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**Name Of Work:- Construction of New GIDC Office Building at Vadodara**

**DETAILED SPECIFICATION OF ELECTRICAL WORKS**

**The work of the ELECTRO-MECHANICAL section shall be carried out by Electrical Contractor having "A" class and above registration.**

**General scope of work:**

General:

The scope of the works covers Design, manufacturing ,factory testing, supply, delivery to site, unloading, handling and storage at site, complete installation including cement concrete foundationandsupportingsteelstructurewherevernecessary,finalcheckup, painting ,performance testing and commissioning including comprehensive free operation and maintenance contract with required manpower for 5years for the streetlight and related electrical equipments and other required accessories to be supplied under thesespecifications on turnkey basis. The scopes also include first filling of consumables and satisfactory performance of all equipment provided in the price schedule.

Note:-Bidder has to design & Submit Mechaincal ,Electrical ,Plumbing & Fire Fighting Services draw-ing /documentsasperNormsofLatestNationalBuildingCode(NBC)/Lift,Fire& SafetyforIndustrialBuilding andRelevantIS Standards toGETCOforApproval.Contractor has to appoint MEPFConsultant to get it done all required drawing & documents for the saidwork.

The contractor shall be fully responsible for the electrical ,mechanical equipment and others installations for storage, theft, fire, natural calamity etc. till the entire work covered by this contract is satisfac- torily completedby him and handed over to the owner.

All the installations shall be of high quality ,safe,durable,complete and fully operational includingall necessary items,sparesandaccessorieswhethernotspecifiedindetails.All the works shall be com- pleted in accordance with the regulations and standards to the satisfactions of the owner.

All the equipment and accessories shall be manufactured and specifications.The equipments/materi- als shall be vendor only. as per the regulations, relevant standards selected and procure from the approved

Thecontractorshallhavetoarrangeinspectionandtestingoftheequipment/materialsas per the In- dian Standard specifications or equivalent at his cost. During the inspection,theOEMshallhavetopro-videtraceablecertificates(ofauthorizedbodies)oftestand calibration

instruments/equipment's that are used for testing of instruments.

The following test certificates shall be provided.

- Certificate of calibration with its accuracy and uncertainty
- Certificate of standard and classification
- MOC certificate of instruments and its parts.

The equipment shall be installed as per the instruction of respective manufacturer of equipments and approved by the owner.

The contractor shall have to submit a completion certificate of electrical license holder for installation of electrical equipments for inspection of installation for release of power supply connection by concern power supply authority.

On completion of work, the contractor shall have to submit inbuilt drawing indicating the complete road wise and phase wise installation of the streetlight.

#### **Documentation required**

- 1) Within 30 days after issue of an acceptance letter, the contractor is required to submit bar chart for showing planning and progress of work.
- 2) The design of items and lighting layout showing lighting poles, section pillar location as per required / desired Lux level shall be submitted by the contractor to Engineer Incharge within 30 days of acceptance of tender. All queries / remarks raised by the Engineer Incharge with respect to the contractor's design shall be complied by the contractor within 15 days.

#### **Quality Assurance/Quality Control Program**

The contractor shall include in his offer the quality assurance program containing the overall quality management and procedure which is required. The contractor shall establish document and maintain an effective quality assurance system.

The owner/ consultant or their representative reserve the right to inspect/ witness, review any or all stages of work at shop/site as deemed necessary for quality assurance.

#### **Safety of materials**

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipment's including those issued/out items in contract/GETCO against damage, theft from any cause whatsoever.

#### **Scope of work:**

Any item of work, either supply or erection of materials which have not been specifically mentioned in this specification and drawing but are necessary to complete the work for trouble free, efficient operation and guarantee performance of the entire System offered shall be deemed as included within the scope of this specification and shall be provided by the contractor without any extra cost to the owner.

### **Care of the works**

From the commencement to virtual completion of the work, the contractor shall take full responsibility for the care for all works including all temporary works and any damages, loss or injury shall happen to the works or to any part thereof to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same, so that at completion of the work shall be in good order and in conformity in every respects with the requirement of the contract and the Engineer In Charge's instruction.

**INTERNAL WIRING (Mains & Wires) and Allied Accessories:** (All the accessories shall be fitted as per Cat-III as per SOR approved by R & B for the year 2012-13) **Cat- III.**

**INTERNAL WIRING (Mains & Wires) and Allied Accessories-** Supply and labour charges for fixing, testing and commissioning of following accessories complete with fixing bracket etc. which shall be supplied by the tenderers with all necessary accessories, tools etc.

**(a) with medium class Rigid PVC pipe and accessories as per IS 694:2010 with latest amendments with improved fire performance for Category C-1. Cat-III**

**Note:- Bidder has to design & Submit Mechanical, Electrical, Plumbing & Fire Fighting Services drawing/documents as per Norms of Latest National Building Code (NBC), Fire & Safety for Industrial Building and Relevant IS Standards to GIDC VADODARA for Approval. Contractor has to appoint MEPF Consultant to get it done all required drawing & documents for the said work.**

**The Contractor / Bidders has to obtain all necessary required statutory licensees /NOC / Permissions from the concern Department for GIDC like NOC from Fire department / Electricity Connection from DGVCL/MGVCL, SOLAR permission from GEDA, Lift, Fire and Safety for Industrial Building etc. All required liaisoning work from the same has to be done by the Contractor/Bidders by their own. Necessary required official Fees /payment will be paid by GIDC.**

### **GENERAL PARTICULARS AND REQUIREMENTS**

## 1. GENERAL

These specifications shall be read in conjunction with Condition of Contract, Bill of Quantities and Drawings to cover the Supply, Erection, Testing, and Commissioning of Electrical work.

### 1.1 Scope of work

The general character and the scope of work to be carried out under this contract are illustrated in Drawings, Specifications and Schedule of Quantities. The Contractor shall carry out and complete the same 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. The contractor shall supply all labor, materials and equipment as required and specified for supply, Installation, Testing, Commissioning and Handing Over of the complete Electrical System. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/ Documents as being furnished or installed but which is necessary and customary to be performed under this Contract.

The Supply Authority will terminate their supply feeder in the HT metering panel from where the scope of this tender starts including installation of the Metering Panel.

The electrical Work mainly comprises of but not limited to—

- LT Power Distribution
- Cables and Wires
- SIT Co of Section Pillar, PCC Panel etc.
- Earthing System
- Light Design As per Lux Level Requirement & Execute accordingly.
- Get Permission of Concern Authority to Finished Work
- Liaisoning Work for Power Supply

For execution of entire system, following are included in the Contractor's scope of work as well as in the rates quoted by them -

- Prepare Light Design As per Lux Level Requirement, Finalize it with Senior Coach, GETCO Department Executive & PMC, and Execute tender items as per final & approved design. Get Permission of Concern Authority to Finished Work, Get Power Supply from concern Electricity Board and complete Liasoning Work needed for it.
- List of recommended spares, as installed drawings, operation and maintenance manual for the Electrical work.

## **2 Electrical Operation Considerations**

- The design ambient temperature shall be considered as 45°C unless otherwise specified.
- The relative humidity shall be considered as 90%
- The system voltage and frequency variations shall be as given below:
- Voltage  $\pm 5\%$  Frequency:  $\pm 3\%$
- Combined voltage and frequency variation will not exceed 8%
- Under transient conditions voltage variation may be  $-20\%$  or  $+10\%$  of nominal voltage, this shall have no consequence on equipment operation
- Seismic Zone: Zone III
- Hot, Arid and Dry Climate.

### **2.1 Bye-laws and Regulations.**

The installations shall be in conformity with the Bye-laws, Regulations and Standards of the Bureau of Indian Standards. Latest Rules of Local Authorities and other statutory boards concerned shall also become applicable to the Installation. The cost of Inspector and approval of statutory authorities as and when required from commencement of work to completion of work shall be borne by the contractor except the statutory fees for permanent work.

### **2.2 Material and Equipment**

All materials and equipment shall in general have ISI Mark whichever available. The valid ISI certificate wherever available along with manufactures test certificate to be submitted before or along with dispatch of materials. Make shall be strictly in conformity with the list of approved manufacturers.

### **2.3 Manufacture Instructions**

Where manufacturer has furnished specific instructions, relating to the material and equipment used in this project covering points not specifically mentioned in these documents, such instructions shall generally be followed in all cases. The specific requirement should be brought in to the notice of Engineer for their decisions.

#### **• Inspection and Testing**

The Owner may carry out inspection and testing at manufacturer's works for this contract. NO equipment shall be delivered without prior written confirmation from Architect / Engineer. In case factory inspection is carried out, then all traveling and lodging expenses shall be borne by the Owner. However, all expenses related to testing shall be to Contractor's account. Tests on site of complete works shall demonstrate the following among others.

That the equipment installed complies with specification in all respects and is of the correct rating for the duty and site conditions.

That all items operate efficiently and quietly to meet the specified requirements. That all electrical circuits are correctly protected and that protective devices are properly co-ordinate.

The contractor shall provide all necessary instruments and labor for testing shall make adequate records of test procedures and readings shall repeat any tests requested by the Architect / Engineer and shall provide test certificate signed by a properly authorized person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the Architect / Engineer at contractor's expenses unless otherwise called for.

If it is observed that the installation or part thereof is not satisfactorily carried out. Then the contractor shall be liable for the rectification and re testing of the same as called for by the Architect / Engineer decision as to what constitutes a satisfactory test shall be final.

The above general requirement as to testing shall be read in conjunction with any particular requirements specified elsewhere. All tests shall be carried out by a test house approved by the Architect / Owner.

#### **.1 Samples**

The Contractor shall be required to have samples of various materials to be kept at site after approval by the Architect / Engineer.

- **Measurements**

All measurements shall be as specified in Technical Specification or BOQ. In absence of any such method of measurement in the said documents, relevant IS Codes or any other approved standard shall be followed.

.1 Bidders shall furnish the Technical Data Sheet as specified hereinafter.

## **TECHNICAL SPECIFICATION ELECTRIC WORK**

- **LT SWITCHGEAR PANEL**

.1 **Scope**

This specification covers the design, material, construction features, manufacture, supply, inspection and testing at the manufacturer's works, delivery and performance testing of L.T. Switchgear panel of voltage not exceeding 1000 VAC.

The switchgears would comprise of LT switch boards, power panels, control panels and Distribution Boards (DBs) required for the supply of power to the medium voltage equipment.

.2 **Codes & Standards**

The design, construction, manufacture and performance of equipment shall conform to latest applicable standards and comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the VENDOR of this responsibility.

Equipment shall conform to the latest applicable Standards as mentioned. In case of conflict between the Standards and this specification, this specification shall govern.

All components shall be of reputed / approved make and subject to Client's approval.

.3 **Tests**

A. All tests shall be conducted in accordance with the latest edition of IS:2834 and as applicable for the controls.

B. Type test certificates for similar capacitor unit shall be furnished.

#### **.4 Constructional Features**

A. Switchgear panel shall be

- (a) of the metal enclosed, indoor, floor mounted modular type
- (b) made up of the requisite vertical sections
- (c) of dust and vermin proof construction
- (d) provided with a degree of protection
- (e) easily extendable on both sides by the addition of vertical section after removing the ends covers.
- (f) provided with a metal sill frame made of structural steel channel section property drilled for mounting the Switchgear along with necessary mounting hardware. Hardware shall be zinc plated and passivated.
- (g) provided with labels on the front indicating the switchgear designation.
- (h) provided with cable entry facilities at top and bottom with 3 mm thick removable gland plates and necessary cable glands.
- (i) of uniform height of not more than 2200 mm
- (j) of single front execution
- (k) provided with gaskets all round the perimeter of adjacent panels, panel and base frame, removable covers and doors.
- (l) provided with busbars running at the top or bottom, as required, all along the length of the switchgear in a separate sheet steel enclosure.

B. Operating devices shall be incorporated only in the front of the Switchgear.

C. The switchgear shall be provided in distinct vertical sections each comprising :

- (a) A completely metal enclosed busbar compartment running horizontally.
- (b) Individual feeder modules arranged in multi tier formation.
- (c) Enclosed vertical busbars serving all modules in the vertical section.
- (d) A vertical cable alley covering the entire height.
- (e) A horizontal separate enclosure for all auxiliary power and control buses, as required, shall be located so as to enable easy identification, maintenance and segregation from the main power buses. Tap-off connections from these buses shall be arranged separately for each



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vertical section.

(f) Each vertical section shall be equipped with space heaters which may be located in the cable alley.

Current transformers shall not be directly mounted on the buses. Current transformers on circuit breaker controlled circuits shall be mounted on the fixed portion of the compartment.

In breaker compartments, suitable barriers shall be placed between circuit breakers and all control, protective and indication circuit equipment including instrument transformers. External cable connections shall be carried out in separate cable compartments for power and control cables.

After isolation of power and control connections of a circuit, it shall be possible to safely carry out maintenance in a compartment with the bus bars and adjacent circuits live.

Cable alleys shall be provided with suitable hinged doors. It shall be possible to safely carry out maintenance of cable connections to any one circuit with the bus bars and adjacent live circuits.

Adequate number of slotted cable support arms shall be provided for dressing the cables.

The withdrawable chassis housing circuit breakers shall be of the fully draw out type.

#### **.5 Sheet Metal Work**

The switchgear frame shall be fabricated using suitable white CIRCA sheets of thickness not less than 2.5 mm.

Frames shall be enclosed by white CRCA sheet of thickness not less than 2 mm smoothly finished, levelled, and free from flaws. Doors and covers shall be made of white CIRCA sheets of thickness not less than 2mm. Stiffeners shall be provided wherever necessary. The complete structure shall be rigid, self-supporting, free from vibration, twists and bends.

#### **.6 Painting**

All sheet steel parts shall undergo rust proofing process to include degreasing de-scaling and phosphating process with 7 tanks process. The steel works shall then be painted with the two coats of zinc chromate primer final paint shall be powder coated in approved shade as per relevant IS. Thickness of powder coating shall be 65 microns.

- **MAIN AND AUXILIARY BUSES**

- .1 **Main Buses**

The bus bars shall be three-phase made of high conductivity copper alloy. Bus bars shall be of uniform cross section throughout the length of the switchgear. These shall be provided with at least the minimum clearances in air as per applicable standards for a 500V, 3 phase system. All bus-bars, bus-taps shall be insulated with close fitting heat shrinkable sleeve of hard, smooth, dust and dirt free colored plastic insulation. Bus bar supports shall be made of Hylam sheets, glass reinforced moulded plastic material, or cast resin. All the bus bars joints shall be tinned copper and greased with electrically conductive grease.

Feeders of rating up to 63A shall be connected to the main bus bars using suitable size copper wires. For feeders above 63A, suitable size bus bars shall be provided for connection to the main bus bar. All the wiring shall be done using FRLS color coded wires of approved make.

- .2 **Auxiliary Buses**

Auxiliary buses for control power supply, space heater power supply or any other specified service shall be provided.

- **CIRCUIT BREAKERS**

- .1 **General**

**Circuit Breakers shall be:-**

- A. of the air break draw out type. electrically operated & mounted along with its operating mechanism on a wheeled carriage moving on guides, designed to align correctly and allow easy movements.
- B. of the shunt trip type
- C. provided with mechanically operated targets to show 'Open', 'Closed', 'Service' and 'Test' positions of the circuit breaker.
- D. provided with mechanically operated, red 'trip' push button, shrouded to prevent accidental operation.
- E. provided with locking facilities in the 'Service', 'Test', and 'Isolated' positions. In test position the breaker will be tested without energising the power circuits. The breaker shall remain fully housed inside the compartment in the test position.

- F. provided with 6NO and 6NC potential free auxiliary contacts, rated 10 A at 240 V A.C. and 1 A (inductive breaking) at 220 V D.C.
- G. provided with 'red', 'green' and 'amber' indicating lamps to show 'closed', 'open' and 'Auto-trip' conditions of the circuit breaker when breaker operation is controlled by a control switch.
- H. Circuit breaker closing and trip coils shall be rated for satisfactory operation on a control supply system.
- I. Closing and trip coil shall operate satisfactorily under the following conditions of supply voltage variation:
- (a) Closing coils - 85% to 110% of rated voltage
  - (b) Trip coils - 50% to 110% of rated voltage
- J. Conforming to IEC 947-1 & 2.

**Circuit breakers shall be provided with the following interlocks.**

- K. It shall not be possible to plug-in a closed circuit breaker, or to draw out a circuit breaker in the closed position.
- L. It shall not be possible to operate a circuit breaker unless it is in the fully plugged-in, test, or fully isolated position.

## **.2 Operating Mechanism**

- A. Power operated mechanism shall be of the motor wound spring charging stored energy type. The closing action of the circuit breaker shall charge the tripping spring ready for tripping. Speed of closing of contacts shall be independent of the speed with which the handle is operated. All stored energy mechanisms shall be provided with mechanical indicators to show the 'charged' and 'discharged' conditions of the spring.
- B. Circuit breakers provided with stored energy operating mechanisms shall be provided with the following interlocks. The circuit breaker shall not close unless the spring is fully charged. Shocks, vibrations, or failure of springs shall not operate the breaker or prevent intended tripping.
- C. Power operated mechanism shall be provided with a universal motor suitable for operation on DC. control supplies with voltage variation from 85% to 110% rated voltage, designed to enable a continuous sequence of closing and opening

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operation as long as power is available and at least one opening operation on

power supply failure, provided with emergency manual charging facilities, provided with facilities for remote panel Closing & opening operations.

D. The controls scheme will be as follows for remote control:

E. All spare potential free contacts of all ACBs, MCCBs and contactors in main LT panel shall be wired up to the terminal block of individual module.

F. Spring charging time for power operated mechanism shall not exceed 15 seconds. Power operating mechanism shall be provided with the following additional features. Closing of the circuit breaker shall automatically initiate recharging of the spring ready for the next closing stroke. The motor shall be mechanically decoupled as soon as the emergency manual charging handle is coupled. The circuit breaker mechanism shall make one complete closing operation once the control switch has been operated and the first device in the control scheme has responded even though the control switch is released before the closing operation is complete provided there is no counter trip impulse. Closing controls shall be so arranged that only one closing operation of the circuit breaker shall result from each close initiating impulse, even if the breaker trips while the initiating device is held in the 'close' position. An electrical anti pumping relay shall be provided on the circuit breaker chassis for this purpose, in addition to the mechanical anti pumping feature incorporated in the circuit breaker.

### **.3 Protection Coordination**

The circuit breaker shall be provided with microprocessor based overload, short circuit and earth fault protection releases, each with a wide setting range integrated in one module.

The microprocessor based trip unit shall be provided with following features:-

A. designed to withstand tough industrial environments i.e. high ambient temperatures, switching surges, electromagnetic interferences, vibrations and switching areas.

B. reliably self-powered by built in current transformers.

C. Motor setting shall be provided with 20 m sec delay to eliminate nuisance tripping caused by high peaks during motor start. It shall also provide single phasing protection.

D. LED display indication of each of overload, short circuit and earth fault.

- E. Integrated test button to check the healthiness of trip unit electronics and associated CT circuits without tripping the breakers.
- F. Alarm display for microprocessor fault.
- G. Query feature to indicate tripping cause upto 48 hours after instant of tripping without back up supply.
- H. Other features such as switchable zone scheme memory, opto-coupled outputs for remote signaling of a trip cause, switchable thermal memory, over temperature indication, communication capability.

It shall be the responsibility of the VENDOR to fully co-ordinate the overload and short circuit tripping of the circuit breakers with the upstream and downstream circuit breakers/fuses/motor starters. to provide satisfactory discrimination.

#### **.4 Moulded Case Circuit Breaker**

MCCB shall be capable of breaking short-circuit currents up to levels as specified in Bill of Quantities / Drawing. Moulded case circuit breakers shall be made of insulating case and cover made of high strength, heat resistant and flame-retardant thermosetting insulating material conforming to IEC 947 Part 2 of 1989, BS 3871, 1965 or other applicable standards.

The switching mechanism shall be quick make/quick-break type with double break contact system utilizing a trip free toggle mechanism. The handle position shall give positive indication of whether the breaker is ON (top), OFF (down) or TRIP (midway). For overload protection, three bimetal magneto-thermal release and electromagnetic releases for short circuit protection to be provided. The magneto-thermal release shall be variable and direct acting. All releases shall operate on a common trip bar so that all phases are disconnected in the event when fault occurs even on only one of them. The tripping mechanism shall be of an inverse time characteristics to prevent tripping on temporary overloads and shall not be affected by normal variation in ambient temperature.

The terminals shall have sufficiently large dimensions to accept links or cable lugs of suitable sizes. These shall be of a reputable manufacturer.

## **.5 Switches/MiniatureCircuitBreakers(MCB)**

- A. Switches/MCBs shall be hand operated, air break, quick make, quick break type conforming to applicable standards.
- B. The switch shall be protected by fuse and the MCB shall be provided with overload/short-circuitprotectivedeviceforprotectionunderoverloadand short-circuit conditions. The switch action shall be trip free to inhibit closing under fault conditions. All brass parts shall be electroplated and all steel parts cadmium plated and allcontacts silver plated. The minimum breaking capacityof MCBs shall be 10 kA r.GI. at 415V/220V D.C.
- C. Switch shall have provision for locking in both fully open and closed positions.MCBs shall be provided with locking facility.
- D. The connections between switch and fuse shall be insulated and all liveconnections shall be shrouded.
- E. Miniature circuit breakers shall be as specified elsewhere or approved. Each miniature circuit breaker shall be provided with spring-washer at each cable termination.

## **.6 EarthLeakageCircuitBreakers(ELCB/RCCB)**

- A. Switches/ELCBs shall be hand operated, air break, quick make, quick break type conforming to applicable standards.
- B. AnEarth-leakagecircuitbreaker(**ELCB**)isasaafetydeviceusedinelectrical installationswithhighEarthimpedancetopreventshock.
- C. It detects small strayvoltages on the metal enclosures of electrical equipment, and interrupts the circuit if a dangerous voltage is detected.

## **8 CABLETRAYS&RACEWAYS**

### **8.1 Scope**

This specificationcoversthedesign.manufacture,testingatworks,inspectionand delivery at site of cable trays.

### **8.2 General**

Itisproposedthatcablestobelaidinthebasementandverticalserviceshaftsbutnot within lift shafts) will be laid



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on suitable cable trays.

Power and data wiring to Workstation receptacles shall be through conduits up to the nearest wall. It shall drop to FFL concealed in ceiling or boxed in an aesthetically pleasing enclosure. Wiring up to workstation shall run in raceways.

### **8.3 Constructional Features**

#### **8.3.1 Material**

The cable trays are to be manufactured from 2mm thick cold rolled sheet steel. The same shall be shaped and cut using power driven dies/ cutters/ presses to the specified sizes and bolted/ together to form a standard length of cable tray and its accessories.

#### **8.3.2 Finishing**

The manufactured trays and all the accessories should undergo seven tank treatments and should be hot-dip galvanized as per BS-2629. The zinc coating of 60 microns has to be uniformly guaranteed. The trays will be tested for this at site at random and the contractor should make available at site Alcometer (or approved equivalent meter) for carrying out the test at site. The owners reserve the right to at random inspect the trays being manufactured at the manufacturer's factory.

The width of the cable trays is specified in the schedule of quantities. The other details will be as shown in the drawings.

GI coupler plates with GI jointing hardware is to be included in the rates of the contractor. In case of GI perforated tray of width 150mm the height of the sidewalls shall be 50mm.

The following accessories are also to be supplied and installed by the contractor and the cost of the same is to be included in the rates for straight lengths to be quoted in the schedule of quantities.

Coupler plates and hardware (as stated above).

- (a) Vertical Elbow Up
- (b) Reducer
- (c) Horizontal Tee
- (d) Horizontal Cross Piece
- (e) Horizontal Elbow
- (f) Vertical Elbow Down
- (g) Providing cold galvanized paint touch up at site wherever trays, accessories and supports

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are cut/ drilled after hot dip galvanizing.

### **8.3.3 Bends**

The trays should have radius so as to enable a bending radius of 12 x Dia. of largest cable to be laid in the tray.

### **8.3.4 Supporting Steel Work For Trays**

Supporting structural steel members to be made from 50mm x 50mm x 6mm GI. angles, 50mm x 6mm GI. flats for trays of width 600mm & above and 40mm x 40mm x 6mm GI. angles, 40mm x 6mm GI. flats for trays of width less than 600mm and GI. Channels duly hot dip galvanized. In general on horizontal runs cable trays of width > 600mm & above will be supported at every 1 Mtr. and trays of smaller width be supported at 1.2 Mtr intervals. In vertical runs the trays should be supported at every 1 Mtr interval. Every horizontal bend will also be given an extra support.

### **8.3.5 Measurement**

The installed trays and accessories will be measured at the central axis of the tray and bends. Bends, reducers, elbows, coupler plates, hardware & steel supports will not be measured separately.

### **8.3.6 Floor Raceway**

Floor raceway of hot dip galvanised / aluminium sheet of 14 g / 2.0 mm shall be used and the dimensions for the same shall be as per the BOQ. The raceways shall be as per the make specified in the tender, The raceways shall be free of any sort of welding edges or other sharp edges to protect cutting of wires during pulling. The raceway shall be laid with use of junction boxes fabricated from 14 g hot dip GI as per drawing.

## **9 EARTHING**

### **9.1 Scope**

This specification covers the supply, installation, testing and commissioning of the Earthing system.

### **9.2 Standards**

A. IS 62305:2010 - Code of Practice for the protection of buildings and allied structures against lightning

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B. IS:3043(1987)-CodeofPracticeforearthing

- C. IndianElectricityRules1956
- D. IndianElectricityAct1910
- E. CEIGRegulations

### 9.3 GeneralRequirement

Complete earthing system comprising earth electrodes in conjunction with earth grid shall be provided for the substation and control room for achieving a safe step and touch potential.

The exact location of Earth Bus/conductor, earth electrodes and earthing points on the equipment shall be determined at site in consultation with the contractor. Any change of methods, routing and size of conductor shall be subject to approval by the contractor.

#### 9.3.1 DetailsofEarthingSystem:

- A. MainEarthGrid -50x6mmGIFlat
- B. PowerTransformerNeutral-50x6mmCu.Flat
- C. TransformerBody -50x6mmGIFlat
- D. EquipmenttoMainGrid -25x6mm CFlat
- E. DBs/JunctionBoxes -8SWGGI Wire
- F. LightningProtection -1x70mm Cuflexible

#### 9.3.2 Earth Electrodes in Earth Pits Plate Earthing

Plate electrodes of G.I. shall be 600 x 600 x 6mm. thick and of copper shall be 600 x 600 x 3mm. thick unless otherwise specified.

Earth bus is a Copper/G.I. strip or flat of specified size interconnecting all earth electrodes. This will be laid throughout the length of electrical shaft (2 nos. per shaft).

#### 9.3.3 ArtificialTreatmentofSoil

If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, sodium carbonate, copper sulfate, salt and soft coke or charcoal in suitable proportions.

### 9.3.4 ResistancetoEarth

The resistance to each earthing system shall not exceed 1.0 ohm.

### 9.3.5 EarthingStation

#### Plate Electrode Earthing

A. Earthing electrodes shall consist of a galvanized iron plate not less than 600mm x 600mm x 6mm thick or copper plate not less than 600mm x 600mm x 3mm thick, as called for in the schedule.

B. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 2.5 mtrs. below ground level.

C. Earth Electrode shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall it be nearer than 2 mtrs. from the outer face of the wall.

D. The earth plate shall be set vertically and surrounded with 150 mm. thick layer of charcoal dust and salt mixture. 20mm. G.I. pipe shall run from the top edge of the plate to the ground level.

E. The top of the pipe shall be provided with funnel and a mesh for watering the earth through the earth. The main earth conductors shall be connected to the electrode just below the funnel, with proper terminal lugs and check nuts. The funnel over the G.L pipe and earth connections houses in a masonry chamber, approximately 350mm. length x 300mm. wide and 300mm. deep. The masonry chamber shall be provided with a cast iron cover resting over a C.I. frame embedded in masonry.

### 9.4 EarthingLayout

Earthing conductors in outdoor areas shall be buried at least 600mm below finished grade level unless stated otherwise. Wherever earthing conductors cross cable trenches, underground service ducts, pipes, tunnels, etc. it shall be laid minimum 300 mm below and shall be re-routed in case it fouls with equipment structure foundations.

Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on earthing terminals of the equipment/structure, if the equipment is available at the time of laying the grid, otherwise "earth riser" shall be provided near the equipment foundation, pedestal for future connections to the equipment earthing terminals.

Earthing conductors along their run on cable trench ladder columns, beams, walls, etc. shall be supported by suitable cleating at intervals of 750 mm. Earthing conductors along cable trenches shall be cleated to the wall nearer to the equipment.

Cable trays and supports shall be connected to the earth mat at every 30 meters interval. Wherever it passes through walls, floors, etc. GI sleeves shall be provided for the passage of the conductor.

Earthing conductor around the building shall be buried in earth at a minimum distance of 2000 mm from the outer boundary of the building.

## **9.5 Jointing**

Earthing connections with equipment earthing pads shall be bolted type. Contact surface shall be free from scale, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making each connection. Bolted connections, after being checked and tested shall be taped with PVC tape.

Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

## **10 WIRING**

### **10.1 Point Wiring**

#### **10.1.1 Scope**

Providing specified size of FRLS insulated, copper conductor, 1.1kV grade, ISI marked of required color coding of approved make both for supply and earthing and drawing these wires through already laid Medium duty PVC conduits with fish wire, ferruling by coding tags as per relevant drawings and duly connecting with lugs, complete finishing, removing debris from site; testing the installations for safety and beneficial use.

#### **10.1.2 Wires: Mains, Sub-mains, Circuit Mains (comprising phase and neutral wires):**

The wires shall be 650 / 1100 V, PVC insulated, FRLS unarmored with stranded copper conductors, unless otherwise specified. The wires shall conform to IS:694.



The minimum area of conductors shall be 1.5 sq. mm for light fittings; 2.5 sq.mm for receptacles rated 6 A receptacles and 4 sq.mm for 16 A and above.

The wires shall be coated red, yellow, and blue for R, Y, B phase and black for neutral. Unless otherwise specified, external lighting cables shall be of 1.1 kV grade, 3C, PVC insulated and armoured type fed from main distribution boards.

***Lugs:***

Copper lugsofrequiredsizeandtype.

***Glands:***

Glandsatterminatingendofrequiredsizeandtype.

***OtherMaterial:***

Rubbergrommet,bush,harnessingmaterial,etc.

### **10.1.3 DrawingofWires**

Wires shall be drawn with adequate care. Correct color coding as per shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral maybe looped onlywithin circuit.For lighting loadorsinglephasedistributionwires of twodifferent phases shalt not bedrawn in single pipe. Lead wires ofsufficient extra length shall be provided and shall be terminated in the terminalsof accessoriesonly, with correct type of and correct size of tugs.

Bushshall be used at pipe opening to protect wire insulation fromgetting damaged due to burrs I sharp edges.

### **10.1.4 Testing:**

***Insulationresistancetest:***

All wiring shall be tested with 500V meggar between phases, phase-neutral and to Earth. IR value shall not be less than 1 M-ohm.

***Polaritytest:***

Polarity test shall be carried out for ensuring correct polarity plug and switch.

#### 10.1.5 Table No- I Colour Code for Wires

| Type    | Colour            |
|---------|-------------------|
| Phase   | Red, Yellow, Blue |
| Neutral | Black             |
| Earth   | Green             |

### 11 SWITCHES & SOCKETS

#### 11.1 Switches

The switches shall be single pole, single or two way as shown in respective internal lighting drawings. They shall be of moulded type rated for 250 volt, and of full 6 / 16 A capacity. They shall be provided with insulated dollies and covers.

The switches shall be rocker operated with a quite operating mechanism with bounce free snap action mechanism enclosed in an arc resistant chamber. The switches shall have pure silver and silver cadmium contacts. The switches shall be flush modular type. The make of the switches shall be as indicated in the drawings or BOQ or make of material or as suggested and approved by the client. The switches installed in outdoor area shall be industrial, metal clad type, and shall be provided in weather proof enclosures, complete with weather proof gasket covers.

#### 11.2 Sockets

Each socket shall be provided with control switch of appropriate rating. The sockets shall be moulded type, rated for 250 volts, and either of full 6 A or 16 A capacity, as mentioned on the drawings.

Sockets shall be of three pin type, the third in being connected to earth continuity conductor. The socket shall be flush modular type. The sockets installed in machine room, plant room or wet / damp area shall be metal clad weather proof type. The finishing and make of all the sockets shall be same as light switch. The socket shall have fully sprung contacts and solid brass shrouded terminals to ensure positive electrical connections.

The sockets shall be provided with automatic shutters, which open only when earth pit of the plug inserts in the socket.

The socket shall be provided with three pin plug top suitable to the socket and of the same make as socket.

### **11.3 Boxes**

The boxes for switches and sockets shall be 18 gauge galvanised sheet steel as manufactured by the switch manufacturer and suitable to accommodate grid typeswitches. The size of enclosure boxes shall be chosen to accommodate the number of switches to be installed at the particular location.

Separate screwed earth terminal shall be provided in the box for earthing purpose. All boxes shall have adequate no. of knock out holes of required diameter for conduit entry. Switch boxes to receive switches. socket outlets, power outlets. Telephone outlets, fan regulators. etc. shall be fabricated to the approved shape and size to accommodate all the devices without overcrowding. Outlet boxes to receive ceiling fan shall be fitted with adequately sized rod I hook to fix ceiling fan. The boxes shall be of minimum depth of 65 mm.

## **12 CONDUITS**

### **12.1 Scope**

Providing specified rigid PVC conduit and laying I erecting in RCC work, such as slab, beam, column before casting, surface, wall, ceiling, etc including entries through wall as per requirement and as per approved method of construction. The scope also includes supply and installation of accessories for the PVC pipes of same make as that of pipe; such as spacers, saddles, couplers, bends, inspection or non-inspection type elbows, tees, junction boxes of required ways and resin I adhesive to make all joints rigid, duly finishing, removing debris from site. Hardware like sheet metal screws of specified sizes, washers, raw/ PVC/ fill type plugs, wooden gutties.

### **12.2 Material**

All conduits, fittings & accessories shall be rigid PVC conduit as indicated in the BOQ and shall comply with IS:9537. All pipes shall have ISI mark on each length of conduit. The minimum size of conduit shall be 20 mm.

The conduits shall be uniformly circular in cross section. The nominal length of conduit used shall be 3 or 4 meter. Joints shall be avoided as far as possible in the conduits. The interior of conduit shall be free from obstruction which might interfere with ready introduction I withdrawal of maximum no. of cables permitted. The ends of conduit shall

be reamed and filed to remove rough edges and inside surface shall be smooth and free from burrs and other defects. All conduits shall be provided with approved type of fish wire.

### **12.3 Method of Construction**

#### **12.3.1 General:**

Work shall be done in co-ordination with civil work to suit final approved layout. Conduit shall be duly clamped and size of conduit shall be correct depending on number of wires to be drawn. Separate pipe shall be used for each phase in single phase distribution and also for wiring other utilities like data, telephone, TV cabling, etc, for which distance between pipes shall be not less than 300mm and anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with color coding. (For visual identification). Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 425m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done in approved manner without changing the cross-section.

**Table No.2. Colour Coding for Conduits in Wall Entry**

| <b>Conduit for</b>   | <b>Colour</b> |
|----------------------|---------------|
| Light/Power Circuit  | Black         |
| Security wiring      | Blue          |
| Fire Alarm wiring    | Red           |
| Low Voltage circuits | Brown         |

### **13 LIGHTING SYSTEM INSTALLATION WORKS**

**The light fitting shall be supplied by contractor as per the instructions given by Consultant.**

### **14 TESTING AND COMMISSIONING**

#### **14.1 General**

The testing and commissioning for all electrical equipment at site shall be according to the procedures laid down below:

Allelectrical equipments shall be installed, tested and commissioned in accordance with the latest relevant Standards and Codes of Practices published by Indian Standards Institution wherever applicable and stipulations made in relevant general specifications. The testing of all electrical equipments as well as the system as a whole shall be carried out to ensure that the equipment and its components are in satisfactory condition and will successfully perform its functional operation. The inspection of the equipments shall be carried out to ensure that all materials, workmanship and installation conform to the accepted design, engineering and construction standards as well as accepted codes of practice and stipulations made in the relevant general specifications.

All tests shall be carried out by the contractor using his own instruments, testing equipment as well as qualified testing personnel. The results of all tests shall be conforming to the specification requirements as well as any specific performance data guaranteed during finalization of the contract. Test sheets shall be prepared & submitted to contractor for approval within 1 month of award.

#### **14.2 Preparation of the Plant for Commissioning**

After completion of the installation at site and for the preparation of plant commissioning, the contractor shall carry out check and testing of all equipment and installation in accordance with the agreed standards, Codes of Practice of Indian Standards Institution and specific instruction furnished by the particular equipment suppliers as well as contractor.

Checking required to be made on all equipment and installations at site shall comprise, but not be limited to the following. The following checks shall be made on all equipment and installations at site:

Physical inspection for removal of any foreign bodies, external defects, such as damaged insulators, loose connecting bolts, loose foundation bolts etc-

Check for grease, insulating/lubricating oil leakage and its proper quantity Check for the free movement of mechanism for the circuit breakers, rotating part of the rotating machines and devices.

Check for tightness of all-cable, busbar at termination/joints ends as well as earth connections in the main earthing network.

Check for clearance of live busbar and connectors from the metal enclosure. Check for proper alignment of all draw out device like draw out type circuit-breakers. Continuity check in case of power cables

Checking of all mechanical and electrical interlocks including tripping of breakers using manual operation of relay.

Checking of alarm and annunciation circuits by manual actuation of relevant relays like Buchholz relay in case of transformer.

Check and calibrate devices requiring field adjustment calibration like adjustment of relay settings etc.

Check proper connection to earth network of all non-current carrying parts of the equipment and installation.

Test reports for all meters are to be furnished.

The tests that shall be carried out on the equipment shall include but not be limited to the following:

#### **14.3 Low Voltage Switchgear (upto 1000 V AC or 1200 V DC)**

Insulation resistance test with 1000V megger for main circuits. The minimum value of insulation resistance shall be 1 mega ohm.

Insulation resistance test with 500V megger for control metering and relaying circuits. The minimum value of insulation resistance shall be mega ohm. Relay operation test by primary & secondary injection method.

Functional test of control circuit.

Checking of settings of all relay / releases as per single line diagram/specification. ON/OFF operation of breakers both manually and electrically in "Test" as well as "Service" positions.

#### **14.4 Cables**

Insulation resistance test with 2,500V megger for high voltage power cables rated above 1.1 KV grade and 1,000V megger for cables rated upto 1.1 KV grade.

All cables of 1.1 KV and all HV cables shall be subjected to high voltage test after joining and terminating but before commissioning as per relevant standards.

In each test, the metallic sheath/screen/armour should be connected to earth.

Continuity of all the cores, correctness of all connections as per wiring diagram, correctness of polarity and phasing of power cables and proper earth connection of cable glands, cable boxes, armor and metallic sheath, shall be checked.

Power frequency withstand test.

Operational tests to know the correct functioning of all devices associated with the transformer

#### **14.5 Earthing System**

Tests to ensure continuity of all earth connections.

Tests to obtain earth resistance of the complete network by using earth tester. The test values obtained shall be within the limits.

All documents / records regarding test data, oscillo graphs and other measured values of important parameters finalized after site adjustment shall be handed over to the Contractor in the form of test reports for their future use and reference.

All Checks / test set c. to be carried out in presence of contractor's representative.

#### **15. Flood Light**

- Circular flood light with protected reflector
- Narrow beam

##### **15.1 Description**

Injected aluminium alloy body and frame, black polyester coated anti-corrosive protection. Reinforced protective glass and silicone gasket. Intensive reflector in specular aluminum. E40 adjustable lamp holder with safety catch. Supply cable entry through a 14mm dia cable gland one for 2000W. Fixing bracket for adjustment on site.

##### **15.2 Installation & Maintenance**

Fix and secured with 3 holes in the bracket. Adjustable on site. Access to the lamp through the back or by opening of the glass (ovoid lamps), Separate control gear, to be ordered with corresponding gear tray.

### 15.3 ProductOverview

|                   |                     |               |
|-------------------|---------------------|---------------|
|                   | <b>Mount</b>        | U-bracket     |
| <b>Housing</b>    |                     | Aluminium     |
|                   | <b>Beamangle(°)</b> | 2x5°          |
| <b>Voltage(V)</b> |                     | 230           |
|                   | <b>Lamps</b>        | 1x2000WHITE40 |
| <b>Colour</b>     |                     | Black         |
|                   | <b>IPrating</b>     | 55            |
| <b>IKrating</b>   |                     | 8             |

### 15.4 DataSheet

Generaldata

|                            |                                |  |
|----------------------------|--------------------------------|--|
|                            | <b>Longdescription</b>         | Easytoinstallandmaintain.Choiceofreflector<br>s: extensive or<br>intensive |
|                            | <b>Controlgearavailability</b> | Separateitem   |
| <b>Controlgearmounting</b> |                                | Remote   |
|                            | <b>Controlgeartype</b>         | Conventional   |
| <b>Environment</b>         |                                | Exterior   |
|                            | <b>Generalapplication</b>      | AreaWash   |
| <b>Housing</b>             |                                | Aluminium  |
| <b>Specificapplication</b> |                                | SportFacilities  |



## Opticaldata

|                     |      |
|---------------------|------|
| <b>Beamangle(°)</b> | 2x5° |
|---------------------|------|

## Distributiontype

Symmetric

|                                  |   |
|----------------------------------|---|
| <b>Opticalcontrollermaterial</b> | Reinforcedprotectiveglassandsilicone gasket |
|----------------------------------|---|

## Electricaldata

|                   |     |
|-------------------|-----|
| <b>Voltage(V)</b> | 230 |
|-------------------|-----|

## Electricalprotection

ClassI

|                     |       |
|---------------------|-------|
| <b>Glowwiretest</b> | 960°C |
|---------------------|-------|

## Lamps

1x2000WHITE40

|                            |    |
|----------------------------|----|
| <b>Leadingtrailingedge</b> | No |
|----------------------------|----|

## Numberofheads

1

## Physicaldata

|                   |       |
|-------------------|-------|
| <b>Weight(kg)</b> | 19.47 |
|-------------------|-------|

## Colour

Black

|                     |     |
|---------------------|-----|
| <b>Lampincluded</b> | Yes |
|---------------------|-----|

## Height(mm)

960

|                 |    |
|-----------------|----|
| <b>IPrating</b> | 55 |
|-----------------|----|

## IKrating

8

|                     |     |
|---------------------|-----|
| <b>Diameter(mm)</b> | 860 |
|---------------------|-----|

## Reflectormaterial

Intensiveinspecularaluminium

|  |                   |
|--|-------------------|
| <b>Singlepackagedimension<br/>s(Lx W x H)<br/>(cm)</b> | 89.00x89.00x47.00 |
|--|-------------------|

**Outerpackagedimensions(LxW  
xH)  
(cm)**

89.00x89.00x47.00

15.5 GearTray

Range features

- Easy to install and maintain
- Choice of reflectors: extensive or intensive
- Asymmetrical distribution

DATATABLE

General data

|                  |   |
|------------------|---|
| Long description | Easy to install and maintain. Choice of reflectors: extensive or intensive. Asymmetrical distribution |
| Product name     | GTMH2000W380V (usable with and without ignitor) for HSI-TS lamp                                       |

|                            |   |
|----------------------------|---|
| <b>Sales pack quantity</b> | 1 |
|----------------------------|---|

#### Physical data

|                   |       |
|-------------------|-------|
| <b>Weight(kg)</b> | 15.60 |
|-------------------|-------|

**Single packaged dimensions (L x W x H) (cm)** 50.00x12.00x12.00

|  |                   |
|--|-------------------|
| <b>Outer package dimensions (L x W x H) (cm)</b> | 50.00x12.00x12.00 |
|--|-------------------|

### 15.6 2x400W Flood Light

Non Integral wide beam long throw flood light luminaires suitable for twin tubular High Pressure SV/MH lamps upto 400W

#### Specification

##### Housing

Die-cast aluminium alloy LM6 with IP65 protection.

##### Cover

Tempered protective toughened front glass, 5mm thick, thermal shock and impact resistant.  
Sealed from front side with silicon sealant & held to the housing by 4 nos. SS toggles.

##### Finish

Epoxy grey powder coated after phosphochromat treatment.

##### Optics

Reflectors made of high purity dimpled/ peened center reflector & pre-anodised specular side reflectors.

##### Lamp Holder

Inceramics with silver plated contacts, re-lamping from side.

##### Electric gear\*

Select appropriate control gear as per selected lamp source & wattage.

##### Mounting

Surface mounting using built in heavy duty bracket with locking holes.

**Applications**

Area lighting High mast towers

Switch yard stations Monuments & facade lighting Sports complex

Submit and approved Light Design according to desire lux level. All light fixtures are must be of same make. Lamp is made of OSRAM.

**LED LIGHT****CODES & STANDARDS:-**

IEC 60529 Classification of degree of protection provided by enclosures (IP Codes)

EN 55015, CISPR 15 Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment.

IEC 62031 LED modules for general lighting-Safety requirements IEC 61547-EMC Immunity requirement

IEC 60598-2-1 Fixed general purpose luminaires

IEC 60598-1 Luminaires-General requirement and tests

IEC 61000-3-2 Electro Magnetic compatibility (EMC) - Limits for Harmonic current emission -- (equipment input current  $\leq 16$  A per phase.

IEC 60068-2-38 Environmental Testing: Test Z-AD: composite temperature/ humidity cyclic test

IEC 61347-2-13 Lamp control gear: particular requirements for DC or AC supplied electronic control gear for LED modules.

IS 10322 Specification for the luminaires IS 4905 Method for random sampling

LM 79 LED luminaire photometry measurement. LM 80 Lumen Maintenance

IEC 62384 DC or AC supplied electronic control gear for LED modules performance requirements

**ENVIRONMENTAL CONDITIONS:-**

The average atmospheric condition during the year is mentioned below. The equipment shall be designed to work in such environmental conditions:

- (i) Maximum ambient air temperature: **50°C**
- (ii) Minimum ambient air temperature: **10°C**
- (iii) Max. Relative humidity: **90%**
- (iv) Average Rainfall: **55 inches**
- (v) Atmosphere: **Dusty and Heavy chemicals smoke at times in certain areas.**
- (vi) Coastal area: The equipment shall be designed to work in coastal area in humid, salt laden and corrosive atmosphere.

**CONSTRUCTIONAL FEATURES:****General:**

- a) Luminaries shall be made of die cast aluminum/ extruded Aluminum body with powder coated finish having safety.
- b) Heat sink used should be aluminum extrusion having high conductivity. Heat sink should be integrated within luminaries and efforts shall be made to keep the overall outer dimensions
- c) optimum such that it permits sufficient heat dissipation through the body itself so as to prevent abnormal temperature inside the luminaries and consequential damage to cover, gasket material, LEDs, lenses and drivers.
- d) LED must be mounted on Metal core PCB with suitable large area surface by means of fins to dissipate the conduct heat. The fins must be exposed to ambient flowing air.
- e) All luminaries shall be provided with toughened glass of min. 0.8 mm thickness of sufficient strength. UV stabilized Poly carbonate material is also acceptable. High efficiency prismatic diffuser/Lens under the LED chamber to protect the LED and luminaries shall be provided.
- f) The minimum IK protection of optic cover shall be IK 05. The test material certificate shall be provided.
- g) Suitable number of LED lamps shall be used in the luminaries. The manufacturer shall submit the proof of procurement of LEDs from OEMs at the time of testing.

- h) Suitable reflector/ lenses may also be provided to increase the illumination uniformity and distribution.
- i) The electrical component of the LED and LED driver must be suitably enclosed in sealed unit to function in environment conditions mentioned earlier.
- j) The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side.
- k) Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.
- l) The equipment should be compliant to IEC 60598-1, IEC 62031 and IEC/PAS 62612 depending on the type of luminary.
- m) The LED Module(s), Driver gear, etc. shall be designed in such a way so that temperature of heat sink shall not exceed 70° C.
- n) All the material used in the luminaries shall be halogen free and fire retardant conforming to standard.
- o) The infrastructure for Quality Assurance facilities to verify/ test/ prove above specifications must be available at the manufacturing facility. The compliance shall be indicated clearly in the tender itself.
- p) All fasteners must be of stainless steel.
- q) All glands inside/outside luminaries must be metallic
- r) Heat sink must be thermally connected to MCPCB/LED light source.

**High power and high lumen efficient LED suitable for following features shall be used:**

- a) The working life of the lamp at junction temperature of 85° C (max) at operating current shall be more than 50,000 working hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day. These features shall be supported with data sheet.
- b) Adequate heat sink with proper thermal management shall be provided.
- c) Lumen maintenance report as per LM 80 guidelines shall be produced for the power LEDs used.
- d) Thermal management shall be in such a way that LED soldering point temperature shall not go beyond 75° C.
- e) The LED luminaries shall be free of glare.

**LED DRIVER specification used for light:**

- 
- a) Current waveforms should meet relevant national and international standard.
  - b) LED Driver shall withstand, withstand voltage up to level mentioned elsewhere in tender and restore once normal working when normal voltage is applied.
  - c) The life of the drivers should be more than 25000 Hrs.
  - d) Maximum Temperature rise  $\leq 30^{\circ}\text{C}$  @  $45^{\circ}\text{C}$   $T_{\text{amb}}$ . With safety margin of  $10^{\circ}\text{C}$ .
  - e) The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements.
  - f) The driver of the luminaires should have Short Circuit, Over Voltage, over current, over temperature, Under Voltage, String Open protections.

**The electronic components used shall be as follows:-**

- a) The protective cum adhesive coating used on PCBs should be cleared and transparent and should not affect colour code of electronic components or the product code of the company.
- b) The construction of PCBs and the assembly for components for PCBs should be as per IS standards.

**Illumination Level:**

The luminaires shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. The lux distribution curve/graph/spatial distribution shall be submitted.

**GENERAL DATASHEET**

| <b>Sr.No.</b> | <b>Parameter</b>                    | <b>Value/Detail</b>               |
|---------------|-------------------------------------|-----------------------------------|
| 4.1.1         | RatedSupplyVoltage                  | 230V~,50Hz                        |
| 4.1.2         | Inputsupplyvoltagerange             | 120-270V                          |
| 4.1.3         | ExpectedInputFrequency              | 50Hz+/-3%                         |
| 4.1.4         | WorkingTemperature                  | +5°to+50°C                        |
| 4.1.5         | WorkingHumidity                     | 10%-90%RH                         |
| 4.1.6         | Usagehours                          | Dusktodawn                        |
| 4.1.7         | PowerFactor                         | ≥0.90                             |
| 4.1.8         | IndexofProtectionLevel              | IP66asperIEC60529.                |
| 4.1.9         | SurgeProtection                     | 4KV                               |
| 4.1.10        | LEDChipefficacy                     | ≥120lm/W                          |
| 4.1.11        | DriverEfficiency                    | >85%                              |
| 4.1.12        | Junction Temperature of             | <85°C                             |
| 4.1.13        | RatedLife@L70                       | 50,000burninghoursat35°Cambient   |
| 4.1.14        | NominalCorrelatedColour Temperature | 5000°Kto6000°K                    |
| 4.1.15        | DispersionAngle                     | Minimum120°                       |
| 4.1.16        | Tiltingangle                        | Adjustable                        |
| 4.1.17        | Maintenance factor of               | 0.85                              |
| 4.1.18        | ColourRenderingIndex                | ≥85                               |
| 4.1.19        | TotalHarmonicDistortion             | <10%(EMI/EMCCertification)        |
| 4.1.20        | LEDMAKE                             | Cree/Osram/Nichia/PhilipsLumileds |

**ParticularsandDetailstobesubmittedbythebidder:**

Inordertoproperlyassessandduediligenceonsubmissions,theBiddershouldprovide following information on the quality and photometric of proposed luminaries.

- GeneralDescription**



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Following details of the proposed luminary shall be submitted as per Annexure: II.

2.           **Electrical specifications**

Electrical ratings of the proposed luminary product shall be submitted in Annexure: III.

3.           **LED chip and driver information**

LED chip and driver information of the proposed luminary product shall be submitted in Annexure: IV.

4. **Photometric information to be submitted as per Annexure: V.**

5. **TESTS & CERTIFICATES:**

Tests are classified as:– Type test Acceptance test

`                                      Routine test.

The luminaries' should be tested as per IEC 60598-2-3: 2002 standards and following test reports should be submitted: -

- (i) Heat Resistance Test
- (ii) Thermal In Situ Test
- (iii) Ingress Protection Test
- (iv) Drop Test
- (v) Electrical/Insulation Resistance Test,
- (vi) Endurance Test,
- (vii) Humidity Test,
- (viii) Electrical and Photometric Measurements Test Report (IESLM79)
- (ix) LED Lumen Maintenance Test Report (IESLM80)
- (x) Vibration test as per ANSI

#### **Type Test:-**

Type test certificates for both the luminaries' shall be provided with the technical-bid.

#### **Acceptance Tests:-**

These tests are carried out by an inspecting authority at the supplier's premises on sample taken from a lot for the purpose of acceptance of a lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below.

**Sample size and criteria for conformity**

The luminaries shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS 4905-1968 (Reaffirmed 2001) may be followed.

**Routine Tests:**

These tests shall be performed by the manufacturer on each complete unit of the same type and the results shall be submitted to the inspecting agency, prior to offering the lot for acceptance test. The firm shall maintain the records with traceability.

**Method of Testing:-****Visual and Dimensional Check:**

The unit shall be checked visually for all dimensions as per approved design and drawing.

General workmanship should be good; all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic/ electrical items.

**Checking of documents of purchase of LED**

Check Document of purchase of LED lamps of approved sources viz. NICHIA/OSRAM/ PHILIPS LUMILEDS/ CREE.

**Resistance to humidity test**

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48° C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

**Insulation resistance test**

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 MΩ when measured with 500 V megger.

**HV test**

Immediately after insulation resistance test, an AC voltage of 1.72 KV rms ( $1500 + 2 \times \text{rated voltage}$ ) of sine wave form of 50 Hz shall be applied for one minute between the

live parts and frame. There shall not be any kind of breakdown, flashover or tripping of supply.

### **Overvoltage protection**

The LED Driver shall be cut off once voltage exceeds 288 V AC. It shall be reconnected when supply comes within limit.

### **Surge protection**

It shall withstand a surge of 4 kV at the input terminals for all types.

### **Reverse polarity**

The Luminaries shall withstand polarity reversal. It shall be operated with reverse voltage for Min. 1 minute at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and Luminary shall operate in a normal way.

### **Temperature rise Test:**

Temperature rise Test shall be conducted at 100 V ~ with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum-recorded temperature under worst conditions shall be corrected to 55° C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10° C.

Temperature at junction shall not exceed 100° C when corrected to 55° C. The Luminaries shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85° C environment. In case of exceeding limit, use of MIL-grade component shall be considered keeping RDSO informed.

### **Ra (Colour Rendering Index) measurement test**

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardised rated value as per Annex: D of IEC 60081- 1997.

The initial reading of the general colour-rendering index (Ra) shall not be less than the rated value decreased by 3.

The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20,000 burning hours and 70% of the initial lumen after 50,000 hours. The initial lumen will be taken after 100 hours aging.

Photometric tests shall be conducted as per Annexure: B of IEC 60081-97.

The lumen maintenance test shall be done as per Annexure: C of IEC 60081-97.

### **Fire retardant Test**

Fire Retardant test shall be conducted as per IEC 60332-1 of the wire used in the luminaries.

### **Test for IP65 protection**

This test shall be conducted as per IEC 60529.

### **Environmental tests (Prototype Test)**

The Luminary shall meet the following tests as prescribed in IEC-60571.

- (i) Dry heat test.
- (ii) Damp heat test
- (iii) Test in corrosive atmosphere
- (iv) Combined dust, humidity and heat test

### **Reliability Test**

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions.

There shall be no failure during this test.

- (i) The light unit shall be mounted in an oven maintained at 45°C.
- (ii) The light will be operated at the specified maximum voltage and at 45°C for a period of 100 hours.

**Photometry Test:-**

The test shall be carried out for Total Luminous Flux, Luminous Intensity Distribution, Electrical Power, Luminous Efficacy (calculation), Colour Characteristics– Chromaticity, and CCT & CRI etc. as per IES LM 79.

**Life Test**

The lumen maintenance & life test shall be done as per IES LM 80 for LEDs. **Endurance Test**

The Luminaries shall be kept “ON” with input voltage of 250 V ~ for 200 hours. After this the Luminaries is subjected to 20,000 cycles of “ON” and “OFF”, each cycle consisting of 3 seconds “ON” and 10 seconds “OFF” period. Luminaries should survive this test. Test to be continued for 20,000 cycles, followed by performance test.

**Safety:**

The Luminaries shall comply with the safety requirements as per IEC 61195.

**All Tests defined for acceptance other than LM 79 and LM 80 is allowed to carry out at Manufacturer works.**

**6. MARKING:**

The following information shall be distinctly and indelibly marked on the housing: Year of manufacture/

Batch Number/ Serial Number

Name of Manufacturer (Engraving only, stickers not allowed)

Rated watt and voltage Input frequency

**18. SPECIFICATIONS FOR MEDIUM AND HIGH VOLTAGE CABLES AND ACCESSORIES****1.0 SCOPE**

This specification along with data sheets covers requirements for design, manufacture, testing at works and supply of Flame Retardant PVC/XLPE cables and cable jointing / terminating accessories for medium and high voltage systems.



## 2.0 STANDARDS

The cables and cables jointing & terminating accessories shall comply with the latest edition of the following standards as applicable:

|                     |   |
|---------------------|---|
| IS:1554             | PVC insulated (heavy duty) electric cables.   |
| IS:7098             | Cross-linked polyethylene insulated PVC sheathed.   |
| IS:8130             | Conductors for insulated electric cables and flexible cords.  |
| IS:5831             | PVC insulation and sheath of electric cables.   |
| IS:3975             | Mild steel wires, strips and tapes for armouring of cables.   |
| 10810 (Part 41)     | Methods of test for cables: Mass of zinc coating on steel armour.   |
| IS:209              | Specification for zinc.   |
| IS:3961 (Pt-2)      | Recommended current ratings for cables: Part-2 PVC Insulated and PVC sheathed heavy-duty cables.  |
| IS:10418            | Drums for electric cables.  |
| IS:10462 (Pt-I)     | Fictitious calculation<br>method for determination of Dimensions of protective coverings of cables: Part-I<br>Electrometric and thermoplastic insulated cables. |
| IS:10810 (Pt-58)    | Oxygen Index test.  |
| IS:10810 (Pt 61)    | Flame Retardant test.   |
| IS:10810 (Pt 62)    | Fire resistance test for bunched cables.  |
| IS:13573            | Joints and terminations for polymeric cables for working Voltages from 6.6 KV upto and including 33 KV.   |
| IEC:60332-3         | Tests on electric cables under fire conditions.   |
| IEC:60502           | Extruded solid dielectric insulated power cables for rated Voltages from 1 KV. upto 30 KV.  |
| IEC: 60540 & 60540A | Test methods for insulation and sheaths of electric Cables.   |
| ASTM:D2863          | Standard method of test for flammability of plastics using oxygen index method.   |



|              |   |
|--------------|---|
| ICEAS-61-402 | Thermoplasticinsulatedwireandcablefortransmission |
|--------------|---|

|                           |  |
|---------------------------|--|
| NEMA-WC5                  | and distribution of electrical energy.   |
| ICEA S-66-524<br>NEMA-WC7 | Cross-linked thermosetting polyethylene insulated wire and cable for transmission and distribution of electrical energy. |

2.2 The cables and accessories shall also conform to the provisions of Indian Electricity Rules and other statutory regulations, as applicable.

2.3 In case of any contradiction between various referred standard/ specification/ data sheet and statutory regulations, the following order of priority shall govern:

Statutory Regulations, Data Sheets, Job Specifications This Specification Codes and Standards

### 3.0 GENERAL CONSTRUCTION

3.1 The cables shall be suitable for laying in trays, trenches, ducts, and conduits and for underground-buried installation with uncontrolled backfill and possibility of flooding by water and chemicals.

3.2 Outer sheath of all PVC and XLPE cables shall be black in colour and the minimum value of oxygen index shall be 29 at  $27 \pm 2$  °C. In addition, suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

3.3 All cables covered in this specification shall be flame retardant (FR) unless specified otherwise in the data sheet. The outer sheath of PVC and XLPE cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF.

3.4 Sequential marking of the length of the cable in meters shall be provided on the outer sheath at every one meter. The embossing/engraving shall be legible and indelible.

3.5 The overall diameter of the cables shall be strictly as per the values declared by the manufacturer in the technical information subject to a maximum tolerance of  $\pm 2$  mm up to overall diameter of 60mm and  $\pm 3$ mm for beyond 60mm.

3.6 PVC / Rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand meter length. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.

### 3.7 PVC cables

3.7.1 All power/control cables for use on medium voltage systems shall be heavy-duty type, 650/1100 V grade with aluminium / copper conductor, PVC insulated, inner-sheathed, armoured and overall PVC sheathed unless specified otherwise in data sheet.

3.7.2 The conductors shall be solid for conductor of nominal area up to and including 6 mm<sup>2</sup> and stranded beyond 6 mm<sup>2</sup>. Conductors of nominal area less than 16 mm<sup>2</sup> shall be circular only. Conductors of nominal area 16 mm<sup>2</sup> and above may be circular or shaped as per IS 8130. Cables with reduced neutral conductor shall have sizes as per Table 1 of IS 1554 (Part-1).

3.7.3 The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831. The thickness of insulation and the tolerance on thickness of insulation shall be as per Table 2 of IS: 1554 (Part-1). Control cables having 6 cores and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation. Colour of the numbers shall contrast with the colour of insulation with a spacing of maximum 50 mm between two consecutive numbers. Colour coding for cables up to 5 cores shall be as per Indian standard.

3.7.4 The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of Type ST-1 PVC compound as per IS: 5831. The minimum thickness of inner sheath shall be as per IS: 1554 (Part-1). Single core cables shall have no inner sheath.

3.7.5 If armouring is specified for multicore cables in the data sheet, the same shall be by single round galvanized steel wires where the calculated diameter below armouring does not exceed 13 mm and by galvanized steel strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanization shall be as per IS - 3975 and IS - 10810 (Part 41). The dimensions of Armour shall be as per method (b) of IS - 1554 (Part -1). If armouring is specified for single core cables in the data sheet, the same shall be with H4 grade hard drawn aluminium round wire of 2.5 mm diameter. For mining cables, the size and type of armour shall be such that the combined conductance of armour shall be equivalent to 75 percent of the conductance of the largest conductor of the cable.

3.7.6 The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST-1 compound as per IS: 5831. The

minimum and average thickness of outer sheath for unarmoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 1554 (Part -1).

3.7.7 If heat resisting PVC cables are specified in the data sheet, the following shall be the requirements: It shall be possible to continuously operate the cable at a maximum conductor temperature of 85 °C. PVC compounds used for HR PVC cables shall be as follows:

- |    |                             |
|----|-----------------------------|
| a. | Conductor insulation-Type C |
| b. | Innersheath -Type ST 2      |
| c. | Outersheath -Type ST2       |

### **3.8 XLPE Cables**

3.8.1 Power cables for 3.3 KV up to and including 33 KV systems shall be Aluminium/ copper conductor, XLPE insulated, sheathed, armoured and overall PVC sheathed.

3.8.2 The conductor shall be stranded and compacted circular for all cables.

3.8.3 All cables rated 3.8 / 6.6 kV and above shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semi conducting screen.

3.8.4 The core insulation shall be with cross linked polyethylene insulating compound drycured, applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions. It shall conform to the properties given in Table-1 of IS: 7098 (Part -2).

3.8.5 The insulation screen shall consist of non-metallic extruded semi-conducting compound in combination with a non-magnetic metallic copper screen. Unless specified otherwise, the copper screen for all the three cores together shall be capable of carrying the single line to ground fault current value and the duration specified in the data sheet.

3.8.6 The conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by coloured strips or by printed numerals.

3.8.7 The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST 2 compound of IS: 5831. The extruded inner sheath shall be of uniform

thickness. In case of single core cables, there shall be extruded inner sheath between insulation metallic screen and armouring.

3.8.8 For multicore cables, the armouring shall be by galvanized steel strips as per method (b)

of IS-7098 (Part-2). If armouring is specified for single core cables in the data sheet, the same shall be with H4 grade hard drawn aluminium round wire of 2.5mm diameter.

**3.8.9** The outer sheath of the cables shall be applied by extrusion over the armouring and shall be of PVC compound conforming to the requirements of Type ST2 compound of IS: 5831. The minimum and average thickness of outer sheath for unarmoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 7098 (Part-2)

**3.8.10** The thickness of the insulation, inner sheath shall be governed by values given in IS: 7098 (Part-2).

**3.8.11** Where specified, 1100V grade power cables shall also be XLPE insulated and shall meet the requirement specified in IS-7098 (Part-1).

#### **4.0 CABLE ACCESSORIES**

**4.1** The termination and straight through jointing kits for use on the systems shall be suitable for the type of cables offered as per this specification.

**4.2** The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.

**4.3** The kit shall include all stress grading, insulating and sealing materials apart from conductor fittings and consumable items. An installation instruction sheet shall also be included in each kit.

**4.4** The contents of the accessories kit including all consumable shall be suitable for storage without deterioration at a temperature of 45° C, with shelf life extending to more than 5 years.

#### **4.5 Terminating kits**

The terminating kits shall be suitable for termination of the cables to an indoor switchgear or to a weatherproof cable box of an outdoor mounted transformer / motor. For outdoor terminations, weather shields / sealing ends and any other accessories required shall also form part of the kit. The terminating kits shall be from one of the makes / types mentioned in the data sheet.

#### **4.6 Jointing kits**

The straight through jointing kits shall be suitable for installation on overhead trays, concrete lined trenches, and ducts and for underground burial with uncontrolled backfill and possibility of flooding by water and chemicals. These shall have protection against any mechanical damage and suitably designed to be protected against rodent and termite attack. The inner sheath similar to that provided for cables shall be provided as part of straight through joint. The jointing kit shall be from one of the makes / types mentioned in the data sheet.

#### **5.0 INSPECTION, TESTING AND ACCEPTANCE**

The cables shall be tested and inspected at the manufacturer's works. All the materials employed in the manufacture of the cable shall be subjected, both before and after manufacture, to examination, testing and approval by SRE / owner. Manufacturer shall furnish all necessary information concerning the supply to SRE / owner's inspectors. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any material, which appears to him to be of unsuitable description or of unsatisfactory quality. The vendor shall give at least 2 weeks advance notice to the purchaser, regarding the date of testing to enable him or his representative to witness the tests.

#### **5.1 Cables**

5.1.1 After completion of manufacture of cables and prior to dispatch, the cables shall be subjected to type, routine, acceptance and special tests as detailed below. SRE/ Owner reserves the right to witness all tests with sufficient advance notice from vendor. The test reports for all cables shall be got approved from the Engineer before dispatch of the cables.

5.1.2 All routine tests, acceptance tests, type tests and additional type tests for improved fire performance shall be carried out as listed in IS: 1554 (Part-1), and IS: 7098 (Part-2) on PVC and XLPE insulated cables respectively.

5.1.3 The test requirements for PVC insulation and sheath of cables shall be as per latest revision of IS: 5831.

5.1.4 Test for Resistance to Ultra Violet Radiation: This test shall be carried out as per DIN 53387 or ASTM-G-53 on outer sheath. The retention value of tensile strength and ultimate

elongation after the test shall be minimum 60 % of tensile strength and ultimate elongation before the test. Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided outer sheath remains same.

5.1.5 Acceptance tests as per IS-1554 (Part-1) and IS-7098 (Part-2) and the following special tests to be performed on the cables as per sampling plan. These tests are required to be witnessed by SRE/owner before dispatch of cables.

5.1.6 Accelerated water absorption test for insulation as per NEMA - WC - 5. (For PVC insulated cables) and as per NEMA WC - 7 (for XLPE insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided type of insulation remains same.

5.1.7 Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC - 5 at  $75 \pm 1^\circ \text{C}$  shall not be less than 50 % of the original dielectric strength. (For PVC insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly and once for each order.

5.1.8 Oxygen Index Test: The test shall be carried out as per ASTM D2863 or applicable Indian Standard specifications. Sampling to be done for every offered lot/size as per sampling plan.

5.1.9 Flammability Test: The test shall be carried out on finished cable as per IS - 10810 (part 1 & 2). Sampling for these tests is to be done randomly once for each order,



asunder:

Part-61-The cable meets the requirement if there is no visible damage on the test specimen within 300 mm from its upper end

Part-62-The maximum extent of the charred portion measured on the test sample should not have reached a height exceeding 2.5 m above the bottom edge of the burner at the front of the ladder.

5.1.10 Test for rodent and termite repulsion property: The vendor shall furnish the test details to analyze the property by chemical method. Sampling to be done for every offered lot / size as per sampling plan.

## 5.2 Cable Accessories

Type tests should have been carried out to prove the general qualities and design of a given type of termination / jointing system as per IS-13573. The type test certificates from independent testing laboratory shall be submitted before dispatch.

## 6.0 PACKING AND DESPATCH

6.1 Cables shall be dispatched in non-returnable wooden or steel drums of suitable barrel diameter, securely battened, with the take-off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum. Ferrous parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

6.2 On the flange of the drum, necessary information such as project title, manufacturer's name, type size, voltage grade of cable, length of cable in meters, drum no., cable code, and BIS certification mark, gross weight etc. shall be printed. An arrow shall be printed on the drum with suitable instructions to show the direction of rotation of the drum.

6.3 Unless otherwise specified, cables shall be supplied in drum.

A tolerance of plus or minus 3 % shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to  $\pm 2\%$ . Offers with short / non-standard lengths are liable for rejection. If non-standard drum lengths are specified in the datasheet, the same shall be supplied.

## **7.0 CABLE LAYING**

### **7.1 General**

7.1.1 Cable installation shall include power, control, lighting, fire alarm, telephone and communication cables. These shall be laid in trenches/cable trays /Duct as detailed in the cable layout drawings. Cable routing given on the cable layout drawings shall be checked in the field so as to avoid interference with structures, heat sources, drains, piping, air-conditioning duct etc. Any change in routing shall be done to suit the field conditions wherever deemed necessary, after obtaining approval of Engineer-in-charge.

High voltage, medium voltage power and control cables shall be separated from each other by adequate spacing or by running through independent pipes, trenches or cables trays, as shown on layout drawings/installation standards. Details of cable routes and cable spacing not shown in detail on these drawings shall be determined by the contractor and approved by the engineer- In-charge.

When single core cables are laid in flat formation, the individual cable fixing clamps and spacers shall be of non-magnetic material. As a general practice, the sheath of single core cables shall be earthed at one point to keep sheath at earth potential unless otherwise stated. Single core cables, when laid in trefoil formation shall be braced by suitable clamps at a distance, not exceeding 3 meters along the cable routing.

If straight through joints are required to be provided on single core cables, armour shall be broken at joints as per manufacturer's recommendations. For single core cables, armour shall be earthed at one end for the cable run length as per manufacturer's recommendation.

The Telephone, Communication and Fire alarm cables shall run on instrument trays/ducts/ trenches in the units. Wherever these are not available, cables shall be taken in a separate trench/tray with a minimum spacing of 300 mm from power and control cables.

Telephone, fire alarm and plant communication cables shall be directly buried in road berm area, (unless otherwise specified in cable layout drawings). These cables shall cross power cables preferably at right angles. Street lighting cables shall be laid on the other side of road berm area.

7.1.2 The lengths indicated in the cable schedule are only approximate. The contractor shall

ascertain the exact length of cable for a particular feeder by measuring at site. All cable routes shall be carefully measured. Before the start of cable laying, the contractor shall prepare cable drum schedule and get that approved by Engineer-in-charge to minimize/avoid straight through joints and then the cables cut to the required lengths, leaving sufficient lengths for the terminations of the cable at both ends. The various cable lengths cut from the cable reels shall be carefully selected to prevent undue wastage of cables. Extra loop length shall be given for feeder cables where required as per the directions of Engineer-in-charge to meet contingencies

Cables shall be laid in directly buried trench or in RCC trench (underground trench) or in cable tray along pipe sleepers or in overhead trays as shown on cable layout drawings.

Overhead trays shall be installed 2700 mm (minimum) above grade level and 300mm above FGL in case cable trays are installed along with pipe sleepers. At road crossings overhead trays shall be installed at 7000 mm (minimum) above grade level or cables shall be routed cable tray culvert/ Electrical road crossings as per layout drawings.

Sufficient care shall be taken while laying cables to avoid formation of twist, sharp bend etc. in order to avoid mechanical injuries to cables. Rollers shall be used for pulling of cables.

Cable installation shall provide minimum cable bending radii as recommended by cable manufacturer.

7.1.3 Cables shall be neatly arranged in the trenches/trays in such a manner that criss-crossing is avoided and final take off to the motor / switchgear is facilitated. Arrangement of cables within the trenches / trays shall be in line with cable layout drawings. Cable routing between cable trench and equipment/motors shall be taken through GI pipe sleeves of adequate size. Pipe sleeves shall be laid at an angle of maximum 45° to the trench wall. Bending radii of pipes shall not be less than 8D. It is to be ensured that both the ends of GI pipe sleeves shall be sealed with approved weather proof sealing plastic compound after cabling. In places where it is not possible, cables shall be laid in smaller branch trenches. Different rows of cable trays in cable cellar below the cutout shall be fixed so that the trays don't obstruct cable entry to the panels.

7.1.4 All cables shall be identified close to their termination point by cable tag numbers as per cable schedule. Cable tag numbers shall be punched on aluminium / Lead straps (2mm thick, 20 mm wide and of enough length) securely fastened to the cable and wrapped around it.

Each underground cable shall be provided with cable tags of lead /Aluminium securely fastened every 30 m of its underground length with at least one tag at each end before the cable enters/leaves the ground. In unpaved areas, cable trenches shall be identified by means of cable markers as per installation drawing. These cable markers shall be placed at location of changes in the direction of cables and at intervals of not more than 30 m and also at cable straight through joint locations.

7.1.5 All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of cables shall be taped with an approved PVC end cap or rubber insulating tape.

7.1.6 Each row of cables shall be laid in place and before covering with sand. All wall openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water inside building/lined trench. Every cable shall be given an insulation test in presence of Engineer-in-charge/Owner before filling the cable trench with sand. Any cable which is found defective shall be replaced.

7.1.7 Where cables pass through foundation walls, the necessary openings shall be provided in advance for the same by another agency. However, should it become necessary to cut holes in existing structures for example floor slab etc., the electrical contractor shall determine their location and obtain approval of the Engineer-in-charge before carrying out the same.

7.1.8 Cables for road crossings shall be taken through ERC (Electrical Road Crossing) as shown in the cable layout drawings.

At road crossing and other places where cables enter pipe sleeves adequate bed of sand shall be given so that the cables do not slack and get damaged by pipe ends.

7.1.9 Wherever cable trench crosses storm water, waste water channel/drain, cables shall be taken through PVC/RCC pipes. Where cables are required to cross drains of depth more than 1200 mm, cables shall be taken over the drain on cable trays supported suitably using ISMC 150/200 sections.

7.1.10 Ends of cables leaving trench shall be coiled and capped and provided with protective cover till such time the final termination to the equipment is completed.

## **7.2 Cables Laid Direct in Ground**

Cables shall be laid underground in excavated cable trenches where specified in cable layout drawings. Trenches shall be of sufficient depth and width for accommodation of all cables. Cables shall be properly spaced as per installation standards. Maximum number of cable layers in trench shall be preferably limited to 6 layers.

Minimum depth of directly cable trench shall be 750 mm, for medium voltage and 900 mm for HV Cables. The depth and the width of the trench shall vary depending upon the number of layers of cables as per SRE installation Standards. The depth and the width of the trench shall vary depending upon the number of layers of cables as per SRE installation Standards

Cables shall be laid in buried trenches at depth as shown in the cable layout drawings. It is to be ensured by the contractor that the bottom of buried trenches shall be cleared of all rocks, stones and sharp objects before cables are placed. The trench bottom shall be filled with a layer of sand or stone dust. This sand /stone dust shall be leveled and cables laid over it. These cables shall be covered with 150 mm of sand on top of the largest diameter cable and sand shall be lightly compacted. A flat protective covering of 75 mm thick second class red bricks or concrete tiles as per specification shall then be laid and the remainder of the trench shall then be back-filled with soil, rammed and leveled.

## **7.3 Cables Laid in Concrete Trench**

Cables shall be laid in 5 or 6 tiers in concrete trench as shown on layout drawings. Concrete cable trenches shall be filled with sand /stone dust in hazardous area to avoid accumulation of hazardous gases and oil. RCC covers of trenches shall be effectively sealed to avoid ingress of chemical and oil in process area. Removal of concrete covers where required for the purpose of cable laying and reinstating them in their proper position after cables are laid shall be done by electrical contractor.

Minimum depth of RCC cable trench shall be 500mm for all voltage grades with 300mm clearance between the bottom of the trench cover and top of the cable. The depth and the width of the trench shall vary depending upon the number of layers of cables and bending radius required for cables as per SRE installation Standards

All wall openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water

## **7.4 Above Ground Cables**

7.4.1 Cables installed above grade shall be run in cable trays, clamped on walls, ceiling or

structures and shall be run parallel or at right angles to beams, walls or columns. Cable routing shall be planned to be away from heat sources such as hot piping, gas, water, oil drainage piping, air-conditioning duct etc. Each cable tray shall contain only one layer of cables as far as possible for power cables. However control cables may be laid in double layer in the cable trays.

7.4.2 Individual cable or small group of cables (upto 3 cables) which run along structures / walls etc. shall be clamped by means of 16 SWG GI saddles on 25 x 6 mm saddle bars. Alternatively small group of cables can be taken through 60/100/150 mm slotted channel tray or channel ISMC-75/100. Cables shall be supported so as to prevent sagging. In general, distance between supports shall be approximately 300mm for cables upto 25 mm diameter and maximum 450 mm for cables larger than 25 mm dia. to prevent the sagging of cables.

7.4.3 Cable laid on supporting angle in cable trenches, structures, columns and vertical run of cable trays shall be suitably clamped by means of GI saddles /clamps, whereas cables in horizontal run of cable trays shall be tied by means of nylon cords. Distance between supporting angles shall not exceed 600 mm. All cable trays (other than galvanized trays) and supporting steel structures shall be painted before laying of cables. The undersurfaces shall be properly degreased, derusted, decaled and cleaned. The painting shall be done with one coat of red oxide zinc chromate primer. Final painting shall be done with two coats of approved bituminous aluminium paint unless otherwise specified.

7.4.4 Where cables rise from trench to motor, lighting panel, control station, junction box etc., they shall be taken in GI pipe for mechanical protection upto a minimum of 300 mm above grade for outdoor area. Cable ends shall be carefully pulled through conduit to prevent damage to cable.

7.4.5 AH GI Pipes shall be laid as per layout drawings and site conditions. Before fabrication of various profiles of pipes by hydraulically operated bending machine (which is to be arranged by the contractor) all the burrs from the pipes shall be removed. GI Pipes having bends shall be buried in soil / concrete in such a way that the bend shall be totally concealed. For G.I. pipes buried in soil, bitumen coating shall be applied on the buried lengths, Installation of G.I. pipes shall be undertaken well before paving is completed and necessary co ordination with paving agency shall be the responsibility of Electrical Contractor.

Following guides shall be used for sizing of GI pipe.

- a) 1 cable in a pipe -53% of pipe cross-sectional area occupied by cables.
- b) 2 cables in a pipe -31% of pipe cross-sectional area occupied by cables.
- c) 3 cables in a pipe -43% of pipe cross-sectional area occupied by cables.
- d) 4 & above cables in a pipe -40% of pipe cross-sectional area occupied by cables.

7.4.6 After the cables are installed and all testing is complete, conduit ends above grade shall be plugged with a suitable weatherproof plastic compound/bitumen/suitable sealing compound. Alternatively rubber bushes shall be employed for the purpose of sealing.

7.4.7 Fire proofing of end of power cables at least 1 meter at each end as per OISD norms for the refinery and Petroleum industry, shall be carried out as per the recommendation of the paint supplier. Rates for the fire proofing of cables shall be included in the cable installation and no separate payment shall be made for the painting.

#### **SPECIAL CONDITION**

- (1) Point wiring shall be from the distribution box or fuse board, No submain shall be measured.
- (2) Samples of materials shall be given to Engineer-in-charge and approval should be taken in writing before its use.
- (3) Fabrication drawings should be get approved from the Engineer-in-charge prior to Manufacturer.
- (4) Pipe laying layout shall be as per consultants drawings.
- (5) There shall be no junction in wiring outlet box shall be used after bond.
- (6) Electrical contractor shall make good the civil work if chased or damaged.
- (7) Electrical Engineer-in-charge opinion shall be final and binding on contractor.
- (8) Qualified labor and supervisor shall work at site.
- (9) Electrical Contractor shall not permit unqualified labor contractor to work at site. He shall observe Govt. rules regarding control of labor. He shall submit test report and carry out tests as required and furnish detailed drawings on completion of work. The responsible authorized person by the contractor should be available offsite daily when work is in progress.
- (10) The work shall be carried out during working days between 8.00 A.M. to 6.00 P.M. only. The cable trench should not remain open for more than 24 hours after excavation. If contractor intends to work on holiday or outside working hours specified, he shall take prior permission from

the Engineer-in-charge. In that case overtime to the staff shall have to be paid by the Contractor. The Electrical appliance-materials shall bear the ISI mark or declaration indicating manufacture's names and appliances material used having been manufactured in accordance with the manufactures' certificate issued by the Government of Gujarat and confirming to the standard specified by the I.S.I. shall be given by the contractor.

(11) Cost of all test should be borne by contractor/ Tenderer, carried out for Electrical related equipment in presence of TPI/PMC/SDCB's representative.

The conditions laid down under House Hold Electrical appliances (Quality control Act 1981) shall be followed.

I/We agree to carry out the above work at rates indicated above at percentage above/below the rates indicated above i.e. I/We agree to carry out the above work at a total cost of Rs. \_\_\_\_\_.

The Contractor shall provide test report and get the installation approved from Govt. Elect. Authority is required.

CONTRACTOR'S STAMP AND SIGNATURE.



**The Contractor / Bidders has to obtain all necessary required statutory licensees /NOC / Permissions from the concern Department for GETCO like NOC from Fire department / Electricity Connection from DGVCL/MGVCL, SOLAR permission from GEDA etc. All required liaosining work fromthesamehastobedonebytheContractor/Biddersbytheir own.NecessaryrequiredofficialFees /paymentwillbepaidbyGIDC.**

**ItemNo.:116**

Point wiring for Light / Bell with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length , in below type of pipe erected with 6A Modular type switch / bell push & accessories and earth continuity of following type, erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D.Connector as directed.(f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of Measurement :-On Point Basis.

**ItemNo.:117**

Point wiring for Tissino / Modular secondary light point with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires, in below type of pipe to be erected complete with earth continuity and necessary connection with primary light with accessories erected on Metal / PVC / wooden box covered with 3 mm thick PC(Polycarbonate) / Acrylic sheet for open / concealed wiring. with necessary Lamp holder / ceiling rose / H.D.Connector as directed. Note:- Maximum up to 6 mtrs length, excess will be considered as Mains for Secondary Point. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of Measurement :-On Point Basis.

**ItemNo.:118**

Point wiring for FAN with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of .ISI marked 1.1 KV Grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected with 6A Modular type switch and hum free EME step type electronic fan regulator mounted and accessories with earth continuity of following type erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on/in wall/ ceiling as per pipe erected. with necessary ceiling rose / H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of Measurement :-On Point Basis.

**ItemNo.:119**

Point wiring for Two Way Controlled Light Point with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (green) both are of .ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires erected in below type of pipe with 6A Modular type switches and following type of accessories erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate modules erected on / in wall / ceiling as per pipe erected. with necessary batten/angle holder or ceiling rose or H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in

wall/ceiling complete CAT III

Mode of Measurement :-On Point Basis.

**ItemNo.:120**

Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories [II] For 16A Plug and 16 amp switch with 2-2.5 sq.mm Cu. Wire from mcb db board. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of Measurement :-On Point Basis.

**ItemNo.:121**

Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories. [I] For 6A Plug and 6 a switch with 2-1.5 sq.mm Cu. Wire from nearby switchboard/mcb db board (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete

Mode of Measurement :-On Point Basis.

**ItemNo.:122**

Point wiring for on board Looped Plug with 6A Modular type switch & 5 pin socket erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate modules erected on / in wall / ceiling with following type accessories Cat. III

Mode of Measurement :-On Point Basis.

**ItemNo.:123**

Providing & erecting Switch board for Computer or electric apparatus consisting of following modular type accessories mounted with PVC / Metallic concealed/open box with single mounting base frame covered with textured/metallic /white front plate,modules erected with necessary connections as directed

1 no. 6A/16A universal plug-switch combined. 3 nos. 6A Switch

3 nos. 6A 5 pin Plug

For Modular Type Accessories Cat. III

Mode of Measurement :-On Point Basis.

**ItemNo.:124**

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge.

(8) Computer RJ-45 socket Cat.III

Mode of Measurement :-On Point Basis.

**ItemNo.:125**

SITC of CAT6 UTP 24AWG PATCH CORD:1M,Plug 30U' Snag less [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ].

Mode of Measurement:-On Each Basis.

**ItemNo.:126**

SITC of CAT6 UTP 24AWG PATCH CORD:2M,Plug 30U' Snag less [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ].

Mode of Measurement:-On Each Basis.

**ItemNo.:127**

Supplying & erecting approved make Dual band wifi Router.

Mode of Measurement:-On Each Basis.

**ItemNo.:128**

Supplying & erecting approved make LAN cable of following size in pipe as per direction CAT – 6

Mode of Measurement:-On Mtr Basis.

**ItemNo.:129**

Supplying & erecting access point with POE. Note : 3 Nos. of Access Point already available in GIDC

Mode of Measurement:-On Each Basis.

**ItemNo.:130**

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (3) Two Pin/RJ-11 Telephone Socket [A] For One Gang Cat.III

Mode of Measurement:-On Each Basis.

**ItemNo.:131**

Supplying & erecting approved make Telephone Cable electrolytic copper conductor PE insulation twisted in two pairs, & wrapped with FRLS PVC tape & sheathed with FRLS PVC or HFFR outer Jacket suitable for telephone wiring & confirming to C-DOT erected in existing pipe. of following size of conductors & nos.of pairs. With necessary connections.

[A] Conductor Size 0.5 mm

- (a) Unarmoured
- (2) Two Pairs

Mode of Measurement:-On Mtr Basis.

**ItemNo.:132**

Providing & erecting main Distribution (MDF) indoor type, back mounted frame as per DoT standard approved with krone strips (c) Suitable for 50 pair

Mode of Measurement:-On Each Basis.

**ItemNo.:133**

SITC of Digital / PCM / TDM EPABX System having SMT design, system with flexible universal slots. Inbuilt Auto attendant facility, Minimum 15 Nos. conference, Analog extension line, Calling GSM, E&M line, PRI / EI & VOIP program me through Analog telephone digital key from Ethernet, public address cord, shall have unrestricted simultaneous dialing facility, QSIG protocol on PRI, 95 / STD / ISD / Local-Locking, Class of Service, Quick Dial-Single Digit dialing of any two external number, Once only ring device, Chairman / Secretary - Do not disturb Facility, Power Down Mode, Hot Line, Hot Outward Dialing, Day Night Mode, Auto Call Back, Barge-in, Call Pick Up & Call Transfer, Call transfer while Ringing with Voice Guide System, (DISA), Caller ID (CLI), CLI Base ECF, CLI Base routing Internet Ready Port, External Music Port, Call Budgeting, Call Most Calculation (ASMDR), DID Direct Inverse Dialing, External Music Input, Fax Homing, Global Directory Printing with following capacities [[Approved by Competent Authority i.e. not Below the rank of Executive Engineer ] [D] No of Extension 64, No of Junctions 12, 8 Port IP Resource in-built, 4 Port Web base Video Conferencing, No of expandable ports : 240, Operators Console - 01 Compatible : ISDN and Networking

Mode of Measurement:-On Each Basis.

**ItemNo.:134**

Supplying & erecting push button type telephone instrument having speaker phone Caller ID & hands free dialing system & 30 memories with display system Single line [[Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:135**

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (4) TV Co-axial Socket outlet Cat.III

Mode of Measurement:-On Each Basis.

**ItemNo.:136**

Providing & Erecting approved make following size of TV Co-axial flexible cable

comprising inner conductor of solid bare copper insulated with Foam PE & Secondary conductor made of poly - Aluminium film bonded Al. Braids @ suitable coverage overall sheathed with black PVC insulation. (b) RG-6

Mode of Measurement:-On Mtr Basis.

**ItemNo.:137**

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. One wire 10.00 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:138**

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. One wire 16.00 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:139**

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. One wire 25.00 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:140**

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. One wire 35.00 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:141**

Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size.

(A) With medium class Rigid PVC pipe and accessories

(a) 2 wire 1.5 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:142**

Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size.

- (A) With medium class Rigid PVC pipe and accessories
- (b) 2 wire 2.5 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:143**

providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected in / on wall / ceiling with 2.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size

- (A) with medium class Rigid PVC pipe and accessories

- (a) 2 wire 4 sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:144**

Providing and erecting ISI mark Medium class RIGID PVC PIPES of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed

- (b) 25 mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:145**

Providing & erecting PVC Corrugated Flexible Conduit with required nos. of coupling, PVC bushes, Check-nuts etc. complete of following sizes.(2) 25 mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:146**

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for

- (A) single phase incoming and horizontal single phase outgoing
- (b) sheet steel double door (IP-43)
- (ii) 6 way

Mode of Measurement:-On Each Basis.

**ItemNo.:147**

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for  
 (A) single phase incoming and horizontal single phase outgoing  
 (b) sheet steel double door (IP-43)  
 (iii)8 way

Mode of Measurement:-On Each Basis.

**ItemNo.:148**

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for  
 (A) single phase incoming and horizontal single phase outgoing  
 (b) sheet steel double door (IP-43)  
 (iv)12 way

Mode of Measurement:-On Each Basis.

**ItemNo.:149**

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used)suitable for  
 (B) three phase incoming and single phase horizontal type outgoing Per phase isolation  
 type (PPI)  
 (b) sheet steel double door  
 (ii)6 way

Mode of Measurement:-On Each Basis.

**ItemNo.:150**

providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark Cat.III

Mode of Measurement:-On Each Basis.

**ItemNo.:151**

Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity (A) 6 to 32 Amp. Cat-III

Mode of Measurement:-On Each Basis.

**ItemNo.:152**

Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity (B) 40 Amp. Cat-III

Mode of Measurement:-On Each Basis.

**ItemNo.:153**

Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (a) 6 to 32 Amp. Cat.III

Mode of Measurement:-On Each Basis.

**ItemNo.:154**

Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (b)40 Amp. Cat.III

Mode of Measurement:-On Each Basis.

**ItemNo.:155**

providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on single phase 240 V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed (i)25Amps. DP Cat. III

Mode of Measurement:-On Each Basis.

**ItemNo.:156**

providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on single phase 240 V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed (ii) 40Amps. DP Cat. III

Mode of Measurement:-On Each Basis.

**ItemNo.:157**

Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections. (A) Suitable for 100 Amp. Capacity



Mode of Measurement:-On Each Basis.

**ItemNo.:158**

Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections. (B) Suitable for 200 Amp. Capacity

Mode of Measurement:-On Each Basis.

**ItemNo.:159**

Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections. (C) Suitable for 300 Amp. Capacity

Mode of Measurement:-On Each Basis.

**ItemNo.:160**

Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 25 KA. at 415 V, having normal current rating up to 25 A to 100A. with Fixed thermal & magnetic release suitable to work on A.C. supply 50 c/s. with all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing. Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:161**

Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 35 KA. at 415 V. having normal current rating 125A. with Fixed thermal & magnetic release suitable to work on A.C. supply 50 c/s. with all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing. Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:162**

Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 35 KA. and above at 415 V . having normal current rating 250A. with variable thermal & magnetic release suitable to work on A.C. supply 50 c/s. with all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing. Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:163**

Providing and erecting Approved make Four pole moulded case circuit breaker having

breaking capacity ICU of 50 KA and above at 415 V having Normal current rating 400A. with variable Thermal & magnetic release suitable to work on A.C.supply 50 c/s. With all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing. Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:164**

Supplying & erecting approved make Four Pole 415V change over switch interior for panel mounting with operating mechanism A.C.23 duty confirming to IS for (F)400A cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:165**

Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board necessary IP- 42 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accessories, supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in- charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating (The rates excludes the cost of switchgears, bus bars, inter connecting mains & Copper Aluminium strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall be supplied with following approved manufacturers with following size. (B) The standard companies switch gear shall be used and only manufacturers at CPRI approved factory. (i) with 350mm depth board

Mode of Measurement:-On SqMtr Basis.

**ItemNo.:166**

Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board necessary IP- 42 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accessories, supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in- charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating (The rates excludes the cost of switchgears, bus bars, inter connecting

mains & Copper Aluminium strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall be supplied with following approved manufacturers with following size. (B) The standard companies switch gear shall be used and only manufacturers at CPRI approved factory. (i) with 550mm depth board

Mode of Measurement:-On SqMtr Basis.

**ItemNo.:167**

Providing , erecting , fabricating the M.S. structure as per requirement on site incorporating proper size of M.S. angles,square,round, flats, bars, channels, sections complete with cutting, welding, grinding & finishing duly painted with one coat of red oxide with erection on site as per direction of engineer in charge with necessary grouting, cementing, plastering & finishing complete.

Mode of Measurement:-On Kg Basis.

**ItemNo.:168**

Providing and erecting multifunctional meter suitable for application of Power monitoring and showing measurement of following Voltage, Frequency, Apparent energy, Apparent power, Active and reactive energy, Active and reactive power, Average voltage Vavg, Peak demand power PM, QM, SM, Demand power P, Q, S, Apparent power S, S1, S2, S3, Unbalance current, Power factor and displacement PF (signed, four quadrant), Calculated neutral current, Active, reactive, apparent energy (signed, four quadrant), Active power P, P1, P2, P3, Voltage U21, U32, U13, V1, V2, V3, Phase currents, Average current Iag, Peak demand currents, Reactive power Q, Q1, Q2, Q3, Demand current I1, I2, I3, [Us] rated supply voltage 40...300 V AC 45...65 Hz, 40...300 V DC, Network frequency 50 Hz, Type of network 3P, Display type 7 segments LED, Display colour Red, Messages display capacity 3 fields of 4 characters, Display digits 12 digit(s) - 14.2 mm in height

Mode of Measurement:-On Each Basis.

**ItemNo.:169**

Supplying and erecting approved make suitable panel indicator LED type lamp, lens cover, complete erected with necessary connections.

Mode of Measurement:-On Each Basis.

**ItemNo.:170**

Providing & erecting L.T. Current Transformer with bar primary 50/5 to 1000/5 ratio 15 VA burden erected in existing CRCA box duly secured with insulating materials connected to the meter.

Mode of Measurement:-On Each Basis.

**ItemNo.:171**

Providing and erecting metallic vitrified danger notice board as per language suggested by engineer incharge for MEDIUM VOLTAGE installation to be erected as per IS-2551.

Mode of Measurement:-On Each Basis.

**ItemNo.:172**

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (7) Blank Plate Single

Mode of Measurement:-On Each Basis.

**ItemNo.:173**

Providing and erecting Approved make Earth fault Relay suitable to mount with inter connection suitable to following size of moulded case circuit breaker having CT ratio & MCCB rating as following along with shunt trip 220V AC. with all internal connections & complete erected in existing M.S.housing.. (3) 250 A -400 A , CT Ratio 1/400

Mode of Measurement:-On Each Basis.

**ItemNo.:174**

Supplying and erecting, commissioning and testing of Diesel Generating set confirming to IS: 4722:1968 & BS:5514 having continuous rating, 3 phase, 415 volts, 50 cycles A.C. supply comprising of a totally enclosed air/water cooled diesel engine with multi-cylinders developing suitable BHP not less than following capacity at 1500 RPM with 10% overload for one hour in 24 hours with standard accessories like fly wheel, lubricating oil cooler, "A" class governor, heavy duty fuel wheel and lubricating oil filter, oil bath air filter, lubricating oil pressure gauge, end exhaust manifold, standard set of tools with adjustable spanners, screw drivers, cylinder head to cover, joint cylinder head to exhaust, element lube oil filter, 12 / 24 volts electric starting equipment complete with standard heavy duty battery, dynamo, cut-outs, ammeter, necessary wiring, pressure gauge, starter etc and heavy duty Residential type exhaust silencer (With DEF System) and vertical hot air duct both logged with asbestos rope, save oil trays, exhaust piping of required length, standard wall/floor mounted fuel with level indicator and piping and drip proof alternator, self excited, self regulated, screen protected, with excitation system, capable of delivering the rated system output at 415 volts, 3 phase, 0.8 PF, 50 Hz, 4 wire, running at 1500 RPM, conforming to IS-4722- 1968 with voltage regulation  $\pm 5\%$  of rated voltage from no load to full load. Both the engine and alternator fitted on a common fabricated steel base plate with antivibration mounting engine and alternator both connected to each other by flexible flange coupling and with floor/wall mounted control panel box comprising of voltmeter ammeter, selector switches, ACB / MCCB / MCB of adequate capacity, indicator lamps duly wired with HRC fuses. The alternator & control panel shall be connected with provided suitable capacity armoured cable and complete with Acoustic enclosure (canopy) made out of 16 SWG CRCA Sheet, sound absorbing material Rockwool of 64 density & 100 mm thick conforming to IS:8183 / PU Foam of 40 Density - at least 40 mm. The resin bonded rockwool covered from inside the canopy by perforated sheet with 3/4 mm holes, sound level not more than 75 dB at a distance of 1 mtr, as per PVCT norms. DG set should have in built fuel tank capacity of minimum 8 hrs of continuous running capacity on full load . Erection, commissioning and satisfactory testing as per requirement with first filling of fuel (minimum up to the 80% of fuel tank capacity), oil, etc. with guarantee / Warrantee of complete system for Two years. & with obtaining all necessary certificate from Electrical Inspector. The Capacity and Ratings of DG sets are as below. (As per new CPCB+ Emission norms Engine With - Turbo Charger, EGR (Exhaust Gas Recirculation), CRS

(Common Rail Fuel System), DOC (Diesel Oxidation Catalyst), SCR (Selective Catalytic Reduction), Integrated wiring harness connected to ECU .) (O) Continuous rating of 160 KVA ,BHP not less than 197 BHP

Mode of Measurement:-On Each Basis.

**ItemNo.:175**

Providing & erecting approved make AMF control panel suitable for following size of 3 phase, 415 V., 50 cycles, A.C. diesel generating set complete of scope as detailed below: 1) Power module: A pair of electromechanically interlocked contactors (for mains & generator) Overload relay for generator contactor Neutral contactor for mains and generator Power socket for connections. 2) Control and metering module: Line voltage monitor. Generator voltage monitor Ammeter 3 items attempt start facility. Air circuit breakers/MCB/MCCB of suitable rating for auto/manual operation. Auto/manual switch. Emergency stop push buttons. Manual start push button. frequency meter. Engine hour meter. Two earthing studs.3) Protection module: The engine shutdown in the unlikely event of Low lube oil pressure High cylinder head 220509temperature. V belt failure. 4) Indicators with alarm Load on generator. 5) Indicators Load on mains Engine fails to start . Emergency stop battery charger. The AMF Panel of following capacity (D) AMF Control Panel for 200 KVA/250 KVA 3 phase DG Set

Mode of Measurement:-On Each Basis.

**ItemNo.:176**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables. (B) 3 core 4 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:177**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables. (C) 3 core 6 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:178**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables. (D) 3 core 10 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:179**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (B) 3 1/2 core 35 Sq. mm ( 16 Sq. mm 1/2 core)

Mode of Measurement:-On Mtr Basis.

**ItemNo.:180**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (C) 3 1/2 core 50 Sq. mm ( 25 Sq.1/2 mm core)

Mode of Measurement:-On Mtr Basis.

**ItemNo.:181**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (F) 3 1/2 core 120 Sq. mm ( 70 Sq. mm 1/2 core)

Mode of Measurement:-On Mtr Basis.

**ItemNo.:182**

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand / Solid Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (A) 4 core 4 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:183**

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand / Solid Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (B) 4 core 6 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:184**

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand / Solid Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (C) 4 core 10 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:185**

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (A) 4 core 16 Sq. mm

Mode of Measurement:-On Mtr Basis.

**ItemNo.:186**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (A) 2 to 4 core 2.5 / 4 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:187**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (B) 2 to 4 core 6 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:188**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (C) 2 to 4 core 10 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:189**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (D) 2 to 4 core 16 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:190**

Providing and, fixing heavy duty flange type brass double compression type cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (B) 3 & 1/2 core 35/50 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:191**

Providing and, fixing heavy duty flange type brass double compression type cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (E) 3 & 1/2 core 120 Sq. mm

Mode of Measurement:-On Each Basis.

**ItemNo.:192**

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.(A) 1.5/ 2.5/4/6 Sq.mm

Mode of Measurement:-On Each Basis.

**ItemNo.:193**

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (B) 10 Sq.mm

Mode of Measurement:-On Each Basis.

**ItemNo.:194**

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (C) 16/25 Sq.mm.

Mode of Measurement:-On Each Basis.

**ItemNo.:195**

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.(D) 35/50 Sq.mm.

Mode of Measurement:-On Each Basis.

**ItemNo.:196**

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.(G)120 Sq.mm.

Mode of Measurement:-On Each Basis.

**ItemNo.:197**

Supplying & erecting earth pit of minimum bore dia.150mm size approved make Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 50mm having 80-200 Micron galvanising, Inner pipe dia of 25 mm having 200-250 Micron galvanising, connection terminal dia of 12mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover. (A)(approved make OEM has to submit test certificate including value of earth resistance of installation duly stamped and signed by agency and officer Incharge has to ensure the value of earthing resistance mentioned in test Certificate) & having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 ohm / meter testing as per IEC 62561-2017, Voltage drop:-

< 1 volt at no load & dry form, Sulphur content:-

<2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted by Agency. (c) For Electrical Installation covering Transformer Neutrals, Lightning arrester Earthing, A.C.Plant & Sensitive Computer System(like Automation, SCADA) i.e independent Earthing in normal soil. Length of Pipe : 3.00 mtrs Back filling Compound :2 nos Bags of 25 Kg.

Mode of Measurement:-On Each Basis.

**ItemNo.:198**

Providing and erecting required size HOT deep Galvanised iron strip for earthing of H.T. , OCB/ ACB/ Transformer LT panel board, Motors etc. using proper clamp.

Mode of Measurement:-On Kg Basis.

**ItemNo.:199**

Providing and erecting required size Copper strip for earthing of H.T. OCB / ACB/



Transformer, LT panel board, Motors etc. using copper clamp.

Mode of Measurement:-On Kg Basis.

**ItemNo.:200**

Providing and erecting Annealed bare Copper wire 8 to 16 SWG.

Mode of Measurement:-On Kg Basis.

**ItemNo.:201**

Supplying and erecting approved make oscillating type bracket fan A.C. 230V. 50cy/s 400/450 mm sweep wall mounted with height adjustment and rotary tilting device complete with guard, flexible Core plug top complete erected with lead wires as directed. CAT II

Mode of Measurement:-On Each Basis.

**ItemNo.:202**

Providing & erecting Approved make Ceiling Fan with double ball bearing with Condenser 230 volt A.C.50 Hz. 900 mm sweep complete having 3 Aluminium blades, canopy erected complete. [ Make shall be approved by Engineer in Charge]

Mode of Measurement:-On Each Basis.

**ItemNo.:203**

Providing & erecting Approved make Power Saving 50 Watt Ceiling Fan with double ball bearing ISI mark with Condenser 230 volt A.C. 50 Hz 1200 mm sweep complete having 3 blades with aluminium blades with , canopy & 30 cm. down rod erected with earthing.(Make shall be approved by Engineer in charge))

Mode of Measurement:-On Each Basis.

**ItemNo.:204**

Supplying and erecting 19 / 20 mm. nominal bore Medium Class M.S. Pipe down rod erected duly painted for fan complete with proper insulation without leakage and earthing.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:205**

Supplying & erecting fan hook box of 10 mm M.S. round bar bounded to the RCC bars up to 50mm length each side and pierced through a 16 Gauge M.S. box / Heavy Duty PVC box complete erected concealed in Ceiling with necessary finishing.

Mode of Measurement:-On Each Basis.

**ItemNo.:206**

Providing 2.5mm.thick laminated acrylic sheet to cover the fan hook or Fan box.

Mode of Measurement:-On Each Basis.

**ItemNo.:207**

Supplying & erecting approved make low noise decorative exhaust fan having square frame ABS body with inbuilt lowers & square frame. 200mm with 1350RPM Cat.II

Mode of Measurement:-On Each Basis.

**ItemNo.:208**

Providing recess in wall or window frame suitable for erection of Exhaust fan complete with plastering and colour washing to match the colour of the wall or window complete with expanded metal in order to render the fitting in accessible and the room water-proof.

Mode of Measurement:-On Each Basis.

**ItemNo.:209**

Supplying and erecting led lamps with following wattage capacity of 220 to 240 voltage, minimum 15000 burning hours life, 500 V in built-surge protection, Polycarbonate diffuser, mounting suitable for E14 / E27 / B22 lamp holders, pf  $\geq 0.5$

(A) LED Lamps integral type, with PC diffuser suitable LAMP holder

(ii) 5 to 8 watts cat – III

Mode of Measurement:-On Each Basis.

**ItemNo.:210**

Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V, Power Factor more than 0.95, THD  $< 15\%$ , CCT 3000 K to 6500K, Luminaire efficacy  $> 85$  lumens/watt, LED driver efficiency  $> 85\%$  (fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer incharge may select any wattage capacity between the ranges shown.)

(A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring loaded mounting clips complete. IP20

(ii) 12 watts, Surge-2 KV cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:211**

Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V, Power Factor more than 0.95, THD  $< 15\%$ , CCT 3000 K to 6500K, Luminaire efficacy  $> 85$  lumens/watt, LED driver efficiency  $> 85\%$  (fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer incharge may select any wattage capacity between the ranges shown.)

(A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring

loaded mounting clips complete.IP20

(ii) 15 watts, Surge-2 KV cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:212**

Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V, Power Factor more than 0.95, THD < 15 %, CCT 3000 K to 6500K, Luminaire efficacy > 85 lumens/watt, LED driver efficiency > 85 % (fitting required LM-79 & LM-80 Certificates) (NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer incharge may select any wattage capacity between the ranges shown.)

(A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring loaded mounting clips complete.IP20

(iii) 16-20 watts, Surge-2 KV cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:213**

Supplying and Erecting Of L.E.D. type High bay fixture having Power Consumption of following watts with, Input Voltage 110 - 290 V.AC with full efficiency, Power Factor > 0.9 with 50/60 HZ, CCVC LED Driver used for maximum power saving, Best Quality Aluminium alloy housing and aluminium Dome for better heat dissipation, CCT Cool white (6000K), CRI 80, Beam angle > 120 degrees, working temperature -20 deg c to +55 deg c, Body IP 65 (A) 70 to 90 watts cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:214**

LED Sign Board letter as per drawing including GIDC Logo" with ACP background Supplying & erecting with required angle iron/pipe supports of one complete signboard having 3.0 mm thick Alluminium Composite Panel (ACP) fascia on the front side. 1.5" Sq. hollow pipe structure frame with back side & surrounding 8" cover up by 24/26 swg pre coated CRC sheet. All text symbol made out-of Acrylic cover letters having 3.0" embossed with LED modules & required power supply & LEDs lighting & Acrylic Cover letters as per text & symbol as directed by Engineer - In Charge. The size of signboard be of 7 m x 0.9 m looking to the site area. Make: As per approved by Engineer In charge.

Mode of Measurement:-On Sqmtr Basis.

**ItemNo.:215**

65" UHD Interactive Display 20 point Touch WIndows, 10 point touch Android 3x HDMI 2.0 In, 1x DP In, 1x C=VGA In, 1x HDMI Out, 6x USB Port, 1x SPDIF Out, 2x RJ-45, 1x RS-232 Port. 1.07 Billion DIsplay Colors Contrast Ratio: 1200:1 Brightness: 390cd/m2. BIS certification, FCC Class A, Country of Origin Certificate

Mode of Measurement:-On Each Basis.

**ItemNo.:216**

Full HD Recording Codec. Supports 1080p60fps 2x HDMI/DP/DVI Input Port. 2x HDMI Output. Supports 1080p60 fps and Video Routing to any Output. 1x Balanced XLR input. 1x Unbalanced Line Input. 1x Balanced Line Output. 2x USB2.0 Interface. 1 RJ-45 port for IP network. Support TCP/IP, DHCP, HTTP, HTTPS with SSL/TLS, RTP, RTCP, SNTP, ARP Input resolution: 1024x768, 1280x768, 1280x960, 1366x768, 1400x1050, 1600x900, 1680x1050, 720p, 1080p. Coding/decoding resolution: 800x600, 1024x768, 1280x1024, 1280x720, 1920x1080. Output resolution: 800x600, 1024x768, 1280x1024, 1280x720, 1920x1080. Acoustic Echo Cancellation, Automatic Gain Control, Acoustic Noise Suppression Support Administrator password, SSH/HTTPS. Infra Red pass through as well as remote upgrade through network. RS-232 Control port for third party control.

Mode of Measurement:-On Each Basis.

**ItemNo.:217**

Full High Definition PTZ Camera with 12X Optical and 12X Digital Zoom. 1/2.7" HD CMOS sensor. HDMI 2.0 and USB 3.0 synchronous Video output. 1080p60 resolution on both HDMI & USB3.0 Interface.

RJ-45 Port

HDMI Port. TCP/IP Control, RS-232 as well as RS 485 Control.

Mode of Measurement:-On Each Basis.

**ItemNo.:218**

Super Cardioid Pickup Pattern. Priority Function for Host with Capacitive Touch Buttons. Frequency response of 60 to 20,000 Hz. Built In Loudspeaker with Volume Control & 3.5mm Headphone Interface. 6 Pin Connectivity with base station.

Mode of Measurement:-On Each Basis.

**ItemNo.:219**

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**ItemNo.:220**

Central Control Unit with 4" Touch Screen & 3rd Gen of audio processing algorithm Noise suppression 1x Balanced Audio Input and Audio Output Interface. 1x Unbalanced Audio Input and Audio Output Interface 2x 25 Watts@ 4 Ohm Amp Output. Max NOM upto 8 Conferencing Modes: Nomal and Voice Activation. RS-232, RS-485 and RJ-45 Control port. 4x Aviation 6-Pin Interface. Inbuilt recording with Playback.

Mode of Measurement:-On Each Basis.

**ItemNo.:221**

10M Control cable for HPS controller to HPS microphone

Mode of Measurement:-On Lot Basis.

**ItemNo.:222**

240 Watts or more Mixing Amplifier 4 or more Microphone Inputs with Individual Phantom Power

Line Inputs x2 Mixed Line Output x1 Individual Gain Control for Microphone Inputs 4 or 16 Ohm, 100V or more Output AC & DC Operation with Auto Cool Function

Mode of Measurement:-On Each Basis.

**ItemNo.:223**

Digital Signal processor with inbuilt AEC.It shall have 4 or more balanced Mic/Line Input Interface.It shall have 4 Line output ports.It shall have USB Audio Interface only for soft applications.It shall support Acoustic Echo Cancellation, Noise Reduction, AGC.

Mode of Measurement:-On Each Basis.

**ItemNo.:224**

Wall Mount Speakers with 5 Inches Driver and 1 inch High Frequency Driver. 100V tapping. Frequency response of 60 Hz to 20,000. Maximum SPL of 104dB. Transformer tapping of 30W/15W/7.5W/3.75W Watts or more. Make & Model : AdonisAV Nyxx

Mode of Measurement:-On Each Basis.

**ItemNo.:225**

27' HDMI 2.0 Active Optical Cable. Support data rate upto 18 Gbps. Resolutions upto 3820x2160@60 Hz@4:4:4. Support HDMI 2.0. Support HDCP 2.2. Highly resistant with RF and EMI interference. No External Power Supplies.

Mode of Measurement:-On Each Basis.

**ItemNo.:226**

27' USB 3.0 Active Optical Cable Only. Support data rate of upto 5Gbps. Support resolutions of upto 1080p@60 Hz or higher. Support USB 3.0. Resistant with RF and EMI interference. 4mm Cable OD..

Mode of Measurement:-On Each Basis.

**ItemNo.:227**

CPU shall be with Core i5 Processor. It shall have 8 GB Ram or more. It shall have 512 GB HDD/256GB SSD or better. It shall have 2x USB3.0 interface, 1 x HDMI interface, 1x 10/100/1000 LAN interface. It shall have 2x USB2.0 Interface. It shall have genuine windows 11 professional series Operating System or better.

Mode of Measurement:-On Each Basis.

**ItemNo.:228**

15U 500watt smart AV rack with colling option

Mode of Measurement:-On Each Basis.

**ItemNo.:229**

Supplying & erecting dual channel amplifier ,power handling capacity of 180 watt ,four micro phone inputs with independent level control ,built in FM tuner,with preset memories,USB drive & SD card for MP3 playback ,100v /telephone input with priority and

VOX, frequency response-80 Hz to 18k Hz Philips / /distortion less than 1% @ rated power up to 50 units [[Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:230**

SITC of 3LCD Lamp based projector having wxga (1280x800) or better resolution with minimum white brightness of 3800 lumens and color brightness of 3800 lumens. The projector should have minimum 1HDMI,1VGA input. Having contrast ratio of 15000:1 or more. the projector should have auto vertical key stone correction of +/- 30 degree and Manual Horizontal of +/-30 degree. the projector should have optical lens, throw ratio 1.30-1.56:1. Zoom Factor of 1.2. Lens focus Manual having focal length 16.9mm to 20.28mm. projector should have features like AV mute slide, quick corner and split function and should support wireless functionality with inbuilt wifi or wifi dongle. [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:231**

SITC of 100 inch Self Lock MW (7 x 5) Instalock Slow Retraction Screen, Aspect Ratio-4:3 [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:232**

SITC of Rack Mounting kit for the control unit [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:233**

Providing & erecting approved make Fingerprint and card based Premium Door Controller with LCD and Keypad having following features. (A) Optical switch, Ethernet RS485, Aux Input & Aux Output Port (D) 5000 Events, Access Control, Time Attendance, Tamper Detection (E) 4 LEDS and Buzzer

Mode of Measurement:-On Each Basis.

**ItemNo.:234**

SITC of Ceiling speaker, 6W, metal [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:235**

Supplying & erecting Amplifier having following specification:Power Output :250W (RMS) (300W Max.) inputs : 6 Misc. & 2 Aux. frequency Response :50-1500HZ I3db Tone

Controls :Cut & Boost type LED Meter :5 LED Arrays The amplifier suitable to operate 240V A.C.& 24volt D.C. (Battery) with automatic changeover from AC to Battery operation, duly protected by wrong Battery Polarity connections. [[Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis.

**ItemNo.:236**

Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed.(d) 1.50 Sq.mm 2 core round PVC sheathed

Mode of Measurement:-On Mtr Basis.

**ItemNo.:237**

Providing & erecting water cooler having storage capacity 150 Ltr. & cooling capacity 150 Ltr.per hour @ an ambient temp of 45° C. The outlet temp. of the water should drop by 15°C within a hour, The water cooler should be comprising of hermetically sealed compressor, fan motor, condensing unit, water tank surrounded by evaporating, coil, thermostats, relay etc.complete with necessary inlet & outlet connection. The body of water cooler will be made from Stainless Steel.

Mode of Measurement:-On Each Basis.

**ItemNo.:238**

Supplying & erecting reverse osmosis (RO) water purification system with M.S. powder coated pedestal frame, prefilter housing carbon filter suitable buster DC pump, auto low & high pressure switches with following size of LPH capacity & erected as directed [E] 200 LPH with 1 phase / 3 phase Raw water pump of 1000LPH @ 2.5kg/cm<sup>2</sup> (1No - Kirloskar/CRI/Lubi) , Dual media filter 10"x54" (1 No), Micron catridge filter 20" x 2.5" - (1No), High pressure pump 1000LPH @ 10kg/cm<sup>2</sup> - (1No - Shimge /CRI /Lubi) , RO Membrane housing with RO membrane of 40\*40 - ( 1 No),RO pressure tube 4" x 1E-(1No), 0-1200LPH Rotameter-(2 Nos). Recovery Rate 50%.

Mode of Measurement:-On Each Basis.

**ItemNo.:239**

Supplying and erecting approved make online Un-interruptible Power Supply system comprising flat cum-boost charger with IGBT base rectifier & Inverter & sealed maintenance free SMF batteries. The charger having operating capacity for input 160-270V AC & inverter having output 230V,50 Hz Ac with 0.8 load power factor with battery, over/under voltage output with over load & short circuit protection equipment. The system housed in CRC sheet duly powder coated paint with following power backup.with MS painted batteries stand, 10% Overload capacity for momentary load. (I) 10 KVA 3 - phase with 1Hr Backup

Mode of Measurement:-On Each Basis.

**ItemNo.:240**

S.I.T.C. submersible pump set suitable for bore of 100 mm. dia. or more having three phase motor capacity not more than 5 H.P. with following capacity . Lifting and Lowering taken

extra. (B) (16 stage) 140 to 180 LPM discharge at 96 to 69 mtrs. head respectively suitable for 50mm dia. delivery pipe cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:241**

Providing and erecting ISI marked PVC insulated PVC Sheathed Flat flexible Submersible copper cable approved make of following Size. (E) 3 Core x 10 Sq. mm.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:242**

Providing & erecting open well type horizontal mono block pump set with stainless steel body having following specification (C) 1 H.P. single phase open well motor pump set suitable for 185 LPM discharge @ 25 mtr. head, suitable for 32 mm dia. Delivery pipe with control panel. Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:243**

Providing & erecting open well horizontal mono block pump set with cast iron body, complete for three phase submersible motor having [C] For 3 HP 3 phase open well horizontal mono block pump set suitable for 85 LPM to 270 LPM @ 11 mtr to 33 mtr head suitable for 50/65 mm dia delivery pipe Cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:244**

Supplying & erecting approved make Automatic liquid level controller 6A. with sensor testing as per instruction of Engineer in charge on site complete with wiring connection with existing wires , with copper conductor from pump to upper and lower tank.

Mode of Measurement:-On Each Basis.

**ItemNo.:245**

Supplying & erecting approved make motor control cubical panel [Star delta] made from 16G CRCA sheet duly epoxy powder painted inside and outside with hinged doors and locking with suitable size of ON - OFF isolator (AC 3 / 23 duty) main fuses. Digital volt and current meter (in a single unit) with micro controller based control unit and current sensing single phasing preventer electronic overload protection, over voltage (Programmable) protection and under voltage (Programmable) protection, prod less dry run protection programming facility for setting of all parameter like overload current, high voltage limit, low voltage limit, dry run limit with digital indication on seven segment LED display for any fault like over load, high voltage, low voltage, dry running single crimped, electronic star delta timer, feather touch start / stop push buttons to be erected on angle iron frame. Grouted on wall the contactors will be of L& T, Siemens, BCH make only) (A) DOL up to 5.0 H.P.

Mode of Measurement:-On Each Basis.



**ItemNo.:246**

Supplying and erecting approved make GRP / FRP Perforated type Cable Tray Material – Corrosion Resistant Polyester Flame Retardant U.V. Stabilized Resin System - Manufactured from Pultruded Sections- Polyester Resin System, Glass Content : 55 – 60 %  
 - - Standard Length : 3000mm- Support Span – 1500mm, Deflection L/200 - Specification NEMA FG1 1993- UV Resistant - Flame Retardant – IS 6746 - Appendix K/UL 94, Very Low Flammability - Specification Followed NEMA FG1 1993 Oxygen Index – Minimum 30% as per ASTM D 2863 - Flame Spread (Extent of Burning) – 20mm as per Standard ASTM D 635 - Tensile Strength – 4000 – 8000 Kg/Cm2 as per Standard ASTM D 638 - Flexural Strength – 2500 – 10000 Kg/Cm2 as per Standard ASTM D 790- Izod Impact Strength – 130 Kg/Cm2 as per Standard ASTM D 256- Compressive Strength – 2500 – 5000 Kg/Cm2 as per Standard ASTM D 695- Barcol Hardness – 50 – 65 (C) Width - 100mm, Pultruded “C” Channel with 35mm Sides 3mm Thickness, Loading 12 Kg./Mtr.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:247**

Supplying and erecting approved make GRP / FRP Perforated type Cable Tray Material – Corrosion Resistant Polyester Flame Retardant U.V. Stabilized Resin System - Manufactured from Pultruded Sections- Polyester Resin System, Glass Content : 55 – 60 %  
 - - Standard Length : 3000mm- Support Span – 1500mm, Deflection L/200 - Specification NEMA FG1 1993- UV Resistant - Flame Retardant – IS 6746 - Appendix K/UL 94, Very Low Flammability - Specification Followed NEMA FG1 1993 Oxygen Index – Minimum 30% as per ASTM D 2863 - Flame Spread (Extent of Burning) – 20mm as per Standard ASTM D 635 - Tensile Strength – 4000 – 8000 Kg/Cm2 as per Standard ASTM D 638 - Flexural Strength – 2500 – 10000 Kg/Cm2 as per Standard ASTM D 790- Izod Impact Strength – 130 Kg/Cm2 as per Standard ASTM D 256- Compressive Strength – 2500 – 5000 Kg/Cm2 as per Standard ASTM D 695- Barcol Hardness – 50 – 65(D) Width - 150mm, Pultruded “C” Channel with 30mm Sides 3mm Thickness, Loading 15 Kg./Mtr.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:248**

Supplying and erecting approved make GRP / FRP Perforated type Cable Tray Material – Corrosion Resistant Polyester Flame Retardant U.V. Stabilized Resin System - Manufactured from Pultruded Sections- Polyester Resin System, Glass Content : 55 – 60 %  
 - - Standard Length : 3000mm- Support Span – 1500mm, Deflection L/200 - Specification NEMA FG1 1993- UV Resistant - Flame Retardant – IS 6746 - Appendix K/UL 94, Very Low Flammability - Specification Followed NEMA FG1 1993 Oxygen Index – Minimum 30% as per ASTM D 2863 - Flame Spread (Extent of Burning) – 20mm as per Standard ASTM D 635 - Tensile Strength – 4000 – 8000 Kg/Cm2 as per Standard ASTM D 638 - Flexural Strength – 2500 – 10000 Kg/Cm2 as per Standard ASTM D 790- Izod Impact Strength – 130 Kg/Cm2 as per Standard ASTM D 256- Compressive Strength – 2500 – 5000 Kg/Cm2 as per Standard ASTM D 695- Barcol Hardness – 50 – 65(F) Width - 300mm, Pultruded “C” Channel with 50mm Sides 4mm Thickness, Loading 30 Kg./Mtr.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:249**

Supplying & laying under floor pregalvanised corrosion proof rectangular sheet steel cable trunking of 1.6 mm thick having with stand point load up to 1.33 ton & free from seepage of concrete of

screed water having following size of dimensions and No of compartments (W xD x T)  
50mm x 38mm x 1.6 mm with One Compartments.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:250**

Supplying & laying under floor pregalvanised corrosion proof rectangular sheet steel cable trunking of 1.6 mm thick having with stand point load up to 1.33 ton & free from seepage of concrete of screed water having following size of dimensions and No of compartments (W xD x T)

100mm x 38mm x 1.6 mm with One Compartments.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:251**

PVC/ GI Junction cross over box for metal/ Al. trunking with duct entry 25mm x 38mm size having epoxy powder coated trap lead with corrosion & rust free having load bearing capacity of 3.6 tons with adjustable levelling screw of following size

150mm x 150mm x 60/75 mm depth.

Mode of Measurement:-On Each Basis.

**ItemNo.:252**

PVC/ GI Junction cross over box for metal/ Al. trunking with duct entry 25mm x 38mm size having epoxy powder coated trap lead with corrosion & rust free having load bearing capacity of 3.6 tons with adjustable levelling screw of following size 250mm x 250mm x 60/75 mm depth.

Mode of Measurement:-On Each Basis.

**ItemNo.:253**

PVC/ GI Junction cross over box for metal/ Al. trunking with duct entry 25mm x 38mm size having epoxy powder coated trap lead with corrosion & rust free having load bearing capacity of 3.6 tons with adjustable levelling screw of following size 350mm x 350mm x 60/75 mm depth.

Mode of Measurement:-On Each Basis

**ItemNo.:254**

PVC/ GI Junction cross over box for metal/ Al. trunking with duct entry 25mm x 38mm size having epoxy powder coated trap lead with corrosion & rust free having load bearing capacity of 3.6 tons with adjustable levelling screw of following size 400mm x 400mm x 60/75 mm depth.

Mode of Measurement:-On Each Basis

**ItemNo.:255**

Supplying and erecting approved make Conical Pole (Standard ) Made from HR sheet steel. The pole should be made as per IS. and shall be coated with hot dip galvanizing as per IS 2629/2633/4759 with required base plate and integral Junction box consist of terminal plate of min 6mm Hylam sheet, standard profile 35mmX7.5mm Din-Rail for MCB Mounting, stud type terminal and arrangement for cable terminations erected on suitable foundation

(included) with necessary GI nut-bolts/J-Bolts. as per details given by manufacturer considering site requirement. The length of poles are as below  
(C) 5 Mtr. Long 65mm Top X140 mm bottom dia, 3mm thickness.

Mode of Measurement:-On Each Basis.

**ItemNo.:256**

Providing and erecting street light pole bracket comprising main B Class MS pipe of 4.2 cm/require outside dia. complete with suitable B Class M.S. sleeve tubing of approx. 45cms.length and suitable for 76.5 mm / 80mm. / require size pole top having sufficient fasteners for fixing the brackets and having spread of 1 mtr. length with suitable rise as per site condition & suitable welded stiffener reducer and nipple with check nut complete painted with one coat of Red oxide / PU base primer and two coats of Aluminium / PU paint. paint with following nos of arms. [A] Single Arm bracket 1 Mtr

Mode of Measurement:-On Each Basis.

**ItemNo.:257**

Providing and erecting street light pole bracket comprising main B Class MS pipe of 4.2 cm/require outside dia. complete with suitable B Class M.S. sleeve tubing of approx. 45cms.length and suitable for 76.5 mm / 80mm. / require size pole top having sufficient fasteners for fixing the brackets and having spread of 1 mtr. length with suitable rise as per site condition & suitable welded stiffener reducer and nipple with check nut complete painted with one coat of Red oxide / PU base primer and two coats of Aluminium / PU paint. paint with following nos of arms. [B] Double Arm Bracket 1 Mtr

Mode of Measurement:- On Each Basis.

**ItemNo.:258**

Supplying & erecting approved make SMC press moulded composite FRP. loop-in, loop- out approx. 2mm thick box complete with Bakelite connector strip 5way(3P+N+E), DIN rail for mounting mob & hinged doors as per requirement having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamps& earth bolt of following size of box. (A) 300mm x 200mm x 100mm [deep]

Mode of Measurement:-On Each Basis.

**ItemNo.:259**

Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses, with toughened glass with company mark/name engraved or embossed 160 to 270 V, Power Factor more than 0.95, THD < 10 %, CCT 3000 K to 5700K, Uniformity ratio >0.45, Luminaire efficacy > 100 lumens/watt . LED driver efficiency > 85 %.( fittings required LM-79 & LM-80 certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer incharge may select any wattage capacity between the

ranges shown.) (A) Street Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (i) above 36 to 48 watts Cat-III

Mode of Measurement:-On Each Basis.

**ItemNo.:260**

Supplying & erecting approved make Digital time switch having lithium cell 6 years operative and operate battery backup 1 channel day clock with 14 memory programme, suitable to operate on 240V + 5%, 16A with, floating contacts Minimum switching setup time

1 minimum & LCD display. Also comprised permanent ON/OFF switching. Programming switches & housed in fire proof thermoplastic enclosure & transparent cover erected as required with necessary connection erected as directed.

Mode of Measurement:-On Each Basis.

**ItemNo.:261**

Supplying & erecting power contactor ,AC3 duty for time switch complete erected as per direction Cat III (B) 2 pole 250V 32 Amp.

Mode of Measurement:-On Each Basis.

**ItemNo.:262**

Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed. (e) 1.50 Sq.mm 3 core round PVC sheathed

Mode of Measurement:-On Mtr Basis.

**ItemNo.:263**

Providing and erecting Pipe type earthing with 40 mm dia 2.5 mtr long 'B' grade G.I. pipe with necessary coupling buch buried in specially prepared earth pit & G.I. earth wire of 8 SWG erected & connected as directed (For panel) For using salt and charcoal / coke as required for pipe type earthing.

Mode of Measurement:-On Each Basis.

**ItemNo.:264**

Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground / road surface for enclosing cable (A)50 mm outer dia

Mode of Measurement:-On Rmt Basis.

**ItemNo.:265**

Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at required depth in existing trench for laying of cable.

below ground / road surface for enclosing cable (D)120 mm outer dia.

Mode of Measurement:-On Rmt Basis.

**ItemNo.:266**

providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark cat III

Mode of Measurement:-On Each Basis.

**ItemNo.:267**

Making trench in Hard Murrum / Tar Road of suitable width of 90 cm or required depth for laying any size of cable or locating the fault all over the run and back filling the same and making the surface as normal ground.

Mode of Measurement:-On Mtr Basis.

**ItemNo.:268**

Making trench in soft soil of suitable width of 90 cm deep for laying cable or locating the fault all over the run and back filling the same and making the surface as normal ground.

Mode of Measurement:-On Mtr Basis.

**DETAILED SPECIFICATION OF FIRE SAFETY WORKS**

**General scope of work:**

**1.0 SCOPE OF WORK**

The scope includes fire protection system only, the detection is covered under separate tender

- 1.1 Fire Hydrant system
- 1.2 Fire Sprinkler System for basement
- 1.3 Fire Extinguishers

The detailed scope is described in the chapter “Extent of Work. “

**2.0 FIRE EXTINGUISHERS**

**2.1 GENERAL:**

The scope of work under this part of the specification covers supply and installation of internal appliances as per requirements specified in schedule & marked on drawings and instructions of engineer-in-charge.

Makes of all the appliances supplied and installed shall be as per the ‘List of Approved Make ‘ or as approved by LFA and shall be of identical design for the entire premises.

Mounting accessories, indicator boards etc are part of the scope of supply of internal appliances.

**2.2 SPECIFICATIONS:**

Internal appliances with various fire extinguishing medium shall conform to the following specifications and shall be installed and maintained as per IS: 2190 / NFPA 10

Portable Extinguishers of the following types shall be installed.

1. Dry chemical Powder type
2. Co2 type
3. Water / Foam type
4. ABC type

#### 2.2.1 DRY CHEMICAL POWDER TYPE:

The Dry chemical powder type shall be of 5 Kg. Capacity and shall have the IS mark 2171 or latest Indian standard complete with powder and charged including with fixing bracket, fitted with gunmetal cap, and discharge hose and open grip nozzle.

#### 2.2.2 CO2 TYPE:

The Co2 Extinguisher shall be ISI mark, with initial charge with high pressure cylinder, complete with wheel type valve, internal discharge tube, with high pressure discharge hose with horn and suspension brackets. The extinguisher shall have ISI mark of 2878 or latest Indian standard and capacity shall be 2 Kgs.

#### 2.2.3 WATER / FOAM TYPE :

The water type extinguisher shall conform to IS 15683 or latest Indian Standard having 9 ltr. capacity & will be with fixing arrangement with all accessories.

2.2.4 ABC (Powder) TYPE : 6 Kg ABC (Powder) type fire extinguisher shall conform to IS 15683 or latest Indian Standard & will be with all accessories & mounting arrangement.

However, type & capacity of fire extinguishers are to be provided according to local CFO requirement

### 3.0 PIPE WORK

#### 3.1 GENERAL REQUIREMENTS:

3.1.1 All the materials shall be of TAC/LFA approved, best quality conforming to the specifications and subject to the approval of the Client or his representative. If so directed, materials shall be tested in an approved testing laboratory & the contractor shall produce the test certificate in original to the Engineer-in-charge & the entire charges for original as well as repeated tests shall be borne by the Contractor.

3.1.2 Before welding, the pipe faces shall be cleared & then shall be welded conforming to IS : 9595 – 1980. The electrodes used for welding shall comply with IS:814. the laying of welded pipe shall also comply to IS 5822 – 1986. The welding joints shall be tested in accordance to IS:3600, Part 1973.

3.1.3 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

3.1.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

3.1.5 Pipes shall be securely fixed to walls, and ceilings by suitable clamps or supported at every 3 mtr. & at change of direction as required. Only approved type of anchor fastners shall be used for

RCC ceiling and walls.

3.1.6 Valve and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

## **3.2 PIPING**

Pipes of the following types are to be used:

3.2.1 M.S. pipes as per IS: 1239, heavy duty (for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall be lagged as per IS: 10211.

3.2.2 MS pipe lines upto 150 mm dia. shall have all fittings as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be fabricated from IS: 3589 Gr.320 pipes as applicable or from steel plates.

3.2.3 For MS pipelines upto 50 mm dia screwed jointing shall be adopted, while for pipelines above 50 mm dia welded or flanged construction is to be carried out or as specified in Schedule of quantities.

3.2.4 Hangers and supports shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor, braces, dampener, expansion joint and structural steel to be attached to the building structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultant / Client / Architect.

3.2.5 The piping system shall be capable of withstanding 150% of the working pressure including water hammer effects.

3.2.6 Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points (@ at every 15-20 mtr.) to facilitate erection and subsequent maintenance work.

3.2.7 Excavation for pipe line shall be in open trenches. Pipes shall be buried atleast one meter below ground level and shall have 230 mm x 230 mm masonry supports atleast 300mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand: 8 stone aggregate) of size 380 x 380 x 75 thick resting on firm soil.

3.2.8 Wherever required Contractor shall support all trenches or adjoining structures with adequate supports to prevent land slides.

3.2.9 On completion of testing and painting trenches shall be refilled with excavated earth in 15 cm layers and compacted.

3.2.10 Contractor shall dispose off all surplus earth within the site.

3.2.11 Contractor shall provide suitable cement concrete anchor blocks for overcoming pressure thrusts in underground / external pipes. Anchor blocks shall be of cement concrete 1:2:4 mix.

## **4.0 VALVES**

4.1 Valves shall be used to start, stop or control flow. Non-return valves shall be provided unidirectional flow.

4.2 Butterfly valve conforming to BS 5155 or as indicated in BOQ will be used for isolation of flow in pipelines. Optionally, gate valves having outside screw rising spindle shall be used and shall be as per IS: 780 / 14846 PN 1.0/1.6, as applicable. For sizes 50mm to 200mm, Butterfly valve shall

be as per IS: PN = 1.6 or as specified in Schedule of quantities. Non-return valves shall be swing check/spring operated type. An arrow mark in the direction of flow shall be marked on the body of the valve. These valves shall conform to IS:5312 for swing type or API 596/598 for spring type check valves

**4.3** Valves below 50 mm size shall have screwed ends while those of 50 mm and higher sizes shall have flanged connections. Drain lines will have locks for draining.

## **5.0 INTERNAL HYDRANT:**

Internal hydrant shall be provided at each landing or at suitable location consisting of single / twin headed gunmetal landing valve as indicated in BOQ with 63 mm dia oblique female instantaneous pattern with caps & chains. Outlet and 80 mm inlet (IS: 5290-1969) with separate shut off valve. Landing valves shall be 63 mm dia. oblique female instantaneous pattern with caps and chains. Landing valves shall be of gunmetal and fitted with instantaneous coupling conforming to IS: 901. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS: 318-1962. The valve spindle shall be of brass rod conforming IS: 320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969. The coupling shall be fitted with an internal plug secured by chain landing valves shall be installed on hydrant riser at a height of 1.0 to 1.2 meter from the floor level.

Each internal hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with nozzle conforming to IS:903.

## **6.0 HOSES**

Hoses pipes shall be of fabric reinforced rubber lines as per IS:636 Type II or canvas hose as per IS:4927, with nominal size of 63 mm and lengths of 15 meter or 7.5 meter, as per quantities specified for in schedule or bill of quantity.

All hose pipes shall carry ISI marking on the body of the hose.

The hose shall have instantaneous spring lock-type coupling on ends. The instantaneous coupling shall be as per IS: 901. It shall be fixed to each other by copper rivets and galvanized M.S. wires and leather bands. All coupling shall be interchangeable with each other, and shall bear ISI markings.

## **7.0 HOSE CABINETS ( HOSE BOX )**

Each hydrant shall be housed in a Hose cabinet of suitable size. The hydrant cabinet shall hold double / single headed hydrant as specified, 2 hoses and one branch pipe as required. Internal hydrants shall normally fit the size of the niche made for it. The cabinet shall be of minimum 16 SWG M.S. sheet with centre opening, double glass front doors (cleat glass of 4mm thickness). The glass shall be firmly fixed by means of steel clips and screw with rubber beading. Hinges shall also be screwed and not welded. The corner members (frame) shall be of 25 x 25 x 3 mm thick angle. The hose box shall be firmly fixed to the wall/support by means of brackets and dash fasteners. The steel work shall have one coat of primer and two coats of red paint. The words "Yard Hydrant", "Hydrant" etc. should be painted in white or red on the glass in 75 mm high letters. The hose box shall be lockable for internal hydrant installation.

## **8.0 HOSE REEL**

The hose reel shall be directly tapped from the riser through a 25 / 32 mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The hose reel shall be swinging type (180degrees) and the entire drum, reel etc. shall be as per IS: 3876 and IS: 884. The rubber tubing shall be of best quality and the nozzle shall be shut off type.



## 9.0 BRANCH PIPES

Branch pipe shall be of either gun metal or aluminium and should conform to IS: 903. One end of the branch pipe will receive the coupling while the other end shall have a nozzle screwed to it. It shall bear ISI marking.

## 10.0 YARD / EXTERNAL HYDRANT

Yard or External Hydrants shall be as per IS: 908 and the valve as per IS:5290. The hydrant shall consist of stand post assembly and a masonry base 200 mm X 200 mm X 200 cm high and shall be made at the point where it comes out of the soil. The valve shall complete with hand wheel, quick coupling connection spring and blank cap. The hydrant shall be laid on 150 dia. or as mentioned in BOQ.

Yard or External hydrant shall be controlled by a cast iron sluice valve. Hydrant shall have oblique female instantaneous pattern 63 mm diameter outlets with caps and chains. The hydrant shall be of gunmetal and flange inlet and single outlet conforming to IS: 5290, a duck foot bends and flanged riser of required height to bring the hydrant to level above ground. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS:318-1962. The valve spindle shall be of brass rod conforming IS:320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969. Each external hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with 20 mm nozzle conforming to IS:903.

## 11.0

## VALVE CHAMBER

A valve chamber shall be brick masonry chamber in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundation 150 mm thick foundation 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling, complete. The wall shall be 230 mm thick with heavy duty ISI marked C.I. manhole covers.

## 12.0 FIRE BRIGADE INLET CONNECTION

A fire brigade inlet connection with a non-return valve shall be provided to facilitate the fire brigade to pump water into the installation by the use of their own equipment. Four way or 150 mm dia connection to the system shall comprise of four instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 150 mm dia. sluice valves, non- return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

Two way or 100 mm fire brigade inlet connection to the system shall comprise of two instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 100 mm dia sluice valve, non-return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

## 13.0 SYSTEM DRAINAGE

The systems shall be provided with suitable drainage arrangements with MS piping of 50 mm dia. complete with all accessories, and provided with drain valve.

## 14.0 HYDRANT SYSTEM

14.1 The hydrant system shall comprise of AC motor driven pump sets. Diesel pump, Jockey

pump etc. with all required accessories including valves, appurtenances, instrumentation and controls etc. complete in all respects. The system shall cover the entire area from independent pipe work from the fire water pump set. The hydrant work shall remain pressurized through the proposed Jockey pump taking care of any leakages in the system pipelines and valve glands. All pumps / motors / engines to be of makes approved by local Fire Authority.

**14.2** The hydrant system shall be kept charged by pressurized water at approximately 7.5 Kg/cm<sup>2</sup> at all times. In the event of fire when any of the hydrant valves in the network is opened, the resultant fall in header pressure should enable starting the Electric Motor driven fire water pumping set through pressure switches automatically. One Diesel Engine / DG set driven pump shall be a stand-by pump serving hydrant system & sprinkler both. In case of failure of electricity or failure of Elec. Pump to start on demand, the stand-by DG set operated pump shall automatically take over. Apart from the automatic starting of the pump sets, provision shall be kept for manual starting also. However shifting down of the pump sets shall be manual.

**14.3** The hydrant system in the yard shall be furnished with external hydrants consisting of landing valves (positioned approx. one meter above ground level) fitted M.S. (Heavy) flanged single headed stand pipes installed on underground hydrant headers distributed 45 M apart approximately or as marked on the plan.

The entire system including all pumps, motors, diesel pump set and panels shall be of approved make by TAC / Local Fire Authority.

## **15.0 SPECIFICATION FOR PUMPS AND ANCILLARY EQUIPMENT**

### **15.1 SCOPE OF WORK**

15.1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated pumps for fire hydrant installations as required by the drawings and specified hereinafter or given in the schedule of quantities.

15.1.2 Without restricting to generality of the foregoing the pumps and the ancillary equipment and shall include the following:

- a) Electrically operated pumps having twin outlets with motors base plate and accessories.
- b) Pump suction and delivery headers, valves, air vessel and connections.
- c) Pressure gauges / pressure switch.
- d) Only single point 3 phase supply will be made available to the Contractor. From there, all provision viz. Electrical switchboard, wiring, cabling, cable tray, control panel, earthing, etc. shall be made.

### **15.1.3 GENERAL REQUIREMENT**

- a) Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in concrete foundations.
- b) Pumps and motors shall be truly aligned with suitable instruments.
- c) The pump shall have single suction & twin discharge connection
- d) All pump connections shall be standard flanged type with appropriate number of bolts.

e) Manufacturer instructions regarding installation connections and commissioning shall be followed with respect to all pumps, switchgear and accessories.

#### 15.1.4 FIRE AND JOCKEY PUMPS

a) The main Fire hydrant & Sprinkler pumps shall be End Suction Back Pull Out type while Jockey pumps shall be of Centrifugal Monoblock Pump type having following specifications.

b) Shut off head should not exceed 140% of rated head. Pump shall not develop less than 65% of rated head at 150% of rated capacity.

#### MATERIALS OF CONSTRUCTION

| Part           | Material                     |
|----------------|------------------------------|
| Casing         | Cast Iron                    |
| Impeller       | Bronze IS:318, Gr. LTB 2     |
| Casing Wearing | SS                           |
| Shaft          | AISI – 410 / Stainless Steel |
| Shaft Sleeve   | S.S. 316                     |
| Stuffing Box   | Gland Packed                 |

c) Pumps shall be provided with pressure gauge with isolation cock on the delivery side.

d) In case of motor driven pump the motor rating should be adequate to drive the motor rating should be adequate to drive the pump at 150% of rated discharge.

e) The pump and its prime mover (Electric motor or Diesel Engine) shall comply with all the equipment of the Rules of the Traffic Advisory Committee.

f) All pumps shall have positive suction & shall be provided with suction strainer of SS & CI bell mouth. In case of negative suction suitable priming arrangement shall be provided.

g) All the pumps shall have single suction & twin discharge connections i.e. low pressure & high pressure to serve designated lower & higher floors respectively as per drawing.

#### A) JOCKEY PUMP

Starting and stopping of Jockey Pump set shall be automatic at predetermined levels through pressure switch. However, arrangements for manual start and stop of the pump shall also be made. Jockey Pump shall take care of small leakages in the piping system and pumps cushion tanks. Jockey pump shall have also single suction & twin discharge connections.

#### B) ELECTRIC DRIVEN

Electrically driven pumps shall be provided with totally enclosed fan cooled, foot mounted, squirrel cage induction motors suitable for fire pumps with IP-55 enclosure.

The motors should be rated not to draw more than 4.5 times the starting current.

Motors shall be atleast equivalent to the horse power required to drive the pump at 150% of its rates discharge.

The motors shall be wound for class-F insulation and windings shall be vacuum impregnated with

heat and moisture resisting varnish, glass fiber insulated.

### c) DIESEL ENGINE

- a) Diesel engine shall have suitable no. of cylinders with individual heat assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping strainer, isolating pressure reducing valves, bye-pass line, exhaust pipe, silencer, day tank for fuel all interconnected piping etc., complete in all respects.
- b) Engine shall be direct injection type with low noise and exhaust omission levels,
- c) The speed of engine shall match the pump speed for direct drive.
- d) The engine shall be capable of being started without the use of the wicks, cartridge heater plugs or either at engine room temperature of 4°C and shall take full load within 15 seconds from the receipt of the signal to start.
- e) The engine shall effectively operate at 46°C ambient temperature at 150 meter above mean sea level.
- f) Engine shall be suitable for running on high speed diesel oil.
- g) The system shall be provided with a control panel with push button starting arrangement also wired to operate the engine on differential pressure gauge.
- h) The entire system shall be mounted on a common structural base plate with anti-vibration mounting, Dunlop make, and flexible connections on the suction and delivery piping.
- i) Contractor provide one fully mounted and supported Day Oil Tank fabricated from 6mm thick MS sheet electrically welded for 8 hours working load and having suitable capacity of oil. Provide level indicators – low level and full level in the Day Oil Tank on the control panel through float switches and an breather. Day Oil Tank shall also be provided with filling connection (Threaded) with cap, gauge glass indication and cocks, drain cock, inspection / cleaning cover with gasket and nuts / bolts. MS dyke to hold 150% of the Day Tank capacity to be built around the Day Tank.
- j) Contractor to provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gasses to outside in open air as per site conditions (Contractor to check the site).
- k) Contractor to provide all accessories, fittings and fixtures necessary and required for a complete operating engine set. The exhaust pipe shall be taken outside the building with minimum number of bends (approx. length 30 Meters) and shall be duly heat insulated with 50mm thick glass wool covered with 24 gauge aluminum cladding.
- l) Contractor shall indicate special requirements, if any, for the ventilation of the Pump Room.

Noise & Vibration level of the pump driven by motor/engine shall be within the acceptable limits of ISO 2372, IS 11727.

### 15.1.5 BOOSTER PUMP (Not Applicable)

A booster pump shall be provided at terrace to pressurize the wet riser system. The pump shall be centrifugal end suction / monoblock type.

### 15.1.6 BASE PLATE

Pumps and motors shall be mounted on a common structural base plate and installed as per

manufacturer's instructions.

## 16.0 CUBICLE TYPE SWITCH BOARD/L.T. PANEL

Cubicle type switchboards and components shall conform to the requirements of the latest revision including amendments of the following codes and standards.

|  |   |
|--|---|
| IS: 8623                               | Specification for factory built assemblies of switchgear and control gear for voltage upto and including 1000V AC / 1200V DC. |
| IS: 4237                               | General requirements for switch-gear and control-gear for voltage not exceeding 1000-V.                                       |
| IS: 2147                               | Degree of protection provided by enclosure for low voltage switch-gear and control-gear.                                      |
| IS: 1018                               | Switch-gear and control-gear selection/installation and maintenance.  |
| IS: 6005                               | Code of Practice for phosphating of iron and steel.   |
| IS: 13947-1993/                        | Air circuit breaker / moulded case circuit breaker. IEC 947 - 1989  |
| IS: 1248                               | Direct acting indicating analogue electrical measuring instruments and testing accessories.                                   |
| IS: 2705<br>Part - I,<br>II & III 1964 | Current transformers for metering and protection with classification burden and insulation.                                   |

## 17.0 AIR CUSHION TANK

Every wet riser shall be provided with an air cushion tank at its top most point. The air cushion tank shall be provided with an automatic air release cock, 20 mm dia. drain pipe, drain valve and shut off valve.

## 18.0 PRESSURE GAUGE

All pressure gauges shall be dial type with Borden tube element of SS 316. The dial size shall be of 150 mm diameter and scale division shall be in metric units marked clearly in black on a white dial. The range of pressure gauge shall be 0-10 kg.sq.cm or as specified in BOQ. The pressure gauges shall be complete with isolation cock, siphon tubing, etc.

## 19.0 PRESSURE SWITCHES

**19.1** The pressure switch shall be industrial type single pole double throw electric pressure switch designed for starting or stopping of equipment when the pressure in the system drops or exceeds pre set limits. It shall comprise of a single pole change over switch, below element assembly and differential spindle.

### 19.2

All pressure

## 20.0 SPRINKLER HEADS

Sprinkler heads shall be provided at approximate spacing so as to cover 12 sq.mtr. per sprinkler head in case of ordinary hazard for basement having car parking area. The spacing shall however be in uniformity with the drawings and properly coordinated with electrical fixtures, ventilation ducts and grilles and other services along the ceiling. Sprinkler heads shall be gunmetal quartz bulb type with a

temperature rating of 68°C. Sprinkler heads shall be of upright conventional type with fusible link for operation. Sprinkler head shall be approved by the under writers Laboratories (U.L.) or Fire Officers Committee (FOC). The finish shall be as specified in bill of quantities.

Contractor shall install cabinet (fabricated from 16 Gauge M. S. sheets with lockable glass shutters. Shelves for keeping spare sprinklers and spanner at locations approved by the Engineer-in-Charge and given in the schedule of quantities. The contractor shall also give required tools for removing and fixing of different types of sprinkler free of cost as directed by Engineer-in-Charge.

## **21.0 SPRINKLER SYSTEM**

### **21.1 GENERAL:**

To supply, install, testing and commissioning of sprinkler system as per drawing and Sprinkler heads spacing shall be in conformity with the drawings and properly coordinated in reflected ceiling with electrical fixtures, ventilation ducts and grills and other services along the ceiling.

Sprinkler heads shall be brass / gunmetal with quartz bulb with temperature rating of 68 degree celsius. Sprinkler heads shall be of type and quality approved by the local fire brigade authority. The inlet shall be screwed. Sprinkler heads shall be pendent, recessed or special side type. All sprinklers shall conform to the specifications given by TAC, IS, NFPA, FOC, UL & FM.

### **21.2 UPRIGHT TYPE SPRINKLER HEAD**

Sprinkler heads shall be quartzite bulb type with bulb, valve assembly, yoke and the deflector. The sprinkler shall be of approved make and type with 15 mm nominal diameter outlets.

The bulb shall be made of corrosion free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall be shatter when the temperature of the surrounding air reaches at 68 c. Upright sprinklers shall be considered for basement.

The nominal bore shall 15 mm diameter and colour of liquid shall be as per temperature rating.

### **21.3 FLOW SWITCH**

Flow switch shall have a paddle made up of flexible material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle / pipe through a connecting socket. The switch shall be potential free in either NO or NC position as required. The switch shall be able to trip and make/ break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Fire alarm panel. The seat shall be of stainless steel. The flow switch shall have IP: 55 protections.

The flow switch shall work at a minimum flow rate of 100 LPM. Further, it shall have a retard to compensate for line leakage or intermittent flows.

### **21.4 BUTTERFLY VALVE**

The Butterfly valve shall be suitable for waterworks and tested to minimum of 16 kg/sq cm Pressure. The valves shall fulfill the requirements of BIS(Indian Standard)BS: 5155 or AWWA C 504, API 609 and MSS-SP-67.

The body shall be of cast iron to IS: 210 in circular shape and of high strength to take the minimum water pressure of 10 kg/sq cm. The disc shall be heavy-duty cast iron with anti- Corrosive epoxy or nickel coating.

The valve seat shall be high grade elastomer or nitrile rubber. The valve in closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be of ENB grade carbon steel.

The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

The valve shall be supplied with manual gear operated opening/ closing system by lever.

## **21.5 DRAIN VALVE**

50 MM / or as specified in SOQ diameter MS pipe conforming to I.S.:1239 (heavy grade) with 50 mm diameter / or as specified in SOQ gunmetal full way valve shall be provided for drainage of any water in the system in low pockets.

## **22.0 TESTING OF THE HYDRANT SYSTEM:**

**22.1** All air shall be trapped from the pipeline through hydrants & air valves. Each section of the pipe shall be slowly filled with the water & allow to stand the water for 2 hours minimum with the ends closed. No joints / connection shall be leaked within this duration. The hydraulic test pressure shall be 1.5 times the design pressure.

**22.2** Flushing of underground connections: Underground mains and lead-in connections to system risers shall be flushed before connections made to piping in order remove foreign materials which may have entered the underground during the course of installation. For hydrant system the flushing operation shall be continued until water is clear.

**22.3** Underground mains and lead-in connection shall be flushed at a flow rate of not less than 480 ltrs. per minute.

**22.4** Provision shall be made for the disposal of water issuing from test outlets to avoid property damage.

## **22.5 Acceptance Test**

At the time of taking over, the hydrant system shall fulfill the following acceptance tests:-

**22.5.1** Starting up of the pressure suction (Jockey Pump) : The pressure switch shall be set at 3.5 kg/cm<sup>2</sup> at the lower limit and 7.5 kg/cm<sup>2</sup> at the upper limit. The system drain shall be opened to cause a drop in the pressure. The Jockey Pump shall start as soon as the pressure gauge needle falls down to 3.5 kg. The Jockey pump shall also stop automatically when the system has been pressurised again upto 7.5kg/cm<sup>2</sup>.

**22.5.2** The main electrical pump shall be set to start at 3.5 kg/cm<sup>2</sup>. An external hydrant valve using a single length of hose and branch pipe shall be fully opened to cause a drop of pressure in the system. At first, the jockey pump shall start when the pressure drops from 7 kg. Further, drop in the pressure from 3.5 kg should be allowed to test automatic start-up of the electrical pump. The electrical pump shall continue to run atleast for 5 minutes and register rise in the pressure upto 3.5 kg the Jockey Pump shall be automatically start at this. The electrical pump shall be stopped manually by pressing the stop button.

**22.5.3** After having the system got fully charged at 7.5 kg/cm<sup>2</sup> the external hydrant valve using hose and branch pipe at (ii) above shall be opened. When the pressure has dropped from 3.5 kg/cm<sup>2</sup>, the electric main pump shall come into operation automatically. After the main pump has run for 5 minutes, the power supply in the pump house shall be switched off. The diesel pump shall automatically come into operation immediately.

**22.5.4** All these tests mentioned above shall be repeated after one hour interval. The result of all the tests shall be identical again. After the system has satisfactorily withstood the above tests, it can be taken over from the contractor.

## 23.0 START-UP/SYSTEM TESTING

It will be the responsibility of the tenderer to cause interim/stage inspection by the Local Fire Authority LFA/ Chief Fire Officer C.F.O during execution of the work as and when so called for by the Employer / Consultant and shall carry out any rectification / modification as may be suggested by the Local Fire Authority (LFA), Chief Fire Officer (CFO).

Soon after the work is completed, the contractor shall inform the LFA/CFO in writing with a copy to the Consultant/Employer for getting the complete system including all sub system and instrumentation, control etc. thoroughly inspected and tested for satisfactory performance. After satisfactory completion of tests of the systems by the LFA / CFO, the contractor shall be required to submit as built drawings to the Consultant / OWNER which have been so approved.

## 24.0 COMMISSIONING OF SYSTEM

**24.1** Pressurised the fire hydrant system by running the main fire pump and after attai required pressure shut off the pump.

**24.2** Open bye-pass valve and allow the pressure to drop in the system. Check that the jockey pumps cuts-in and cuts-out at the pre-set pressure. If necessary adjust the pressure switch for the jockey pump. Close bye-pass vavle.

**24.3** Open bye-pass valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the preset pressure and should not cut-out automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However, the jockey pump should cut out as soon as the main pump starts.

**24.4** Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.

**24.5** When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant simultaneously and allow the hose pipe to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.

**24.6** Diesel engine / DG set driven pump should also be checked in the same manner as given in clause above by running for 8 hours.

**24.7** Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly, shall be replaced by the Contractor. Landing valves shall also be checked by opening and closing under pressure.

## 25.0 HANDING OVER

**25.1** All commissioning and testing shall be done by the Contractor to the complete satisfaction of the Engineer-in-Charge / Consultants, and the job handed over to the Client.

**25.2** Contractor shall also hand over to the Client all maintenance and operation manuals and all items as per the terms of the contract.



**ItemNo.:269**

Supplying & erecting carbon dioxide (CO<sub>2</sub>) fire extinguisher user of following capacity with necessary clamps made from 50 x 6 mm M.S. Flat with nut & bolts grouted in wall complete. [A] For 4.5 Kg Capacity

Mode of Measurement:-On Each Basis.

**ItemNo.:270**

Supplying & erecting ABC powder type 'Ceasefire' type Fire extinguisher as per IS 13849 or 1 Kg capacity with necessary clamp for erection on wall

Mode of Measurement:-On Each Basis.

**Item No.:271**

SITC of Analogue Addressable Multi- Sensor which is fully compatible with Analogue Addressable Protocol, having removable high performance chamber with Twin fire LED's allow 360 degree viewing, User selectable sensitivity modes 1% to 4.5% obs/m, Incorporate Optical and dual Heat elements, lock mechanism (sensor to base), Electronically addressed, Pulsing/non-pulsing controlled from panel. Approved by LPCB & VdS. (Including Five year free maintenance with guarantee).

Mode of Measurement:-On Each Basis.

**Item No.:272**

SITC of sensor isolator mounting base, includes stainless steel contacts, slim profile - only 8mm, quick connection via square cable clamps, facility for remote indicator, Approved by LPCB (Including Five year free maintenance with guarantee).

Mode of Measurement:-On Each basis.

**Item No.:273**

SITC of Analogue Addressable Manual Call Point with Integral Short Circuit Isolator, Analogue Addressable Protocol having, Bi-coloured status LED (red for alarm, amber for (short-circuit), Non-frangible element fitted as standard (conforms to EN54), pulsing/non-pulsing can selectable via panel, Electronically addressed, Approved by LPCB. (Including Five year free maintenance with guarantee)

Mode of Measurement:- On Each basis

**Item No.:274**

SITC of addressable loop powered Base sounder with integral Beacon, includes 51 user- selectable tones (all tones EN54-3 compatible), variable sound output 50 ~ 98 dB(A) ( $\pm 2$  dB(A)) output at 1 metre, Auto shut down feature prevents noise pollution, 'O' rated beacon to EN-23, IP21 rated for internal use, sounder and beacon can operate independently, Approved by LPCB (Including Five year free maintenance with guarantee).

Mode of Measurement: On Each basis

**Item No.:275**

Supplying & laying of 2x1.5 sqmm fire alarm armoured cable, 600/1000V rated with annealed copper conductor having XLPE insulation, steel wire armouring & FRLS outer sheath

complete as required.

Mode of Measurement:-On Mtr basis.

**Item No.:276**

SITC of Microprocessor based Net-workable Analogue Addressable Fire Alarm Control Panel. The Panel shall be compliant with EN54-2, EN54-4 and approved by LPCB. The Fire Alarm Control Panel shall have inbuilt 3 loops and expandable upto 4 Loops. The Panel must have large graphic display. The Panel must also have the capability to take Addressable Intelligent Wired and Wireless Devices on same loop. Each loop shall have a capacity of 127 analogue Addressable devices and 127 Base sounders/Base Sounder Beacons. The Panel shall have 240 V AC power supply along with automatic Battery Charger. Approved by LPCB (Including Five year free maintenance with guarantee).

Mode of Measurement: On Each basis

**Item No.:277**

**Supply, Installation, Testing and Comissioning of Fire Supression System.**

Contains FK-5-1-12 Fire Suppression Fluid (2.5lbs/1.14kgs), ECS Cylinder bracket (1), EOL Adapter W/Pressure Gauge (1), Rubber Grommets (4), Plastic Loop Clamps (25)

Mode of Measurement: On Each basis

**Item No.:278**

Pressure Switch point 5 bar / Signal Generator UL Listed

Mode of Measurement: On Each basis

**Item No.:279**

UL Listed Head Detection Tube (Red Colour)

Mode of Measurement: On Each basis

**Item No.:280**

Master Control Unit with Audio Visual Alarm

Mode of Measurement: On Each basis

**Item No.:281**

End of Line Plug UL Listed

Mode of Measurement: On Each basis

**Item No.:282**

AUTOMATIC PUMPING SYSTEM: (PUMP ROOM)

Main Fire Hydrant/Sprinkler Pump- Electric Motor Driven:

SITC of: Back pull out type -Single Stage, Self Mriming, Centrifugal Pump for Main Fire Pump with Electric Motor, Base frame and Couplings.

MOC:-Casing-CI, Impeller- Bronze, Shaft- SS 410, Sleeve-SS410.

Flow Capacity: 1680 LPM

Head: 60 mtr

Speed: 2900 Approx

Pump shall be capable of furnishing not less than 150% of rated capacity at a head not less than 65% of rated head The shut off head shall not exceed 120% of rated head.

UOM:-Price Per Complete set of Pump + Motor + Accessories.

Note:-01. Minor civil work like tank hole/ Core Cutting etc. are in bidders scope.

Location: In Pump Room

Make: Kirloskar / Lubi.

Mode of Measurement: On Set Basis

#### **Item No.:283**

Jockey Fire Pump- Electric Motor Driven:

SITC of: Back Pull-out End Suction Type -Single Stage, Self Priming, Centrifugal Pump for Jockey Fire Pump with Electric Motor, Mechanical Seal, Base-frame and Couplings.

MOC:-Casing-CI, Impeller- Bronze, Shaft- SS 410, Sleeve-SS410.

Flow Capacity: 180 LPM

Head: 60 mtr

Speed: 2900 Approx

Pump shall be capable of furnishing not less than 150% of rated capacity at a head not less than 65% of rated head The shut off head shall not exceed 120% of rated head.

UOM:-Price Per Complete set of Pump + Motor + Accessories.

Note:-01. Minor civil work like tank hole/ Core Cutting etc. are in bidders scope.

Location: In Pump Room

Make: Kirloskar / Lubi.

Mode of Measurement: On Set Basis.

#### **Item No.:284**

Standby Fire Pump- Diesel Engine Driven

SITC of: Diesel Engine driven Standby Pumping System complete with,diesel engine, Back Pull-out Type Single Stage, Self Priming, Centrifugal Pump, Couplings & Base-frame:

MOC:- Pump Casing-CI, Impeller- Bronze, Shaft-SS410, Sleeve- SS410.

Flow Capacity: 1680 LPM

Head: 60 mtr

Speed: 2900 LPM

Diesel Engine includes 100 ltr diesel tank, battery, battery charger, engine oil and coolant.

UOM:-Price Per Each Set.

Note:-01. Minor civil work like tank hole/ Core Cutting etc. are in bidders scope.

Location: In Pump Room

Make: Kirloskar / Lubi.

Mode of Measurement: On Set basis

#### **Item No.:285**

Fire Pump Control Panel- Auto and Manual Type.

Supply, Installation and Testing of: Electric Control Panel for Electric Motor Driven Main Fire Pump and Jockey Fire Pump. all pumps can be Start Automatically (by Pressure Switch) & Manually.

Design As per the Detail Specifications given.

UOM:-Price Per Set.

Location: In Pump Room

Make: Kirloskar / Lubi

Mode of Measurement: On No basis

**Item No.:286**

Air Vessel:

SITC of Pressurized Air Vessel f Size 450 mm Dia x 2000 mm long fabricated from 10 mm thick MS Plate with 25 mm drain valve, air release valve with ball valve on top and isolation valve.

Mode of Measurement: On No basis.

**Item No.:287**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall FRLS type with necessary clamps or in existing trench / pipe of following size of cables

- 3.5 core 35 Sq. mm

Mode of Measurement: On Rmt Basis.

**Item No.:288**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. - 3.5 core 35 Sq. mm

Mode of Measurement: On No basis.

**Item No.:289**

Solderless crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. - 35 Sq.mm.

Mode of Measurement: On No basis

**Item No.:290**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall FRLS type with necessary clamps or in existing trench / pipe of following size of cables - 4 core 16 Sq. mm

Mode of Measurement:-On R.Mtr Basis.

**Item No.:291**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables.- 4 core 16 Sq. mm

Mode of Measurement:-On No basis

**Item No.:292**

Solderless crimping type Aluminium lugs conforming to IS suitable for cable of following size

evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. - 16 Sq.mm

Mode of Measurement:- On No Basis

**Item No.:293**

Pressure Gauge with Siphon Tube and Cock.

Supply, Installation and Testing of: Pressure Gauge with Siphon Tube and Cock.

MOC:-4" Dial- Glycerin filled- Stainless Steel Body Pressure Gauge with GI Siphon Tube and Brass Cock.

Size:-Dial: 4" (100 mm)

Range: 0 – 16 Bar (kg/cm<sup>2</sup>)

UOM:-Price Per Unit

Mode of Measurement:- On No Basis

**Item No.:294**

Pressure Switch with Siphon Tube and Cock.

Supply, Installation and Testing of: Pressure Switch with Siphon Tube and Cock.

Size:- Range suitable for System Design Pressure.

UOM:-Price Per Unit

Mode of Measurement:- On No Basis

**Item No.:295a**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Under Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint, Wrapping-Coating etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 150 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:295b.**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Under Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint, Wrapping-Coating etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 80 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296b**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

b Size: 150 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296c**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 100 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296d**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 80 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296e**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 65 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296f**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 50 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296g**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 40 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:296h**

Pipe Laying.

Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe.

With necessary Pipe Fitments (Flanges, Bands, Socket etc.),

MS Support/Clamps/Hangers etc.

Hardware (Gaskets, Nut-Bolts, Paint etc.),

Consumables (Welding Rod, etc.) and Labour Charge.

Quality: GI, C-Class (Heavy).

Paint:

UOM:-Price Per Running Meter

Size: 25 mm

Mode of Measurement:-On R.Mtr Basis

**Item No.:297a**

Gate /SluiceValve

Supply, Installation and Testing of: Gate/ Sluice (Rising Spindle -Screw & Yoke Type) Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: Cast Iron, Seat: Nitrile, Stem: SS. (With Flange Ends).

Standard: ISI Marked.

UOM:-Price Per Each No.

Size: 100 mm

Mode of Measurement:-On No Basis

**Item No.:297b**

Gate /SluiceValve

Supply, Installation and Testing of: Gate/ Sluice (Rising Spindle -Screw & Yoke Type) Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: Cast Iron, Seat: Nitrile, Stem: SS. (With Flange Ends).

Standard: ISI Marked.

UOM:-Price Per Each No.

Size: 80 mm

Mode of Measurement:-On No Basis

**Item No.:298a**

Check Valve

Supply, Installation and Testing of:

Check Valve (Ball type or Swing type) with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron (With Flange Ends).

Standard: ISI Marked.

UOM:-Price Per Each No.

Size: 150 mm

Mode of Measurement:-On No Basis

**Item No.:298b**

Check Valve

Supply, Installation and Testing of:

Check Valve (Ball type or Swing type) with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron (With Flange Ends).

Standard: ISI Marked.

UOM:-Price Per Each No.

Size: 80 mm

Mode of Measurement:-On No Basis

**Item No.:298c**

Check Valve

Supply, Installation and Testing of:

Check Valve (Ball type or Swing type) with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron (With Flange Ends).

Standard: ISI Marked.

UOM:-Price Per Each No.

Size: 50 mm

Mode of Measurement:-On No Basis

**Item No.:299a**

Butterfly Valve

Supply, Installation and Testing of: Butterfly Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: SS, Seat: Nitrile.



UOM:-Price Per Each No.

Size: 150 mm

Mode of Measurement:-On No Basis

**Item No.:299b**

Butterfly Valve

Supply, Installation and Testing of: Butterfly Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: SS, Seat: Nitrile.

UOM:-Price Per Each No.

Size: 100 mm

Mode of Measurement:-On No Basis

**Item No.:299c**

Butterfly Valve

Supply, Installation and Testing of: Butterfly Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: SS, Seat: Nitrile.

UOM:-Price Per Each No.

Size: 80 mm

Mode of Measurement:-On No Basis

**Item No.:299d**

Butterfly Valve

Supply, Installation and Testing of: Butterfly Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Disk: SS, Seat: Nitrile.

UOM:-Price Per Each No.

Size: 50 mm

Mode of Measurement:-On No Basis

**Item No.:300a**

Strainer.

Supply, Installation and Testing of: Y Type Strainer with necessary pipe fitments, hardware and consumables.

MOC:-Body: Cast Iron, Mesh: SS-304.

Working Pressure: 10 Bar

UOM:-Price Per Each No

Size: 150 mm.

Mode of Measurement:- On No Basis

**Item No.:301**

Air Release Valve- 25 mm

Supply, Installation and Testing of: Air Release Valve Check Valve with necessary pipe fitments, hardware and consumables.

MOC:-Body: Gunmetal / SS.

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:302**

FIRE HYDRANT, SPRINKLER & ACCESSORIES

Fire Hydrant Landing Valve (Stainless Steel (SS-304), ISI Marked):

Supply, Installation and Testing of: Fire Hydrant Landing Valve with necessary pipe fittings, hardware and consumables.

MOC:-Body: Stainless Steel (SS-304), Working Parts: Stainless Steel (SS-304), Coupling: Stainless Steel (SS-304),

Standard: -ISI Marked.

Size:-63 mm (Flange End: NB 75 mm, PCD 160 mm)

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:303**

Fire Hose Pipe (Delivery Hose)- 63 mm x 15 m

Supply, Installation and Testing of: Fire Hose with Hose Couplings.

RRL (ISI Mark- Type A) Fire Hose.

Hose Couplings: ISI Marked Stainless Steel.

With SS Wire Binding.

Standard: - ISI Marked & TAC Approved Hose.

Size:-63 mm dia x 15m long Hose.

UOM:-Price Per Each Set.

Mode of Measurement:-On No Basis

**Item No.:304**

Cabinet For Fire Hose (Hose Box)- Double Type

Supply, Installation and Testing of: Fire Hose Cabinet (Hose Box) suitable to accommodate 02 no. of 15 m long fire hoses and 01 no. of nozzle. With Lock-n-key facility. Wall Mounting Design.

MOC: 16 Gauge MS Box with Powder Coating

Standard: - As per Guidelines.

Size:- Suitable for 02 nos. of 15 m long hoses.

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:305**

Fire Hose Nozzle- Short Branch Pipe Nozzle.

Supply, Installation and Testing of: Short Branch-pipe Nozzle.

MOC: Stainless Steel (SS-304).

Standard: ISI Marked, Heavy Quality.

Size:- 63 mm X 20 mm

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:306**

Fire Hose Reel Set (ISI)-19 mm x 30 m -Rubber Hose.

Supply, Installation and Testing of: Fire Hose Reel Set with necessary pipe fitments, hardware and consumables.

MOC:-Drum: 16 G Powder Coated MS,

Hose: 19 mm X 30 m heavy-duty RUBER hose.

Shut-off Nozzle: SS-304.

With Control Valve: SS- 25mm Ball Valve.

Standard: ISI Marked. Heavy Quality.

Size:-19 mm dia x 30m long Hose.

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

#### **Item No.:307**

Fire Service In-let (In-let Connection for Fire Brigade)-4 Way Type.

Supply, Installation and Testing of: Fire Service Inlet with necessary hardware and consumables.

MOC:-Body: Heavy-duty CI.

Couplings/NRV: Gunmetal.

Standard: -Made As per IS Standard- Heavy duty quality.

Size:-Couplings: 63 mm, 150 mm E-table Flange End.

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

#### **Item No.:308**

Sprinkler Head/ Nozzle.

Supply, Installation and Testing of: K 5.6 Pendent type Standard Response Sprinkler rating of 57 deg.C. with required accessories.

MOC:-Brass

Standard: UL Listed

Size:-15 mm (1/2")

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

#### **Item No.:309**

Flow Switch

Supply, Installation and Testing of: Flow Switch with necessary pipe fitments, hardware and consumables.

UOM:-Price Per Each No.

With all wiring/ cabling up to control panel and all electrification.

Mode of Measurement:-On No Basis

#### **Item No.:310**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Copper conductor for 1.1 KV. to be laid on wall FRLS type with necessary clamps or in existing trench / pipe at road crossing or floor of following size of cable.

(a) 3 core 2.5Sq. mm.

Mode of Measurement:-On Rmt Basis

**Item No.:311**

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables.

(a) 2 to 4 core 2.5 Sq. mm.

Mode of Measurement:-On No Basis

**Item No.:312**

Solderless crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (A) 1.5/ 2.5/4/6 Sq.mm.

Mode of Measurement:-On No Basis

**Item No.:313**

Providing and fixing, testing and commissioning of Draining Valve 50mm dia with by pass drain connection as required.

Mode of Measurement:-On No Basis

**Item No.:314**

Fire Extinguisher Providing and fixing, testing and commissioning of CO2 type Fire Extinguisher of capacity 22.5 kg filled with Co2 Gas as per IS 15222 with controll discharge mechanism fitted with Hose, Horn & TROLLEY confirms to IS 2878 bearing ISI mark. Co2 Cylinder as per IS 7285.

Mode of Measurement:-On No Basis

**Item No.:315**

Fire Extinguisher- ABC Powder type, 6 kg.

Supply, Installation and Testing of: ABC Powder Fire Extinguisher necessary hardware and consumables.

Stored Pressure Mechanism.

Charged with MAP-50 % (ABC) Dry Powder.

With wall mounting clamp.

Size:-6 kg Powder.

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:316**

Fire Extinguisher- CO2 Gas type, 4.5 kg.

Supply, Installation and Testing of: CO2 Gas Fire Extinguisher with necessary hardware and consumables.

Standard: - Confirming to IS: 15683-2006 with ISI Mark.

Size:-4.5 kg

UOM:-Price Per Each No.

Mode of Measurement:-On No Basis

**Item No.:317**

Supplying FIRE bucket round bottom of 9 litres capacity made out of 24 gauge G.I. sheet with extra handle at bottom duly painted white inside and Red out side with FIRE mark, filled with dry-sand

and kept on existing stand provided or hung on wall hook.

Mode of Measurement:-On No Basis

**Item No.:318**

Supplying and erecting floor mounting stand for keeping four nos. of FIRE buckets comprising 1500 mm in length, 900 mm height frame made out of 30mm X30 mm X 4 mm angle iron with cross supports for legs, welded with 4 hooks and duly painted with one coat of red lead and two coats of approved enamelled silver paint..

Mode of Measurement:-On No Basis

**Item No.:319**

Safety Signage- Night Glow Type:

SIRC of: Single Side Printed Night Glow (Glow in Dark ) Safety Signage. Printed on PVC sticker sheet and pasted on 3-5 mm thick PVC foam sheet.

Size: 10" X 10".

Mode of Measurement:-On No Basis

**Item No.:320**

CIVIL MISCELLANEOUS ITEM RCC Hume Pipe: Providing and Laying NP3 RCC Hume Pipe of 300 mm at road crossing.

Mode of Measurement:-On Rmt Basis

**Item No.:321**

CERTIFICATION & FIRE N.O.C. CHARGES

Approval of Fire Hydrant & Entire Fire Protection System from Local Fire Authority and any other relevant statutory authority at initial and various other stages of work, including preparation of report/drawings as per fire authority requirement. Contractor shall include cost of all liason work which are not explicitly mentioned above but are mandatory to have fire authority approval (any statutory charges will be paid extra)..

Mode of Measurement:-On Nos Basis

**Item No.:322**

Note:-

(a) General Features & Special Features of the all lift items shall be taken as below.

(A) GENERAL DESCRIPTION OF LIFTS.

[1] GEAR LESS LIFT DRIVE (MRL) comprising of High Starting torque Lift 3 phase 440 V A. C. Permanent Magnet Synchronous motor of proper rating with high efficiency shall be used.[2] Micro processor based / PLC, ACVVVF, vector control drive with encoder feedback closed loop system shall be used for lift car and door operation which shall be full collective selective operation hall call demand response, UP/DOWN hall stops, Main, Up/ Down Contactor with overload and phase reversal relay and safety controls.

[3] Car with M S platform with bracings of adequate size and to sustain the impact load cabin + passenger with safety factor of fire for steel and side panels of Stainless steel of sheet of grade 304 duty. Car ceiling will be S.S. finishes with aesthetic appearance with LED ceiling lights. Car flooring shall be of s/s 304 chaker plate design sugeested of engineer in charge. of engineer in charge. Car doors shall be of stainless steel grade 304, hairline finish with centre opening / telescopic automatic doors. Car panel will also be S.S. 304 finished with emergency stop device, mechanical door safety device, facility of auto/ attended mode. All car panel buttons and all floor switches must be with brail

language as per lift act.

"[4] All landing doors must be fire rated for 2 hour shall be fully automatic centre opening/ telescopic opening made of hairline finish steel grade of 304 with key holes and infrared curtains with Unlocking facility from outside

[5] Appropriate battery operated emergency light in the car along with alarm switch shall be provided. Also, Emergency Light & Fan should start immediately without any Time Delay as soon as power fails.

[6] Digital scrolling indicator system for up-down arrow along with floor position indicator shall be provided inside the car and at all floors.

[7] Full height infra red curtain with multiple cross / crossing light beams shall be provided.

[8] Automatic Rescue Device (ARD) shall be provided accordingly of passenger capacity with Manual Rescue Operation ( Manual Cranking Facility).

[9] Audio visual indication in the lift car showing over loading shall be provided such that doors kept open till excess load is removed."

"[10] Spring buffers/PU Buffers shall be provided.

[11] Car fan as per passenger capacity with automatic sleep timer shall be provided.

[12] Voice annunciator with suitable music shall be provided in lift car.

[13] Self diagnostics system for operational and safety parameters shall be provided in control panel.

[14] Mechanical over speed governor with governor calibration as per actual site parameters and submission of calibration certificate submission, door key holes in the floor doors, fireman switch shall be provided.

[15] Lift machine hoisting arrangement in the lift machine room and monkey ladder for lift pit should be provided by the lift agency, along with the other steel structure works, foundations for the machine etc...

[16] In the hoist way fascia plate shall be provided without any extra cost, where ever required as / if directed by engineer in charge."

"[17] Permanent wiring with necessary safety devices like RCCB in all circuit, Over Voltage Under Voltage protection and THD eliminator in circuit for lift machine room and lift well with proper numbers of light points, with fixtures, exhaust fan and plug points shall be provided by the agency. Only 3 phase Power Supply shall be made available by department in lift machine room. Necessary Earthing as per Lift Act/Rules shall be arranged by Lift Agency.

[18] Any civil/ electrical works for additional and alteration in lift shaft and machine room related to erection of lift shall be made by lift agency without any extra cost. (granite/marble fixing around all landing door openings are not in lift agency's scope.)

[19] Agency has to provide all working drawings and documents and liaison services for obtaining all necessary permission from lift inspector and other authorities.

[20] acrylic transparent licence/display A4 size holder in lift car"

"[20A] As per statutory requirement of Govt. Of Gujarat lift & escalator act 2000, lift agency has to provide

1. Car top safety barricade

2. Push & talk communication system.

3. Fireman's switch operation at Ground Floor.

4. carrying out third party lift inspection during/after lift erection and provide report by third party authorized by concern licensing authority 5. agency has to provide third party insurance upto completion of free maintenance period and submit the document for the same."

"[21] Car Panel Operating Buttons with floor position indicator/buttons must be of Auto Glow type clearly visible when view from inside cabin.

[22] For Physically Handicapped person Full Length Handrails of hairline finish steel grade of 304 should be provided at appropriate height on the Rear & Side Wall Panels in Lift Car. [23] With Necessary KVA rating voltage controlled Stabilizer suitable for your controller, drive and all

equipments of lift.

[24] Necessary rating of DP Elcb and FP Elcb required for lift is in scope of work which rating is suggested by CEICED Department (electrical Inspector)"

**DESCRIPTION OF LIFT :**

Supplying, Erecting, Testing & Commissioning the passenger lift having following main features:

"15/16 Passengers, Ground plus 2 upper floor with Rated Speed of 1.0 m/sec.,

(C) With General PLUS ADDITIONAL SPECIAL FEATURES attached herewith. Prem. Cat."

Mode of Measurement:-On Each Basis

**Item No.:323**

Providing and erecting Inverter based approved make split air-conditioning unit consisting of condensing unit with variable speed fan motor, inverter type hermetically sealed rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by means of extra supplied proper insulated copper tubing, drain PVC pipes suitable for (cost includes Eco Friendly green gas charging and 15A plug top & Remote Control & MS Stand) with necessary core cutting.

(2)For ISEER Range (KWH/KWH)(4.0 to 4.49)

(A) for 1.0 ton capacity- Premium Cat.

Mode of Measurement:-On Each Basis

**Item No.:324**

Providing and erecting Inverter based approved make Cassette type split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed scroll/rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by Eco friendly Green gas charging & Internal copper wiring & Remote control ( 3 star and above of current year) with necessary core cutting. (A) for 1.5 ton capacity (1 Way)

Mode of Measurement:-On Each Basis

**Item No.:325**

Providing and erecting Inverter based approved make Cassette type split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed scroll/rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by Eco friendly Green gas charging & Internal copper wiring & Remote control ( 3 star and above of current year) with necessary core cutting. (B) for 2 ton capacity (1 Way)

Mode of Measurement:-On Each Basis

**Item No.:326**

Providing and erecting Inverter based approved make Cassette type split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed scroll/rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by Eco friendly Green gas charging & Internal copper wiring & Remote control ( 3 star and above of current year) with necessary core cutting.(A) for 1.5 ton capacity (4 Way)

Mode of Measurement:-On Each Basis

**Item No.:327**

Providing and erecting Inverter based approved make Cassette type split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed scroll/rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by Eco friendly Green gas charging & Internal copper wiring & Remote control ( 3 star and above of current year) with necessary core cutting.(B) for 2 ton capacity (4 Way)

Mode of Measurement:-On Each Basis

**Item No.:328**

Providing and erecting Inverter based approved make Cassette type split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed scroll/rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by Eco friendly Green gas charging & Internal copper wiring & Remote control ( 3 star and above of current year) with necessary core cutting. (C) for 3 ton capacity- 1/3Phase (4 Way)

Mode of Measurement:-On Each Basis

**Item No.:329**

Supplying and erecting insulated pair of soft copper tubing open or concealed including power and control cable,necessary PVC drain pipes for Split AC machine up to 4 TR capacity

Mode of Measurement:-On Mtr Basis

**Item No.:330**

Supply, Installation, Testing and Comissioning of 4MP Varifocal Lens Dome Type Camera, H.265 4MP IR Turret Dome N/W Camera, Manual Varifocal 2.8-12mm, 50M, Micro SD, DC12V/PoE, IP67/IK10, Basic IVA, 4MP resolution (2560 × 1440), True day/night, Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Built in MIC, Cyber Security, Basic intelligent video analytics, Audio In, NDAA Compliance, UL, CE, FCC Certified (Including Five year free maintenance with guarantee).

Mode of Measurement:-On Each Basis

**Item No.:331**

Supply, Installation, Testing and Comissioning of 4MP Varifocal Lens Bullet Camera, H.265 4MP IR Bullet N/W Camera, Manual Varifocal 2.8-12mm, 50M, Micro SD, DC12V/PoE, IP67/IK10, Basic IVA, 4MP resolution (2560 × 1440), True day/night, Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Cyber Security, Basic intelligent video analytics, NDAA Compliance, UL, CE, FCC Certified (Including Five year free maintenance with guarantee).

Mode of Measurement:-On Each Basis

**Item No.:332**

Supply, Installation, Testing and Comissioning of 64 Channel Network Video Recorder (NVR), Dual OS design, HDD Hot Swap with RAID support, N+1 hot spare configuration, Support 16CH@2MP, H.265/H.264 Video Compression, HDMI, VGA output, up to 8 SATA interface each with max 10 TB support and 1 eSATA, 16-ch synchronous playback at up to 1080p resolution, Gigabit Ethernet network interfaces, bandwidth 320 mbps, CE FCC, BIS, Operating Temp -10 deg to 50 deg C, USB and serial Interface, RAID supported (Including Five year free maintenance with guarantee)

Mode of Measurement:-On Each Basis



**Item No.:333**

SITC of SCREEN SIZE 80 cm diagonal (32" INCH), RESOLUTION HD (1366\*768), USB INPUT (2.0 SUPPORT) 2\*Side(USB2.0), HDMI INPUT 3\*Side(HDMI 1.4), USB DEVICE SUPPORT USB Supported HDD, HOTEL MODE Yes, Basic, BLUETOOTH Yes (Ver. 4), WIFI TYPE(STANDARD) 802.11a/b/g/n 2.4G 2T2R, Built-in, WIFI BAND TYPE 2.4GHz, OS & VERSION INFO Android 'P' - 9.0, MEMORY FLASH 8GB EMMC, RAM 1.5GB , DDR3 2133 Mhz. (Including Five year free maintenance with guarantee)

Mode of Measurement:-On Each Basis

**Item No.:334**

SITC of 48 x 10/100/1000BASE-T ports 4 x Gigabit GbE/SFP combo ports Advanced L2 switching and security features L2+ Static Routing Optional "standard mode" or "surveillance mode" management user interface [Approved by Competent Authority i.e. not Below the rank of Executive Engineer ]

Mode of Measurement:-On Each Basis

**Item No.:335**

Supply, Installation, Testing and commissioning of 4 TB Surveillance Series Hard disk supporting 24X7 operational efficiency.

Mode of Measurement:-On Each Basis

**Item No.:336**

Providing & Erecting Network rack with following capacity with Necessary cooling fan,Cable manager,6A PDU,equipment rack with necessary mounting accessories.  
(A) 9 U

Mode of Measurement:-On Each Basis

**Item No.:337**

Providing & Erecting Network rack with following capacity with Necessary cooling fan,Cable manager,6A PDU,equipment rack with necessary mounting accessories.  
(H) 24 U

Mode of Measurement:-On Each Basis

**Item No.:338**

"Supply, Installation, Testing & Commissioning of following size of Grid Tied Solar Power Plant with

Solar Panels (ALMM approved): Frame Material : Anodized Aluminum alloy Frame With Twin Wall Profile, Front Cover : High Transmission Low-Iron Tempered Glass (AR Coated), High efficiency and positive power tolerance Pmax: 0/+5, Module Efficiency should be approx. 18%-21%, Normal operating temperature 45°C, Junction Box with Waterproof IP67 & MC4 Compatible and Enclosed with Bypass diodes, 100% Electroluminescence test to ensure error free Modules, Thep. temp. co-efficient of the PV module shall equal or better than -0.45%/degree C. Solar PV modules of minimum fill factor 75% to be used. Unit Production:- 4 to 5 Unit /kw /day (Actual)(1Year Avg) With 10 year Product warranty and 25 year Linear Power Warranty.,

Solar Inverter: MPPT Range: 80-1000 V, Max efficiency: 97.5% - 98.9%, O/p Frequency: 50/60Hz, Operating Altitude (m) ≤4000, O/p Power Factor: ~1, O/P THDi: <3%, Operating Temperature Range: -25~60°C, Anti-islanding Protection: "Integrated, Input Reverse Polarity Protection Integrated, Insulation Resistor Detection Integrated, Residual Current Monitoring Unit Integrated,

Output Over Current Protection Integrated, Output Short Circuit Protection Integrated, Output Over Voltage Protection Integrated, Protection Degree: IP65, User Interface LCD & APP, Datalogger & Communication: GPRS / Wi-Fi, Module Mounting Structure: Seamless Box Pipe / 'C' Channel of suitable size for rooftop solar installations with good stability against wind & weight load., Hot Dipped Galvanized steel coils. suitable arrangement for base plate for foundation, solar panel mounting, the structure should be suitable for carry the load of solar panel, wiring, sprinkler system etc. with necessary foundation work/wall mount, j bolt, anchor fastener etc. the nut bolt used for installation of structure should be (SS 304) quality. and Balance of System with necessary Switchgears (Suitable size and protection of ACDB & DCDB), inter connecting wiring, earthing system, lightning arrester system, all liaisoning work with various gov. department like state nodal agency, DISCOM & CEIG is included in agency scope  
(Excluding GEDA Application fees, Solar connectivity Charges, Meter connectivity Charges, Meter testing Charges.) (D) Grid Tied Solar Power System: 26 - 50 kW (3 - phase)

Mode of Measurement:-On Per kW Basis

#### **Item No.:339**

Providing & erecting Automatic solar panel cleaning system for solar power projects which includes necessary plumbing work (UPVC pipes and accessories) from source of water to project site (upto 30 meters), Suitable size of submersible/ open well motor, necessary wiring for motor and sprinkler system with safety, timer circuit for automatically on/off the sprinkler system, necessary size and number of nozzles/JET (minimum 1 Nozzle/Jet per module). (D) 21KW-50KW Cleaning System

Mode of Measurement:-On Per kW Basis

#### **Item No.:340**

Providing, erecting, testing & commissioning approved make oil immersed ONAN cooled, double wound, core type indoor / outdoor copper wound 11KV/ 433V step down transformer of following capacities operating on 3 phase, 50 Hz 4 wire & neutral earthed system continuously rated for a full temperature rise in oil not exceeding 45 Deg.C. at maximum ambient temp. of 50 Deg. C. complete with necessary radiator first filling of new transformer oil & standard fitting as below complying with IS 1180( Part 1 ):2014 standards with energy efficiency level 2 off load tap changing range steps +2.5% to -5% on H.V for variation should be provided. The H.V. shall be connected Delta & Secondary with star connection. The transformer should have cable-end boxes on H.T. side suitable for up to 3 core 150 sq.mm. XLPE cable & on L.T. side suitable for bus duct or cables as per requirement complete with test certificates from manufacturers

1. Oil conservator with filling Hole & Cap - One No.
2. Thermometer pocket with 6" dial type thermometer switch alarm & trip contacts- Two nos.
3. Silica-gel breather with charge- One No.
4. Plain oil level gauge - One No.
5. Drain / Sampling / Filter valve- One No.
6. Top Filter Valve - One No.
7. Explosion vent with Diaphragm - One No.
8. Rating & Diagram plate - One No.
9. Additional neutral bushing for earthing - One No.
10. Bi directional Roller - Four Nos.
11. Earthing terminals - Two Nos.
12. Lifting lugs - Two Nos.
13. Air release plug. - One No.
14. Double float buchholz relay with Alarm and trip contacts.
15. Control cable as required from Transformer to VCB Panel is to be provided with necessary

connection to VCB relays for protection. as per IS 1180 level-2

"(a)250 KVA Max. allowable losses at 50 % of rated load is 0.98 KW and at full load is 2.93 KW"

Mode of Measurement:-On Each Basis

**Item No.:341**

Providing, and erecting 11 KV D.P. 9 mtr. high Structure made of 6" x 3" 'I'-Section Girder, 4" x 2" channels, clamps, nuts, bolts etc. Suitable for erection of the followings duly connected with necessary ACSR conductors. as per drawing approved by the Engineer- in charge complete with following. Height as per IS 7 Mtr above ground )

(A) 11 KV 200 Amps Drop out fuses with S.R.B.P. tubes carries.-Three nos

(B) 11 KV G.O.D. switch complete with insulators, operating handle with galvanised pipe, Sq.bar etc. 400 Amp.- One Set

(C) 11 KV lightening arrestor with clamp- Three Nos.

(D) 11 KV shackle insulators- Six Nos.

(E) The above D.P. structure should be earthed with 25 mm.X 3 mm thick double copper earth strips run separately and connected with separate copper plate earth electrode.

Mode of Measurement:-On Each Basis

**Item No.:342**

Providing and erecting ISI Marked 3 core 95 Sq.mm XLPE insulated 11 KV armoured cable Aluminium conductor IS-7098 to be laid on wall with clamps or in provided cable trench / pipe approved manner as directed..

Mode of Measurement:-On Mtr Basis

**Item No.:343**

Providing, and erecting 11 KV Ring Main Unit (RMU) 1 incoming & 2 outgoing with RMU kit.

Mode of Measurement:-On Each Basis

**Item No.:344**

Providing and erecting cable end termination kit, heat shrinkable Push on type Densons/ Raychem/ Elastimold make suitable for 11 KV XLPE cable 3core 95 & 120 Sq.mm(A) Outdoor type

Mode of Measurement:-On Each Basis

**Item No.:345**

Providing and erecting cable end termination kit, heat shrinkable Push on type Densons/ Raychem/ Elastimold make suitable for 11 KV XLPE cable 3core 95 & 120 Sq.mm(A) indoor type

Mode of Measurement:-On Each Basis

**Item No.:346**

Providing, erecting, testing commissioning & getting Plan Approval as well as NOC from Electrical Inspector for extensible H.T panel comprising of one 400A. H.T. VCB incoming & Two outgoing 400 A Drawout type VCB confirming as per I.S. for use on 11 KV, 3 phase, 50 c/s. unearthed A.C. supply system having breaking rupturing capacity of 350 MVA complete with spring operated mechanism, mechanically & automatic ON-OFF and spring mechanism charged, discharged indicators, ON-OFF mechanical push button, operation counter necessary auxiliary switches, closing shunt trip, air insulated busbar chamber having heat shrinkable PVC sleeves, mechanical interlocks

safety shutters, isolating plugs and a VCB trolley with three vacuum interrupters with epoxy support insulators and self aligning finger type isolating contacts. The breaker shall be Manual cum motorised mechanism & auto spring charge with TNC switch closing with following accessories.

"1. 144 mm. square flush mounting type digital multifunctional meter with communication facility - Three sets.

2. Power Factor Meter One No

3. Double core current transformer cast resin type having ratio 200 to 50/1 core for metering & second core for protection having required class of accuracy. - Three Sets

4. Instantaneous under voltage relay& Temperature rise Tripping Relay

5. Electrical closing coil & short trip coil operating on 110V. D.C.- Three Sets

6. Auxiliary relay for anti pumping device

7. Three phase Three limb Drawout type feeder connected & output of 200 VA cast resin insulated potential transformer having ratio 12000V./110V. and 200 VA Burdon with 0.5 accuracy. - One No.

8. Common Alarm bell operating on 110V A.C.- One No.

9. Digital KWH Meter - One No.

10. Cable boxes suitable up to 11 KV 3core 150 sq.mm XLPE cable. - Three Nos"

"11. 230V. A.C. to 110V. D.C. power pack for closing & tripping circuit common.

12.Breaker ON-OFF, Auto trip and spring charged indicators. - Three Sets.

13.Phase indicating & panel illumination lamps with plug socket - Three Sets.

14.Numerical Communicable type non directional O/C & E/F Relay with a setting of 5-250% both in O/C & E/F. -Three Set complete with necessary interconnection with air insulated high grade copper busbar {Breaker Testing scope include Closing Time, Opening Time, VCB Hi-Pot test at Site}{ Relay Testing Scope Include testing of all protection by three phase testing kit at site }(VCB Trolley is to be provided)"

Mode of Measurement:- On Each Basis

#### **Item No.:347**

Providing and fixing printed instruction chart both in English and Gujarati and duly framed with front glasses, for treatment of person suffering from Electric shock with minimum 50" diagonally size.

Mode of Measurement:- On Each Basis

#### **Item No.:348**

Providing pair of rubber hand gloves suitable for working on 11 KV/22 KV supply

Mode of Measurement:- On Each Basis

#### **Item No.:349**

Supplying rubber matting of following thickness as per IS:15652/IEC 61111 (b)4mm

Mode of Measurement:- On Sqmtr Basis

#### **Item No.:350**

Supplying FIRE bucket round bottom of 9 litres capacity made out of 24 gauge G.I. sheet with extra handle at bottom duly painted white inside and Red out side with FIRE mark, filled with dry-sand and kept on existing stand provided or hung on wall hook.

Mode of Measurement:- On Each Basis

#### **Item No.:351**

Supplying and erecting floor mounting stand for keeping four nos. of FIRE buckets comprising 1500 mm in length, 900 mm height frame made out of 30mm X30 mm X 4 mm angle iron with cross supports for legs, welded with 4 hooks and duly painted with one coat of red lead and two coats of approved enamelled silver paint.

Mode of Measurement:- On Each Basis

**Item No.:352**

Supplying & fixing Steel Chequered Plate having 7 mm thickness, duly painted with two coats of black Japan colour. (Average Wt 61.1 kg / Sq.Mtr)

Mode of Measurement:- On Sqmtr Basis

**Item No.:353**

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Copper conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe at road crossing or floor of following size of cables. (G) 12 core 2.5 sq.mm

Mode of Measurement:- On Mtr Basis

**Item No.:354**

Lightening protection system for highest building at plant area by air terminal with rod and GI strip conductor test link to earth electrode as per requirement .

Mode of Measurement:- On Kg Basis

**Item No.:355**

Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table-9 of IS-456-2000 in masses by weigh batching ) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. (including cost of 35 kg per Cu. M. reinforcement of CRS steel of all dia Fe500 grade conforming to IS) - For Foundation, of DG Set and Transformer Plinth,etc.

Mode of Measurement:- On Cum Basis

**Item No.:356**

Providing and erecting Sana Saniya Products Fencing Wire 1000 Meter 10kg./ Boundary Wire 1.5 Mm Silver Plastic Fence Post

Mode of Measurement:-On Lot Basis

**Payment Schedule**

| Sr.No. | Particular   | % age of Payment of the Total Amount |
|--------|--|--------------------------------------|
| 1.     | On receipt of material equipment/machinery (at site) duly inspected / certified by the DEE(M&E) GIDC | 70.00 %                              |

|    |   |          |
|----|---|----------|
|    | Vadodara & on satisfactorily verified by XEN (M&E), Vadodara  |          |
| 2. | On satisfactory completion of installation work certificate by DEE(M&E) GIDC Vadodara & on satisfactorily verified by XEN (M&E), Vadodara                       | 10.00 %  |
| 3. | On testing and satisfactory performance of all items (at site) duly certified by the DEE(M&E) GIDC Vadodara & on satisfactorily verified by XEN (M&E), Vadodara | 10.00 %  |
| 4. | On satisfactory Commissioning certified by the DEE(M&E) GIDC Vadodara & on satisfactorily verified by XEN (M&E), Vadodara                                       | 10.00 %  |
|    | Total   | 100.00 % |

#### RECOMMENDED BRANDS/ MANUFACTURES OF CIVIL ITEMS

**Note: If any item make is not mention in tender then contractor has to approve the make from GIDC authority /Architect.**

| MATERIAL  | APPROVED MAKE / MANUFACTURER   |
|---|--|
| Ordinary Portland Cement  | Ultratech, JK, Ambuja,ACC  |
| White Cement  | Birla, J.K.  |
| Structural Rolled Steel sections- beams, Channels, tee, flats, angles, bars (Round, square, hexagonal, bright), etc | Tata, Jindal, JSW  |
| Steel FE 500D/550D  | Tata, Jindal, JSW,SAIL   |
| Structural Rolled Steel sections  | Tata, Jindal, JSW  |
| Structural Hollow Steel section   | Tata, Jindal, JSW  |
| Structural tubular section  | Tata, Jindal, JSW  |
| Stone rubbles and gravels   | Sevalia, Vadagam, Ambakanta, Sayala, Chikhali  |
| Shuttering Plywood  | Marino, Duro ,Green ,Century, Archidply, Monarch   |
| Commercial plywood  | Marino, Duro ,Green ,Century, Archidply, Monarch   |
| Decorative Ply [ veneer ]   | Marino, Duro ,Green ,Century, Archidply, Monarch   |
| Prelam particle board   | Novapan, Bhutan ,(exterior grade only), Archidply  |
| Laminate sheet  | Formica , Greenlam, Alfaica, Decolam, Century, Durian, Silicon, Uro, Bloom                 |
| Bison Panel [cement bonded particle board]  | NCL Industries Ltd. / Swastik  |
| Flush door  | Kitply, Anchor, Greenply, Monarch, Archidply, Century                                      |
| Pressed steel door frames/windows   | NCL Industries Ltd. , AGEW steel manufacturer [pvt] ltd., Trigan , perfect.                |
| Locks   | Godrej, Yale, Armour, Hettich, Atich, Dorma.   |
| Float Glass   | Modiguard, IAG, Triveni, Saint Gobain.   |
| Mirror  | Modiguard, IAG, Triveni, Saint Gobain  |
| M.S. rolling shutter  | Sarvottam, Suryoday, Gandhi, Sagar   |
| Pre cast terrazzo tiles & skirting [mosaic]   | Alcock, Nitco,Hindustan,Dinesh   |
| Polished Kota stone slab  | From approved quarry & As per tender specification & sample approved by Architect & Client |
| Polished Granite stone  | From approved quarry & As per tender specification & sample approved by Architect & Client |

|  |  |  |
|--|--|--|
|  | GVT Glazed Vitrified tiles                 | SOMANY, KAJARIA, JOHNSON   |
|  | Construction chemicals/concrete and mortar | Roffee, Fosroc, Pidlite / Samrock, SIKa, STP   |
|  | Joint filler                               | GE silicon, Cibatul / Wecker, laticrete, Dr. Fixit, Nitco                                  |
|  | Pre coated Steel roofing / walling sheets  | Tata blue scope Interarch, Nippon Dendro (poly steel) Meta color, JSW                      |
|  | Paints                                     | Asian, Nerolac, Burger, dulex  |
|  | Texture paint                              | Asian, Nerolac, Burger, dulex  |
|  | Polish                                     | MRF, ASIAN   |
|  | Hardware                                   | EBCO, Royal, Hettich, Kitch, Gaze, Hafele,   |
|  | Adhesive                                   | Fevicol, Araldite  |
|  | Floor spring [ heavy duty ]                | Hitco, Efficient, Supreme,   |
|  | Floor spring                               | Ozone, Godrej, Hyper, Starling, Dorma  |
|  | Door closer                                | Godrej, Dorma, Yale  |
|  | Aluminum sections                          | Jindal, Hindalco, Banco  |
|  | UPVC window                                | Aluplast/Rehau/Wintech   |
|  | Bans park Stone                            | From approved quarry & As per tender specification & sample approved by Architect & Client |
|  | Rust Remover                               | Perma, Roff Rust Clear (Pidilite Industries), Dr. Fixit product                            |
|  | Polymer bonding agent                      | Perma, Roff Bond Repair (Pidilite Industries), Dr. Fixit product                           |
|  | Non-shrink grout                           | Perma, Roff Grout GP (Pidilite Industries), Dr. Fixit Product                              |
|  | Super plasticizer for jacketing            | Perma, Roff Plast 330 / Concrete Master, Dr. Fixit Product                                 |
|  | Rebar and Anchor Fasteners                 | Hilti or Fischer OR FOSROC   |
|  | Acrylic SBR base bonding agent             | Perma, CICO, Dr. Fixit Product<br>BASF, Pidilite   |
|  | Epoxy Bonding                              | Perma, Roff Concrete Bond (Pidilite), Dr. Fixit Product                                    |
|  | Anti-Termite Chemicals                     | Perma, Chloropyriphos/ Biflex TC / lindane/Bayer Crop Science                              |
|  | PVC Sleeve                                 | Supreme / Astral / Prince / Truflo   |
|  | Expansion Board                            | Capcell HD Board   |
|  | CP Fixture                                 | Jaquar / Kohler / American standard  |
|  | Sanitary wares                             | Jaquar / Kohler / American standard  |
|  | Plumbing                                   | Prince, Astral, dutron   |
|  | Water Proofing                             | Perma / BASF/ Fosroc / Sika  |
|  | Over deck Insulation                       | BASF/ Fosroc / Sika  |
|  | Tile Chemical                              | Perma, Bal, Laticrite, Kerakoll, Somani  |
|  | PVC spacer                                 | BAL Endura / Kerakoll / BASF   |
|  | Self Levelling Chemicals                   | Perma / BASF / Cico / Sika   |
|  | Anti-bacterial Paint                       | Sikka / Liquid Plastic/SSK/Viessmann / artilin / BASF / Huntsman                           |
|  | Galvalume roofing sheet                    | Jindal, Tata, JSW  |
|  | Pre coated Sheet                           | TATA, JSW, JinDAL  |
|  | Hardeners                                  | 'Ironite', 'Ferrok', 'Hardonate.'  |
|  | Wire Mesh                                  | Sterling Enterprises, Trimuriti, Welded Mesh.  |
|  | S SRailing                                 | Kitch, gaze, Hafele, Fitwell   |
|  | Gypsum ceiling                             | SAINT GOBAIN-GYPROC, USG BORAL, KNAUFF   |
|  | Grid ceiling                               | AEROLITE, RAMCO, ARMSTRONG   |

|  |                                      |                                      |
|--|--------------------------------------|--------------------------------------|
|  | Shera plank ceiling                  | EVEREST,SHERA,ECP PRO                |
|  | Cement sheet ceiling                 | EVEREST,SHERA,ECP PRO                |
|  | Hard wearing skid resistant flooring | FOSROC INDIA,SIKA INDIA,ARDEX ENDURA |
|  | Crane                                | TATA,JSW,ESSAR                       |
|  | GRC                                  | Swastik ,GRC master or equivalent    |

### RECOMMENDED BRANDS/ MANUFACTURES OF ELECTRICAL ITEMS

**Note: If any item make is not mention in tender then contractor has to approve the make from GIDC authority /Architect.**

| No. | ITEM                               | STANDARD MAKE  |
|-----|------------------------------------|--|
| 1   | PVC PIPE                           | PRECISION/ POLYCAB/ NIHIR/BBC  |
| 2   | WIRE                               | POLYCAB/RR KABEL/HAVELLS/ FINOLEX/ALLCAB                                       |
| 3   | ACCESSORIES                        | ANCHOR – PENTA / HONEYWELL-EVO / HAVELLS – REO / INDOASIAN-ELOVIRA / LEGRAND - |
| 4   | LED FITTINGS                       | BAJAJ/ HAVELLS / PANASONIC/Nessa/ CROMPTON/Wipro                               |
| 5   | SWITCH GEAR & DB                   | C&S / INDOASIAN / HAVELLS /HAGGER / L&T  |
| 6   | FAN                                | USHA / CROMPTON / BAJAJ / ORIENT   |
| 7   | CABLES                             | RR / HAVELLS / POLYCAB / ALLCAB / FINOLEX                                      |
| 8   | CAT-6 CABLE                        | D-LINK / FINOLEX / LEGRAND   |
| 9   | DWC PIPE                           | SYRON / GEMINI /FINOLEX  |
| 10  | WATER COOLER                       | VOLTAS / BLUE STAR   |
| 11  | Pump Set                           | Kirlosker, Crompton, Lubi  |
| 12  | MCB/ELCB/RCCB/ Distribution Switch | L&T Schneider/ Havells/ ABB/ Legrand/C&S                                       |
| 13  | Motor Starter                      | L&T, Siemens, BCH, Havell's, C&S, Gelco, Eleco                                 |
| 14  | Fire Alarm System                  | Honeywell - notifier, Siemens  |
| 15  | HVAC                               | Voltas/DAIKIN/Carrier/Bluestar/Hitachi   |
| 16  | LIFT                               | Kone/Indel/Otis/Express/schreder   |
| 17  | DG SET                             | Ashok Laylend/ TATA/Kirloskar Green/Cummins/Supernova                          |
| 18  | Conical Pole                       | Utkarsh/Transrail/Bajaj/Wipro/Volmount   |
| 19  | HT PANEL                           | Siemens, ABB, Schneider Electric   |

### SOLAR SYSTEM MAKES

| N o. | ITEM                                    | STANDARD MAKE  |
|------|---|--|
| 1    | ENERGY METER                            | : SECURE   |
| 2    | MCCB                                    | : L&T, SIEMENS, SCHNIDER, ABB, CONTROL & SWITCH GEAR |
| 3    | CABLES                                  | : KEI/ Polycab/ RR                                   |
| 4    | PVC CABLE                               | : Lapp/ Polycab / APAR                               |
| 5    | SOLAR MODULE                            | : Kashyap Solar, Pahal Solar , MNRE Approved         |
| 6    | INVERTER/ PCU                           | : Polycab, Delta, Solis                              |
| 7    | WEB BOX WITH RS 485 COMMUNICATION CABLE | : MNRE APPROVED                                      |



# IS CODE AND APPROVED MAKE LIST FOR FIRE FIGHTING SYSTEM

| Sr. No. | Item                   | MAKE                                     |
|---------|------------------------|--|
| 1       | Pipe                   | Jindal/Tata/surya                        |
| 2       | Fasteners              | Hilti/ficher                             |
| 3       | Motors                 | Kirloskar/Crompton/ABB<br>Eqv.           |
| 4       | Pumps                  | Kirloskar,C&CS,Grundsfos                 |
| 5       | Sluice Valve           | C&CS,zoloto,kranti.                      |
| 6       | Strainer/<br>Footvalve | Sant/ C&CS,zoloto,kranti.                |
| 7       | Butterfly Valve        | Sant/ C&CS,zoloto,kranti.                |
| 8       | Hydrant Valve          | C&CS,essel                               |
| 9       | Fire Hose              | C&CS,super                               |
| 10      | Branch pipe            | C&CS,essel                               |
| 11      | Hose Reel              | C&CS,super                               |
| 12      | MS Box                 | C&CS,super                               |
| 13      | Sprinkler              | HD/ Tyco/ Reliable                       |
| 14      | Non Return valve       | Sant/ C&CS,zoloto,kranti.                |
| 15      | Fire Extinguisher's    | Kanex, C&CS,agni,essal.                  |
| 16      | Painting               | Asian Paints/ICI/<br>Berger              |
| 17      | Fire Alarm             | C&CS ,Agni ,Honeywell/Siemens/<br>Edward |

## TV MAKE

| Sr.No. | ITEM                   | STANDARD MAKE                                |
|--------|------------------------|--|
| 1      | Dome Camera            | UNV / Avigilon / Samsung/Hikwison/CP<br>plus |
| 2      | Bullet Camera          | UNV / Avigilon / Samsung/Hikwison/CP<br>plus |
| 3      | Network Video Recorder | UNV / Avigilon / Samsung                     |
| 4      | 4TB HDD                | WD / Seagate                                 |
| 5      | 43" Display            | Samsung / Panasonic / Planar                 |
| 6      | Junction Box           | Standard                                     |
| 7      | 24 Port Network Switch | Netgear / D-Link                             |
| 8      | CAT-6 Cable            | CKS Acoustics / D-Link / Tyco                |
| 9      | System Rack            | Valrack / Elixir / APW President             |
| 10     | Connectrs& Accessories | Standard                                     |

**AUDIO VIDEO SYSTEM MAKE**

| <b>Sr.No.</b> | <b>ITEM</b>                 | <b>STANDARD MAKE</b>              |
|---------------|-----------------------------|-----------------------------------|
| 1             | 55" Interactive Display     | Panasonic / Samsung / Planar      |
| 2             | Video Conference System     | Clearone / CKS Acoustics / Lumens |
| 3             | POP UP Box                  | Wyrestorm / Rampo / Extron        |
| 4             | 2x1 HDMI Switcher           | Wyrestorm / Rampo / Extron        |
| 5             | HDMI Transmitter & Receiver | Wyrestorm / Rampo / Extron        |
| 6             | CAT-6 Cable                 | CKS Acoustics / D-Link / Tyco     |
| 7             | HDMI Cable (1 Mtr / 3 Mtr)  | Wyrestorm / Rampo / Extron        |
| 8             | USB Cable 1 Mtr.            | Wyrestorm / Rampo / Extron        |

**SPECIAL NOTES :**

- The successful tenderer will have to supply the makes from above in consultation with the DEE[M&E],GIDC without any extra cost.
- Tenderer should have to specify the list of makes considered in the tender while quoting the rates in the tender, in covering letter of separate letter enclosure. However, the final decision for accepting make specified by tenderer would be of competent authority of GIDC
- The client Architect and Consultants. Have right to check the challans of supplier.
- Within a week of work order, the contractor shall submit the sample of each item / component of above mentioned approved make for the approval of the Client/Architect/Consultant.

Sign & Seal of Contractor