) System Capability: ONVIF 26) VMS: Camera shall support open source VMS 27) Cyber Security: trusted boot, AES 256-bit Encryption, Configuration encryption, trusted execution, Digest, security logs, account lockout, , video encryption, IP/MAC filtering, HTTPS, trusted upgrade. 28) Ethernet: 1 RJ 45 10/100 Ethernet port 29) Power Input: The camera should support simultaneous dual power input - 12 VDC (via power adapter) and PoE - to ensure continuous operation in the event of a failure in one power source.					

	30) Power Requirement: 12VDC/24 VAC/PoE (802.3af)/ePoE 31) Enclosure: IP67 weather proof, IK10 32) Operating Condition: Ambient Temperature:- (-)05°C to 50°C, humidity 95% (max) (non-condensing) 33) IR life: 40000 hours or higher 34) Video Bit rate: 32 KBPS - 8 MBPS or better 35) Standards: BIS with ER, STQC Certified, CE, FCC and RoHS				
105.1	5/6MP ((3200 × 1800)@20 fps or better) IP IR 2.8/ 3.6/6/8/12 mm fixed lens (as per site requirement) outdoor bullet Camera	Each	88.00	12525.00	1102200.00
106	Supplying Installation Testing and Commissioning of PTZ (Pan, Tilt and Zoom) IP IR Camera having following specifications and features etc :- PTZ (Pan, Tilt and Zoom) IP IR Camera having following specifications and features etc :-1) IP IR PTZ Camera: Motorized PAN TILT ZOOM with IR2) Image Sensor: 1/2.8" or better progressive Scan CMOS3)Signal System: PAL/NTSC4) Minimum Illumination: 0.008 Lux@ F1.6, AGC ON, 0 lux with IR, or better5) Imaging: 1/1s to 1/30000s, Auto Gain Control, White Balance- Auto, Back Light Compensation, Image Rotation, Multi zone Privacy Masking (Upto 24 Area), HLC, Defog, Region Of Interest and EIS features.6) On Screen Display: Camera should display Camera title, Date & Time in live & recorded video both.7) Signal to Noise Ratio: > 50 dB8) Event Notification: Through Relays, E-Mails or FTP9) Day & Night: True Day & Night High Performance Mechanical IR cut filter with auto switch, IR Source- Inbuilt IR LED's with effective distance. The camera should have IR LED’s and cover distance up to 300 meter or above 10) Auto Tracking: The camera should be equipped with Deep learning-based auto tracking function using simultaneously all of the panning, tilting and zooming should be available. When a motion is detected in a registered monitoring area, the camera should track the motion (object) and capture it. 11) Pre/Post Event Buffering: The camera should support at least of 5 seconds of pre & post event buffering. 12) Pre-sets: 300 Pre-sets 13) Video Compression (Minimum): H.265 or better, H.265, H.264H,				

	H.264, Audio:- G.711U/A, G.711Mu, G.726, AAC, G.723 14) Wide Dynamic Range: WDR (120db or more), HLC & BLC 15) Digital Noise Reduction: DNR (2D+3D) On/Off 16) Image Setting: Rotate Mode, ROI ,EIS, Defog, saturation, brightness, contrast, sharpness adjustable through client software or web browser 17) Profile Management: User configuration import, export					
	18) Cyber Security: Configuration encryption, AES 256-bit Encryption, Digest, account lockout, video encryption, IP/MAC filtering, trusted boot, trusted upgrade, trusted execution 19) On board Storage: Camera should support built in Micro SD/SDHC/SDXC Card slot upto 512 GB . It should be supplied with minimum 128GB Memory. 20) Recording Management: Format SD, overwrite, storage management, video to NAS device, remote archive access via FTP login 21) Edge based Video Analytics & Alarm Trigger: Motion/tampering detection; network disconnection detection; IP conflict detection; memory card state detection; memory space detection, Tripwire, Intrusion, Object Abandon/ Missing, SMD, Face Detection 22) Network Protocol: SFTP, IPv6, IPv4, DNS,NTP, HTTP, HTTPS, SNMP, TCP/IP, PPPoE, NFS, ICMP, DHCP, SMTP, RTSPS. 23) System Capability: ONVIF Profile S, G & T. CCTV Camera OEM should be fulltime member of ONVIF and quoted models should be listed on ONVIF official website (All the certifications & Credentials should be valid on the date of technical evaluation). 24) VMS: Camera shall support open source VMS 25) Connectivity: 1x LAN RJ-45 (10/100Base-T) 26) Audio Support: Audio Interface : The camera should have 1/1 Audio In/Out to connect External Mic and Speaker Audio Compression : PCM, G.711U/A, G.711MU, G.726, MPEG2- Layer2, G.722.1					

	27) Alarm In/Out : Alarm In/out- 7/2 Ch In/Out 28) Power Input: The camera should support simultaneous dual power input - DC/ AC (via power adapter) and PoE (802.3af) - to ensure continuous operation in the event of a failure in one power source. 29) Power Requirement: 24 VDC, 2.5 A (± 25%), PoE+ (802.3at) 30) Enclosure & Weather Proof Standard: IP67 weather proof and IK10, TVS 8000V lightning proof, surge protection, voltage transient protection 31) Operating Condition:- Ambient Temperature:- (-)05°C to 50°C, humidity 95% (max) (non-condensing) 32) IR life: 40000 hours or higher 33) Video Bit rate: 32 KBPS - 8 MBPS or better 34) Standards: BIS with ER, STQC Certified, CE, FCC and RoHS 5MP IP IR motorized PTZ (2960 x 1668@25/30fps or better) camera, Triple streaming , configurable on resolution:- Main stream: 5MP@25/30 fps Sub streams:1080p@25/30 fps, varifocal lens 3.95mm (±5mm) ~ 177.75mm (±5mm) or better with Automatic & manual Focus Adjustment provisions, 45x Optical zoom and 16x Digital zoom with angle of view H: 65.7°– 1.9°V: 39.4°–1.1°D: 73.1°–2.1, PAN Travel: Pan: 0° ~ 360° endless, Manual Pan: 260° /s, Pre-set : 300° /s, Tilt Travel: Tilt: - 20° ~ 90°, auto flip 180°, Manual Tilt: 120° /s, Pre-set : 200° /s	Each	4.00	107974.00	431896.00

107	Supplying Installation Testing and Commissioning of following Channel Network Video Recorder (NVR) with camera licenses to record for all channels having specifications and features etc as mentioned below : 1) Network Video Recorder Embedded/ Installed OS (Linux) along with Camera Licenses to record per NVR and to provide a live view, storage and simultaneously Multi-channel playback of all IP camera or more and must be ONVIF with minimum support of 384 Mbps incoming Bandwidth. 2) NVR should support video compressions : H.265 or better, H.264, MJPEG. 3) Must support 1 channel RCA Input, 2 channel RCA Output for Two-way Talk with G.711U/A, G.711u, PCM, G726 audio compressions. 4) Intelligent auto power on when power resumes after power outage. 5) Storage: It should support minimum 8 SATA Slots with 20TB capacity/ Slot and RAID support of RAID 0/1/5/6/10. 6) Connectivity Interface : 2 Nos. x 10/100/1000 Mbps Ethernet Ports, 1x RS485, 1x RS232, 1x eSATA Port 7) Backup Interface : Its should have 4 Nos USB port (2x USB3.0, 2xUSB2.0) 8) Video Output Ports: 2x HDMI and 2 VGA 9) Alarm Ports: It should have 16/8 Ch In/ Out ports to connect various type of external sensors and output devices like hooter/ Siren etc.					
	10) Email & SMS Alert options: Option for SMS/ Email Alerts to minimum 5 designated mobile number for power failure, HDD failure, vandalism, tempering, network disconnection and panic 11) Web & Mobile Application: Web, Mobile app (For iPhone, iPad, Android Phone) for alerts and viewing. 12) Protocols: HTTP, HTTPS, TCP/IP, IPv4/IPv6, UDP, DHCP, DNS, SMTP, UPnP, IP Filter, PPPoE, FTP, DDNS, Alarm Server, IP Search, Multicast, Auto Registration, ONVIF 21.12 (Profile T, Profile S, Profile G), CGI, SDK and OEM Cloud for remote monitoring without any public IP need. 13) Standards: CE, FCC, RoHS, BIS Certified 14) Power Supply : Should support AC100-240V, 50/60Hz Power supply.					

	15) Operating Condition : -5°C to 50°C, humidity 90% (max) (non-condensing) 16) The VMS application shall support all the features & functionalities of the offered cameras. 17) VMS should consist Licenses for all channels to record Cameras with General, motion detection, intelligent, alarm and POS recording modes. VMS should be provided with Camera Licenses , with no dependency of VMS licenses by binding with the MAC address of the cameras to achieve the functionality. 18) The NVR OEM shall be responsible for providing a mobile application compatible with both Android and iOS devices, enabling remote monitoring and playback of cameras/NVR footage. 19) The OEM must provide its own DDNS server hosted in India, eliminating the need for a public IP address for remote monitoring over the Internet. 20) Must support Continuous, Alarm, Motion, Instant, Panic Recording Mode 21) It should support Resolution: 32MP; 24MP; 16MP; 12MP; 8MP; 5MP; 4MP; 1080p; 720p; D1; CIF; QCIF					
	22) When alarm recording is enabled and an event occurs, you can click the alarm icon on monitoring page to view the alert details. The snapshot function is supported on monitoring and playback page 23) The Network Video Recorder (NVR) shall be configured to send email whenever a system message is created or an alarm event occurs. The email server shall be a valid SMTP server. Each recipient email address shall be configured to receive any combination of critical, warning, or informational messages or alarm notifications. When an alarm occurs, the email message includes the NVR name, time of alarm and a list of camera that is configured to record upon alarm 24) It should have Web and GUI interface. 25) Built-In Artificial Intelligence: NVR should have built-in AI :- 2 Channel face detection and recognition, - Minimum 4 Channel perimeter protection, - Minimum 8 Channel Smart Motion Detection					

	26) Face Recognition Database Capacity: It should support total Blacklist and Whitelist capacity of Minimum 20,000 Faces or more with Face Detection speed of 12 face images/sec and facility to add Name, gender, birthday, address, credential type, credential No., countries & regions and state to each face image.27) Face & Human Attributes Search: Search Pictures/ Video by Gender, age group, glasses, expressions, face mask, beard, Top color, top type, hat, bag, age, gender and umbrella.28) ANPR Capability: It should support ANPR Camera with License plate, plate color, vehicle body, vehicle model, vehicle logo, calling, seatbelt, vehicle registration location etc vehicle attributes.29) Alarm Notifications based on: Motion detection, video tampering, video loss, scene changing, PIR alarm, Camera external alarm, Face detection, face recognition, perimeter protection (intrusion and tripwire), ANPR, people counting, stereo analysis, crowd distribution, heat map, Disk Full, Storage Error, IP Conflict and abnormal behaviour of fan, cybersecurity exception30) Alarm Notification should be linked with Recording, snapshots, Camera external alarm output, buzzer, logs, pre-sets and email.31) General AI Based Search: Search Pictures by channel, time, event type, target classification (Fall Detection, People Approach Detection, People No. Exception Detection, People Staying Detection, Violence Detection.32) Smart playback function: Should support smart search for the selected area in the video and smart playback to improve the playback efficiency34) VCA (Video Content Analytic): Should support multiple video contented analytics based on camera analytics35) Analytics by NVR: Perimeter protection and face recognition				
107.1	64 Channel Network Video Recorder (NVR) having display split :- Main screen: 1/4/8/9/16/25/36/64, 2nd screen: 1/4/8/9/16	Each	4.00	82600.00	330400.00
108	Supplying, Installation, Testing and Commissioning following capacity Surveillance grade Hard Disk with upto 256MB/s Transfer Rate, 256 MB Cache, 7200 RPM Disk Speed, 3.5 inch form factor, SATA Interface, BSMI, ICES-003/NNB-003, CE, FCC, KC, Maghreb, RCM, UKCA, VCCI, CB-Scheme, TUV, UL Certifications.				
108.1	8 TB (Terabytes)	Each	16.00	20119.00	321904.00

109	LED Display Supplying, Installation, Testing and Commissioning of following size LED display (LED monitor) industrial grade with3840x2160 resolution or better, USB playback, Bluetooth and miracast connectivity, 4X HDMI 2.0, DP 1.2, HDR 10/10+,brightness: 500-nits or better, Video wall mode should be available, contrast ratio: 1200:1, OPS slot, viewing angle (H/V):170°/ 170°, response time less than 12ms, Display control shall be on monitor screen and programmable with remote (remote shall be supplied with system), Key Board, Optical Mouse, etc.as required.				
109.1	55 inch or larger	Each	4.00	82057.00	328228.00
110	Supplying, Installation, Testing and commissioning of smallform-Pluggable (SFP) for Network Switches. Must be hotPluggable, RoHS Complaint, etc. complete as required.				
110.1	10 G SFP + Single Mode/Multi Mode 14972	Each	40.00	14972.00	598880.00
111	Supplying and fixing of following modular switch / socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
111.1	Telephone socket outlet	Nos.	116	168.00	19,488.00
112	Supplying and drawing following pair 0.5 mm dia FRLS PVC insulated annealed copper conductor, unarmored telephone cable in the existing surface/ recessed steel/ PVC conduit as required.				
112.1	2 pair	Metre	11600	39.00	4,52,400.00
113	Supply, Installation, Testing & Commissioning of Type 1 IP Phone having 2 VoIP account, 120 x40 DOT matrix screen with backlight, Full HD duplex speaker phone, IPV6, Gigabit Etherent, PoE etc. complete as required.	Each	4	11,698.00	46,792.00
114	lP Phone Type 2				
114.1	Supplying, Installation, Testing & Commissioning of Analog phones having standard feautres like 16 digit LCD display, 2 way speaker, caller ID and number storage facility etc. complete as required.	Nos.	40	1,544.00	61,760.00
	SH-X - Electric Vehicle Charging System				

113	Supply, Installation, Testing and commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc.Light EV AC Charger (Mode-3) Power : 7 kW, Input power supply: 1phase 230 +10% Volt, output supply: 230 Volt AC, Frequency:50 Hz +/-3%, Operational temperature range : -25 to 55 degree C (outdoor), -5 to 55 degree C(Indoor)., RH upto 95%, Charging Device as per IS-17017-22-1 EV-EVSE Communication: as per relevant IS Codes, Bluetooth Low Energy, one Charge Point Plug/ Socket as per IS-60309 and IS-17017-2, Vehicle Inlet/ Connector As per EV manufacturer, suitable for 2 Wheelers and 4 wheelers. Indoor use: at least IP41; Outdoor use: at least IP44. Mechanical Strength :protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.O/L,S/C protection. Insulation Resistance > 1 M Ω. Cable Length: 7.5 m. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252 (Part 1) : 2010. OCPP (Open charge point protocol) 1.6J upgradable to ocpp 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.	Each	15.00	23385	350775.00
114	Supply, Installation, Testing and commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc. Parkbay DC Charger (Mode-3) Power Level 2: Normal Power ~24 KW and above, 3 phase 415VAC(-40% to +20%), Frequency:50 Hz +/-5%, output supply: DC 12/24 Volt, Operational temperature range : -25 to 55 degree C (outdoor), -5 to 55 degree C(Indoor), RH upto 95%, Charging Device as per Device/protocol: IS-17017-23, EV-EVSE Communication as per IS-17017-24 ,ISO-15118, Infrastructure Socket as per IS-17017-2-2/3, Vehicle Connector as per IS-17017-2-3 Vehicle Inlet/ Connector As per EV manufacturer, suitable for 4 wheelers. Indoor use: at least IP41; Outdoor use: at least IP44. Mechanical Strength :protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262. O/L,S/C protection. Insulation Resistance > 1 M Ω. Cable Length: 7.5 m. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252	Each	10.00	888982.00	8889820.00

	(Part 1) : 2010. OCPP(Open charge point protocol) 1.6J upgradable to ocpp 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.				
115	Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on cable tray as required.				
115.1	Upto 35 sq. mm (clamped with 1mm thick saddle)	Meter	50.00	53.00	2650.00
115.2	Above 35 sq. mm and upto 95 sq. mm (clamped with 25x3mm MS flat clamp)	Meter	50.00	109.00	5450.00
115.3	Above 95 sq. mm and upto 185 sq. mm (clamped with 25/40x3mm MS flat clamp)	Meter	50.00	138.00	6900.00
115.4	Above 185 sq. mm and upto 400 sq. mm (clamped with 40x3mm MS flat clamp)	Meter	50.00	226.00	11300.00
				TOTAL	**151469711.00**

Abstract of E & M Sub heads

SH-I - Internal EI	**66566003.00**
SH-II Solar PV Power Generation	**1357000.00**
SH-III Lifts	**26922984.00**
SH-IV - Uninterruptible Power Supply (UPS) system	**341772.00**
SH-V - Firefighting, Sprinkler and Fire Extinguisher system	**22600102.00**
SH-VI - Intelligent Fire Alarm System	**7582247.00**
SH-VII - Diesel Engine Driven Generating Set	**1871541.00**
SH-VIII - HVAC system	**2826180.00**
SH-IX - CCTV and Intercom System	**12134987.00**
SH-X - Electric Vehicle Charging System	**9266895.00**
TOTAL	**151469711.00**