SPECIFICATIONS OF ELECTRICAL ITEMS

POINT WIRING (LIGHT, BELL, FAN & PLUG)

The point wiring shall be confirm IS : 5908 - 1970. A point shall consist of the branch wiring from the branch distribution board (switch board) together with a switch as required, as far as and including the ceiling rose or socket-outlet or suitable termination. A three-pin socket-outlet point shall include, in addition, the connecting wire or cable from the earth pin to the earth stud of the branch distribution board.

The installation shall generally be carried out in conformity with the requirements of the Indian Electricity Act, 1910, as amended upto date and the Indian Electricity Rules, 1956.

The point wiring shall be carried out in the under mentioned manner:

(a) Supply, installation, fixing of conduits with necessary accessories, junction/inspection/switch/outlet boxes.

(b) Supplying and drawing of wires of required size including insulated earth continuity wire.

(c) Supply, installation and connection of flush type switches, sockets, cover plates, switch plates fan regulators etc. as specified.

(d) The point shall be complete with branch wiring from the first switch board to the outlet point through other loop. Switch boards if necessary in a circuit, conduit with accessories, junction, inspection boxes, control switch, socket outlet boxes, ceiling roses, connector etc.

(e) For Concealed type electric point wiring the Groove/Zary should be done by using Stone Cutter Machine.

Unless otherwise mentioned, the system of wiring shall consist of single core 650/1100 volt grade PVC insulated wire with Aluminium/copper conductor laid through exposed surface mounted/concealed in wall and ceiling rigid PVC pipe/rigid steel conduits/PVC oval conduit/PVC casing-N-Capping/trunking/FIA approved PVC pipe etc. as specified.

The rigid PVC pipe/rigid steel conduits/PVC oval conduit/PVC casing-N-Capping/trunking/FIA approved PVC pipe shall confirm to IS:9537/I.S.S. with minimum wall thickness of 1.5mm. The corresponding accessories shall confirm to IS:3419. The minimum diameter of pipe shall be 20mm.

The steel conduit and accessories shall confirm to IS:1653-1964 and IS:3837-1966 as amended up-to-date respectively.

The PVC trunking (PVC casing-N-Capping) shall be with double locking arrangement with grooves of size not below 1.5mm. in height confirm BS:4678 Part-4 of 1982 and with accessories of PVC/Resin

polypropylene not below 1.8mm. thick duly sealed at joints.

The wiring shall be as per colour code viz. Red for R phase, Y ellow for Y phase, Blue for B phase, Black for neutral, Green for earth, Grey for control, white for bell point and all off wires shall be same as phase wire. The wiring shall be done in a looping manner. All looping shall be made only in switch boards.

The switches and socket outlets shall be shockproof flush type either tissino type/Modular type/molded plate type with silver-coated contacts with ISI Marked IS:3854.

The Conduit run on surfaces shall be supported on metallic 1.2mm. thick saddles/heavy duty PVC saddles which in turn shall securely screwed to wall or ceiling. Saddles shall be at intervals of not more than 500mm. Fixing screws shall be with round or cheese head and of rust-proof materials. No cross-over of conduits shall be allowed. Unless it is unavoidable. The entire conduit installation shall be clean and neat in appearance.

The Conduits embedded into the walls shall be fixed by means of staples at intervals of not more than 500mm. Chases in the walls shall be neatly made with electrically operated masonry wall cutter and shall be refilled after laying the conduit with suitable mortar and brought to the finish of the wall. Conduit buried in concrete structure shall be put in position and securely fastened to the reinforcement. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked out at the time of pouring concrete necessary fish wire shall be drawn in all conduit run.

The all materials and accessories used shall confirm to Indian Standard Specification. All types of wiring shall be capable of easy inspection. The open (unconcealed) wiring shall run along with walls should run as near the ceiling as possible. All runs of wiring and the exact positions of all points and switch boards shall be first marked on the building and got approved from the in charge electrical engineer before actual commencement of work.

The conduit for point wiring shall have a nominal cross-sectional area not less then either 1.00 mm2 copper or 1.5mm2 aluminium as specified. For open type switch boards shall not be erected within 2.5 meter of any washing unit or in bathrooms lavatories on toilets or kitchens. The switch block shall be PWD type with best valsadi seasoned teak wood or other durable wood with solid back thoroughly protected both inside and outside with good insulating varnish shall be provided. There shall be a clear distance of not less than 25mm between the teak wood board and cover. All the joints of board shall be dovetailed. The wooden block shall be covered with 3 mm thick laminated sheet firmly screwed on four corners with the help of chrome plated counter shunt round headed steel screws. For large size switch boards laminated sheet shall be screwed at six plates. Where so specified, the switchboards shall be recessed in the wall for concealed type wiring. The front shall be fitted with 3 mm thick laminated sheet. Ample room shall be provided at the back for connection and at the front between the accessories mountings. The concealed base shall be of either 16 gauge M.S. or teak wood as specified or instructed.

The Maximum load of each circuit shall not exceed 800 watts and maximum points of each circuit shall not exceed 10 points. Where wiring passes through wall, care shall be taken to see that wire pass very freely through protective pipe [rigid steel conduit / rigid PVC pipe / porcelain tube] and that the wires pass through without any twist or cross in wires, or either ends of holes.

The general and technical specification given in the tender booklet shall also be considered as a part of agreement. All the wiring materials shall be of approved make as specified in the tender booklet or as approved by in-charge Electrical Engineer.

TELEPHONE PLUG SOCKET

The Telephone plug & socket shall confirm Indian Standard Specification or IS:1293: The telephone socket outlet shall be two points type. The dimension of socket and plug shall have silver coated pins & pin seating of exact dimensions. so that pin of plug shall firmly fitted to seat in socket & no loose contact may arise. The connections to socket with telephone cable shall be made by tinned / silvered soldering. The socket shall be of flush mounted tissino type / moulded plate type / modular type as specified.

The telephone socket shall be erected on seasoned teak wood block or on concealed box covered with 3mm thick laminated sheet. The general specification give in tender booklet shall also be considered as a past of agreement. The telephone plug & socket shall be of approved make as specified in the tender booklet or approved by in-charge electrical engineer.

RIGID PVC PIPE/FIA APPROVED PVC PIPE :

The Rigid PVC/FIA Approved PVC pipe shall confirm IS:2509 or ISI marked a specified Rigid PVC pipe shall be 1.5 mm to 1.6 mm. thick manufactured from high grade vergin PVC. The diameter of PVC pipe/FIA Approved shall be as per specified. Fittings for rigid PVC/FIA Approved pipe such as bends, elbows, nipples, couplings, reducers, plugs etc. shall be specifically designed and manufactured for their application. All fittings shall confirm to IS:3415.

The rigid PVC/FIA Approved pipe shall be erected on wall/ceiling with properly screwed heavy duty rigid PVC saddles at the intervals not more than 500mm. and pipes to pipes and pipes to fittings shall be fixed with adhesive solution. 16 gauge G.I. fish wire shall be erected with erection of pipe as a drawer wire. The installation of pipes shall be as per IS:4648, IS:732 and IS:1646.

The PVC pipe/FIA Approved shall erected concealed in wall/ceiling or for open execution as specified and as per instruction of in-charge-electrical engineer.

The general specifications given in the tender booklet shall also be considered as a part of agreement. The PVC pipe/FIA Approved and fittings shall be of approved make as specified in tender booklet or as approved by in-charge-electrical engineer.

For Concealed type electric point wiring the Groove/Zary should be done by using Stone Cutter Machine.

MAINS :

The Mains shall be with ISI Marked PVC insulated wire with aluminium / copper conductor as specified. The size of phase and neutral shall be same while the size of earth conductor shall be as specified in the item. The number and size of conductor shall be as specified in the item. All wires shall be single core multi-strand PVC insulated as per IS:634 and shall be 660 V/1100V. grade. All wires shall be as per colour code viz. Red for R phase, Yellow for Y phase, Blue for B phase, Black for neutral, Green for earth conductor.

The Necessary connections to control switchgear, MCB Dist. board, plug etc. shall be made firmly as per requirement and as instructed by in-charge-electrical engineer.

The general specifications given in the tender booklet shall also be considered as a part of agreement. The wires shall be of approved make as specified in the tender booklet or as approved by in-charge-electrical engineer.

TELEPHONE WIRE ,CABLE & TAG BOX :

The type of cables and the services shall be as follows :
Indoor Multi pair, PVC insulated sheathed armored and sheathed. ii) Inside Twin core PVC insulated with conduit twisted cores.

All multi core cables and wires shall be of tinned copper conductor of not less than 0.5 mm dia and shall be colour coded twisted pairs with rip cord.

The conductor resistance shall be less than 150 ohms per KM and the insulation resistance between the conductors not less than 50 megohms and the nominal capacitance of about 0.1 micro farad per kilometer.
Cables laid underground or locations subject to dampness and flooding shall be filled with polyethylene compound and shall have sufficient protection against moisture and water ingress.

All armoring shall be of galvanized steel wires and protected against corrosion by an outer sheath of PVC in the case of indoor cables and polyethylene in the case of outdoor cables. Outer sheathing must be fire retarding and anti-termite.

All unarmoured single core cables and inner sheath of armored cables shall be provided with rip cord.
All single pair cables for final extension to the telephone outlet box shall be unarmoured tinned copper conductors of not less than 0.5 mm. diameter and shall be drawn in conduits. All telephone outlets shall consist of 2 A 2 pair polythene connector in G.I box with 6 mm perspex cover with beveled edges and chromium plated brass hardware.

The telephone tag blocks shall be suitable for the multi core telephone cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enameled
The installation of conduits shall generally be as specified under section `CONDUIT WIRING'.
All cables shall be on cable racks and neatly stitched together.

The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.
The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows:

Conduit diameter Max. No. of cables
Inch / mm.
3/4" / 20 2 Nos. single pair
1" / 25 6 Nos. single pair
1¼" / 32 12 Nos. single pair
1½" / 40 18 Nos. single pair
Category 6 UTP cable

Cable should meet or exceed the TIA Category 6 / ISO Class E attenuation specification, NEXT requirements in ISO/IEC 11801, CENELEC EN50173 and TIA/EIA 568C.

CAT 6 UTP balanced twisted pair cable shall conform to the Category 6 component specifications and the installed channels shall comply with the ANSI/EIA/TIA 568C.2-1Category 6 and ISO/IEC 11801 Class E Channel Performance Specification

All balanced twisted pair cable and apparatus shall conform to the Category 6 component specifications and the installed channels shall comply with the Category 6/Class E Channel Performance Specification up to the maximum100 meters (328 feet) length, including up to 6 connection points.
The high performance Category 6 UTP cable shall be of the traditional round design with mylar bisector tape
There should not be any limitation for minimum length of Cat 6 Channel (should not have high resonance problem in shorter channels.

The Category 6, 4 pair UTP channel shall support emerging high-bandwidth applications, including 1 Gbps Ethernet, potentially 1.2 Gbps ATM and 2.4 Gbps ATM, IEEE 1394B S400,Multi-Tasked Split Screen Computing, Virtual Holographic Video Conferencing, Instant Access Telemedicine, 3D CAD/CAM Engineering, Internet-Intranet Communications/Commerce, as well as all 77 channels (550 MHz) of analog broad band video
Category 6 cable shall perform on 400 % margin and at least 6 db NEXT
The Category 6 cable and components shall be electrically backward compatible with existing Category 3, 5, and 5e

Should be UL verified as Category 6 / ETL listed as Category 6, i.e., The 4 pair UTP cable shall be UL and c (UL) Listed Type CMP (plenum) or CM (non-plenum)
Should have thin bisector tape for additional performance benefits
Performance guaranteed to meet or exceed Category 6/Class E Channel Specifications to 550 MHz
Performance guaranteed up to 6 connections in any length channel configuration up to 100 meters
CAT 6 UTP indoor cable shall consist of 23 AWG polyethylene, insulated conductors, twisted into four pairs and shall be of the traditional round design with bisector tape and jacketed with a non-plenum polyethylene jacket.

Category 6/Class E NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT and return loss extrapolated to 250 MHz
Cable should be capable of delivering potentially in excess of 1.2 Gbps to the workstation in accordance with application standards.

The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem,Switched-56, T-1, ISDN,RS-232, RS422, RS-485, 10BASE – T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, Ethernet IEEE 802.3 1000BASE-T, TIA-854-A 1000BASE-TX, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, IEEE 1394B S100 and S400, as well as all 77 channels (550 Mhz) of analog broadband video, Building Automation System applications.

Transmission: The balanced twisted pair cable channel performance shall be guaranteed up to the maximum 100 meters (328 feet) length, including up to 6 connection points.
The cable jacket shall comply with Article 800 NEC for use as a plenum or non-plenum cable. The 4 pair UTP cable shall be UL□ and c (UL□) Listed Type CMP (plenum) or CMR (non-plenum)
The Category 6 UTP Ethernet Cable and Category 6 Channel Components shall be manufactured by a single manufacturer. The manufacturer shall warrant the Category 6 channel cable, components, and applications for a period of 20 years.

Physical Specifications:

→Nominal Jacket Thickness: 0.022 in (0.56 mm)
→ Nominal Outside Diameter: 0.232 in (5.89 mm)
→Gauge of Conductor: 23/24 AWG

Electrical Specifications:
→Maximum DC Resistance: 7.61 Ohms/100 m
→ Maximum DC Resistance Unbalance: 3%

Conformance to Electrical Standards as follows:
→ ANSI/TIA/EIA 568B.2-1 Category 6

→ISO/IEC 11801: 2002 (Edition 2) Class E
→CENELEC EN50173: 2002 (Edition 2) Category 6

COMPUTER BOARD.

The computer board should be consisting of 1 No. 6A/16A Universal plug switch combined with fuse and indicator, 4 Nos. 6A tissino switch & 4 Nos. 6A tissino type 5pin Plug. In single board erected on wooden / PVC/Metal Board with 3mm thick laminated sheet as directed.

DISTRIBUTION BOARDS

Distribution boards shall be fabricated from 18 gauge M.S. sheet or shall be readymade as specified in the make of material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall. Distribution boards shall be powder coated with 7-tank process application.

The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links. There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB's and other accessories.

Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.

Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase

and two terminals for 3 phase DB's shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

The top and the bottom faces of the D.B. shall be provided for conduit entry of minimum 1" dia. The faces if asked shall be kept detachable.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows

Up to 15 A	2.5 sq.mm.	40 A	10 sq.mm.
25 A	4.0 sq.mm.	63 A	16 sq.mm.
32 A	6.0 sq.mm.		

Each DB shall have indicating lamps preferably neon type denoting power availability in the board after the switch indicating lamps shall be complete with fuses.

ELCB

The ELCBs shall be of approved make & should be conforming to IS:12640/1988 & BS:4293/1983 having sensitivity of 30 MA & breaking capacity of 10 KA & suitable for 240/415 V 40 Amp. rating ELCBs should have characteristics of quick acting & tripping with all advanced features & do not incorporate any electronic component. The wiring for connection shall be used of PVC copper wires of adequate capacity with proper size of lugs.

The ELCBs shall be erected on polished wooden board as per direction of Engineer in charge.

The general and technical specification given in the tender booklet shall also to be considered as a part of agreement. The ELCB shall be of approved make and category as specified or approved by in-charge-electrical engineer.

MINIATURE CIRCUIT BREAKER (MCB)

Miniature circuit breakers shall be quick make and break and break type conform with British standard BS: 3871 (Part-I) 1965 and IS: 8825 (1996). The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10000 amps, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "ON" and "OFF" indications.

The circuit breaker dollies shall be of trip free pattern to prevent closing the breaker on a faulty current.

The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall

be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection. The over load or short circuit devices shall have a common trip bar in the case of DP and TPN miniature circuit breakers. All the MCB's shall be tested and certified as per Indian Standard, prior to Installation.

POWER CONTACTOR:

The contactors shall meet with the requirements of IS: 2959 and BS: 775.

The contactors shall have minimum making and breaking capacity in accordance with utilization category AC3 and shall be suitable for minimum Class II intermittent duty.

If the contactor forms part of a distribution board then a separate enclosure is not required, but the installation of the contactor shall be such that it is not possible to make an accidental contact with live parts.

Each Contactor shall be provided with at least two (2)

CUBICAL PANEL:

A) Structure:

The Panels shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation having dead front operated and floor mounting type. The design construction shall be such as to allow extension at either end.

All CRCA sheet steel used in the construction of Panels shall be 2 mm. thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet steel shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.
The PCC & MCC shall be of double front construction and draw-out type. Except for the stated panels other panels will be fixed type with single front construction.

The Panels shall be totally enclosed, completely dust and vermin proof, conforming to degree of protection IP-52.Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof.
All doors and covers shall be fully gasketed with neoprene rubber and shall be lockable.

All panels and covers shall be properly fitted and secured with the frame and holds in the panel correctly positioned. Fixing screws shall enter into holes, taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of Panels.
A base channel of 75 mm x 40 mm. shall be provided at the bottom. A clearance of 300 mm. between the floor of the Panels and the bottom of the lower most units shall be provided. Panels shall be preferably arranged in multi-tier formation.

The Panels shall be of adequate size with a provision of 20% spare feeders and also 20% space to accommodate possible future additional switchgear.
The size of the Panels shall be designed in such a way that the internal space is sufficient for hot air movement and the electrical component does not attain temperature more than 45°c. All the electrical component shall be derated for 50°c.

Knock out holes of appropiate size and number shall be provided in the Panels in conformity with the number, and the size of incoming and outgoing cables.
Alternately, the Panels shall be provided with removable sheet steel plates at top and bottom to drill holes for

cable entry at site. The Panels shall be designed to facilitate easy inspection, maintenance and repair.
The panels shall be sufficiently rigid to support the equipment without distortion under normal and under short circuit condition. They shall be suitably braced for short circuit duty.

B) Protection class:
All the indoor Panels shall have protection class of IP 52 for indoor installation and IP 55 for outdoor installation.

C) Painting:
The painting shall be with 2 coats of epoxy primer along with two coats of PU paint [Anti – corrosive paint]. Paint shade shall be confirmed with the client. Alternatively they can be powder coated after proper cleaning. The thickness of painting shall be between 70- 80 microns.

TIME SWITCH.

The approved make segment time switch should be suitable for operation on 230V +10% 16A. The contact should be

Flotting with 24Hrs dial having 15/30 minute segments. With early manual over ride switching for ON & OFF without influencing the program sequence with quarts time switch. The time switch should be housed in fire proof thermoplastic enclosure & transparent cover erected as directed & as required on site.

BUSBAR CHAMBERS

The busbar shall be air insulated and made high quality, high conductivity, high strength copper and as per relevant IS code. The busbar shall be for three phases and neutral system with separate neutral and earth bar. The busbar and interconnection between busbar and various components shall be of high conductivity, hard drawn, electrolytic copper. The busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall be rated for the frame size of the main incoming breaker. The busbar shall have uniform cross section through out the length. Ratio of 1 sqmm = 1.2 A shall be adopted for tinned copper busbars.

The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system. The busbar shall be supported on unbreakable, non hygroscopic DMC insulated supports at sufficiently close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum.

The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick FRC sheet to avoid any accidental contact. The busbar shall be arranged such that minimum clearances between the busbar are maintained as per below.

Between phases	:	27 mm min.
Between phases and neutral	:	25 mm min.
Between phases and earth	:	25 mm min.
Between neutral and earth	:	23 mm min.

All busbar connection shall be done by drilling holes in busbars and connecting by chromium plated bolt and nuts. Additional cross section of busbar shall be provided in all PCCs / MCCs / PDBs to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts.

All connection between busbar and circuit breaker / switches and between circuit breaker/ switches and cable terminals shall be through solid copper strips of proper size to carry full rated current. These strips shall be insulated with insulating strips.

MOTOR CONTROL PANEL : (Direct-On-Line & Star-Delta) :

The cubical panel shall be made from 16 gauge CRCA sheet duly epoxy powder coated inside and outside. The panel shall have hinged doors and locking arrangement. The panel shall be designed to withstand the worst weather condition with maximum expected ambient temperature of 45 C & 90% humidity and salty, duty weather. The panel shall be totally enclosed, complete dust and vermin-proof, rigid floor mounting, air insulated, bottom cable entry, cubical type suitable for operation on three phase, 415 volt, 50Hz, power supply. The panel shall have IP-51 protection class construction. Neoprene/synthetic rubber gasket shall be provided between all adjacent units and beneath all cover.

The panel shall comprises suitable size of ON-OFF isolator (AC - 3/23 duty) Main fuses, Indicating lamps for R-Y-B phases, Overload relay, Ammeter, Voltmeter each with two way selector switch, main contractor and start-stop push buttons. The isolator, overload relay and contactor shall be of L & T. Siemens or Cutter Hammer make. The panel with D.O.L. starter shall be equipped with single phasing preventor while panel for automatic Star-delta starter shall be equipped with single phasing preventor cum water level guard complete unit with toggle switch to by pass SPP cum WLG, thermal/electronic star-delta cut-off timer etc.

All the instruments shall be prewired with suitable size of ISI marked PVC insulated control cables with tinned copper conductors. Terminals for both incoming and outgoing cable connections shall be suitable for 1100 V grade.

The panel shall be connected, tested and commissioned as per the instruction of in-charge-electrical engineer. The general specification given in the tender booklet shall also be considered as a part of agreement. The panel shall be of approved make as specified in the tender booklet.

M.C.C.B.

The moulded case circuit breaker (MCCB) shall be air break type and having quick make - quick break with trip free operating mechanism.

Housing of the MCCB shall be of heat resistant and flame retardant insulating material.

Operating handle of the MCCB shall be in front and clearly indicate ON/OFF/TRIP positions.

The electrical contact of the circuit breaker shall be of high conducting non deteriorating silver alloy contacts.

The MCCB shall be provided with thermal / magnetic type bi-metal overload release and electromagnetic short circuit protection device. All the releases shall operate on common trip busbar
so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three

phases and thereby single phasing of the system is avoided.

The MCCB wherever called for in the appended drawings shall provide an earth fault relay.

The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date.

The electrical parameters of the MCCB shall be as per the description given in the relevant drawings.

DIGITAL VOLT METER:

Voltmeter shall comply with IS:1248. The dial of the meter shall be square in square in shape of 10 x 10 cm size. The voltmeter shall be moving iron type, flush pattern, with dust and moisture proof enclosure.

The voltmeter selector switch shall be arranged to provide line to line voltage reading.

DIGITAL AMMETER:

Ammeter shall comply with IS;1248.The dial of the ammeter shall be square in shape of 10 x 10 cm size. The voltmeter shall be moving iron type, flush pattern, with dust and moisture proof enclosure. The range of the ammeter shall be in accordance 1 to 1.5 times the feeder full load current. Separate current transformer shall be provided for all ammeters having capacity more than 40 Amps.

L.T. CURRENT TRANSFORMER

Where ammeters are called for C.T.s shall be provided for current measuring. Each phase shall be provided with separate current transformer of accuracy Class 1 and suitable VA burden for operation of associated metering and controls. Current transformer shall be in accordance with IS: 2705 - 1964 as amended upto date. Accuracy class of the current transformers shall be:

Class PS for differential protection.
Class 5P20 for other protection
Class 1.0 ISP < 5 for metering

INDIACATOR LAMP

The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip. Push button shall be of self-glowing type with LED lamp.

Indicating Lamp shall be LED type and shall supplied complete with translucent covers to diffuse the lamp light. Indicating lamps shall be part of push buttons.

Colour shade for the indicating lamps shall be as below:

ON indicating lamp	:	Green
OFF indicating lamp	:	Red
TRIP indicating lamp	:	Amber
PHASE indicating lamp	:	Red, Yellow, and Blue

DANGER NOTICE BOARD :

I The danger notice plate shall be affixed in a permanent manner on operating side of the Panels.
ii. The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.
iii. The danger notice plate, in general, shall meet the requirements of local inspecting authorities. iv. Overall dimensions of the danger notice plate shall be 200 mm. wide x 150 mm. high.
v. The danger notice plate shall be made from minimum 1.6 mm. thick mild steel sheet and after due pre-treatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.
vi. The letters, the figures, the conventional skull and bones etc. shall be positioned on plate as per recommendation of IS: 2551-1982. vii. The said letters, the figures and the sign of skull and bones shall be painted in signal red colour as per IS: 5-1978.
viii. The danger plate shall have rounded corners. Location of fixing holes for the plate shall be decided to suit design of the Panels.
ix. The danger notice plate, if possible, should be of ISI certification mark.
x. Suitable Voltage rated rubber mats to be provided.

CEILING FAN WITH REGULATOR

The Ceiling Fans shall conform Indian Standard Specification IS : 374-1979. The enclosure of motors of Ceiling Fans shall be of the totally enclosed type. The enclose of regulators shall be ventilated type. The stamping of fan motors shall be made from electrical steel sheet. The Ceiling Fans shall have three numbers well balanced blades made from metal or other suitable material. The blades and motors shall be secrely fixed so that they do not lossen in operation.

The size of Ceiling Fans shall be as specified. The Ceiling Fans shall be suitable for operation on electric A.C. single phase 230 volt, 50 Hz power supply. Proper type of lubrication bearings shall be used to ensure a reasonable amount of silent operation.

The earthing terminal shall be provided on the suspension system. The live parts shall not be accessible in the assembled fan and regulator. capacitor of the fan shall conform IS:1709-1960. The suspension system shall be either bolted or screwed at the motor end and the suspension system shall be either bolted or screwed at the motor end and the suspension end. The suspension system of the Ceiling Fans shall be of adequate strength to with stand a tensile load of 1000 Kg without breakage and a torsion load of 500 Kg without breakage current carrying parts and other metal parts shall be corrosion resistant under normal conditions. The terminals shall be prepared from stainless steel or other corrosion resistant alloys. Radio and television interference suppressots shall be fitted.

The Regulators shall be capable of reducing the speed of the fan at least 50 percent of the full speed. The regulators shall be provided with an off portion and minimum five running positions excepts in case of continuously variable electronic type speed regulators. The regulator handle or knob shall either be of insulating material or adequately electrically and thermally insulated metal. The mechanism of the regulator shall be so designed to ensure positive contact at each running position. The voltage drop across the electronic type regulators at the maximum speed position shall not exceed 2% of the service value at the test voltage and at full speed shall be as per I.S.S.

The Ceiling Fans shall relate to ISI marked twin twisted flexiable wire of size not less than 24/0.2mm.

The general technical specification given in the tender booklet shall also to be considered as a part of agreement. The cutouts shall be of approved make as specified of given category in tender booklet or as approved by in charge electrical engineer.

MS PIPE DOWN RODE.

The MS pipe down rode of medium class should have nominal bore of 19/20mm for erection of ceiling fans complete with necessary painting as required and as directed. The flat 3 core flexible wire of size 24/0.2 should be necessarily erected as required and as directed on site.

CONCEALED FAN HOOK WITH M.S. BOX :

The dimensions M.S. box shall be 175 x 175 x 75 mm. The wall thickness of the box shall be 16 gauge 15 mm. dia. M.S. rod in the shape of 'U' with their vertical legs bent horizontally at the top at least 19mm. on either side and shall be inserted through M.S. box on both sides. At the time of erection, the two ends of M.S. rod shall be bound to the top reinforcement of the roof. Necessary knockout on both side in the center shall be made in M.S. box for entry of conduit in the box.

All the fan hook shall be so fabricated that the fans revolve steadily. The size of fan hook shall be of such that the hook shall be completely hide by the top canopy of the fanned and the fans revolve steadily and bushing in the top suspension.

The box shall be free from burns, fins and internal roughness. During erection care shall be taken the outer surface of the box shall properly flush with the ceiling. There shall be full threaded holes on four corners of box for fixing screws.

DECORATIVE EXHASUT FAN.

Supplying & erecting approved make low noise decorative exhaust fan having size 200mm with 1350 RPM with square frame ABS body with inbuilt lowers & square frame. shall erected on the site as directed by in charge Electrical Engineer.

LED INDDOR / OUTDOOR FITTING:

- General Purpose Led Luminaires suitable for Office /Industry / Street Light applications. The Fixtures should be Operational for 220-240 V Single Phase 50 HZ AC , and operational from 170-280 V without significant drop in output .
- The LED modules should be from Cree/Nichia/Philips Lumi Leds Only with efficiency of a min 130 lm/watt and efficacy of fixtures should be greater than 80 lm/w for both indoor and outdoor fixtures, built with Integral driver. The class and LED shall be procured from a single bin of class 1 to 2 only.
- The Min degree of Protection for Indoor Fixtures should be IP20 and IP65 for Outdoor/ Semi Indoor Fixtures. The THD of Fixtures should be strictly <10 % and drivers should be compulsorily provided with miswiring/ overload and short circuit protections.
- For Indoor applications the housing should be made of die cast/ Metal Housing and diffusers should be polycarbonate only, outdoor fixtures should be with die cast aluminum / extruded aluminum housing only.
- The Fixtures should be prewired upto the terminal block and easy to mount and Install and maintain if necessary. The fixture should comply LM79-08 certification criteria and also module should be backed with LM80-08 Certificate from the OEM.
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XLPE PVC INSULATED CABLE 2, 3, 3½ & 4 core

The Scope of work shall cover supply, laying, connecting, testing and commissioning of low and medium voltage power cabling.

All Cables shall be as per relevant Indian Standard with ISI Mark.

All cables shall be 1100 volt grade XLPE PVC insulated, PVC sheathed aluminium or copper conductor with or without armouring as specified and with an outer pvc protective sheath heavy duty. Cables shall have high conductivity stranded aluminium or copper conductors and cores colour coded to the Indian Standard. Type designation and core identification of cables shall be as per relevant Indian Standard.

All cables shall be new without any kind of visible damage. The manufacturers name, insulating materials, conductor size, voltage class and IS mark shall be marked on the surface of the cable at every 600mm length.

The cable shall be supplied in single length i.e. without any intermediate joint. The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practice.

Cable shall be laid in the routes as directed by in charge Electrical Engineer.

Cable running indoors shall be laid on walls or ceiling as per the site situation. Cables shall be fixed directly to wall or ceiling and supported with G.I. saddles / clamps at not more than 500 mm. interval with chrome plated screws.

In case of cables buried directly in ground, cables shall be laid in an excavated trench not less than 900 mm

from G.L., over a sand or soft earth cushion to provide protection against abrasion.

In case cables entering the building or one room to another it would be done through porcelain / PVC pipes. After erection the pipes shall be sealed with M-seal.

TRENCH.

The Trench for laying of cable should have width of 90cms. Deep. The trench should be so excavated for laying of cable 90cms below the ground all over the run and back filling the same and making the surface as normal ground.

DWC PIPE 50 MM:

- Double Wall Corrugated Pipes of HDPE.
- High Density Polyethylene (HDPE) material.
- Dimension OD 50mm & ID 38 mm ,
- Min bending 700 & Id of coil 1400.
- Compression strength at 5% applied Defection load 2450N.
- While bent at a bending radus given In Dimension 95% of ID passes smothly at room temperature & -5 'C.
- Impect strength 5 kg Striker Falling through a height of 570 mm Energy -28 Joules.

RIGID PVC PIPE

The ISI mark rigid PVC pipe of suitable size as specified in tender booklet should be erected at road crossing on floor and on wall as directed for laying of cable. The pipes of suitable size of dia as specified in tender should have specified weight per 6 Mtr. As mentioned for suitable class

BRASS CABLE GLAND & LUG

Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used.

Crimping shall be done with the help of hydraulically operated crimping tool.
For joints where by cable is with aluminium conductor and busbars are aluminium, bimetallic lugs shall be used with compound. CUPAL type of washers shall be used.
Crimping tool shall be used for crimping any size of cable.

EARTHING:

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 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.(a) For Electrical Installation up to 440V in normal soil.

BARE COPPER WIRE.

The bare copper wire of 8 to 16 SWG should be annealed & erected for earthing purpose as directed and as required confirming to IS specification.

WATER COOLER-80 TO 150 LITRES CAPACITY:

The water cooler shall be with hermetic sealed type suction cooled compressor with overload protection confirming to IS:10627 (Part-1) 1983.

The water tank of cooler shall be fabricated from S.S. sheet of 0.8mm. minimum thickness as per IS:304 and shall be made by electrically seam welded lap joints. Water tank cover and lid bottom shall be made of 1.25mm. aluminium sheet duly anodized/epoxy painted high impact polystyrene (HIP) of 1.5mm. thickness. Double locking of the lid shall be provided.

The cabinet of the water cooler shall be made of M.S. Sheet of 1.0m. thick. The drain pan of water cooler shall be made of stainless-steel sheet of 0.63mm. The drain shall be 'CSR' or 'PSC'. Water cooler shall be installed as per the instruction of in-charge-electrical engineer. Necessary plumbing connection to inlet and outlet of water cooler by using necessary G.I. pipe and fittings, PVC heavy duty connection pipes with male and female screwed nipples etc. shall be done and made waterproof without any leakage.

The general specification given in the tender booklet shall also be considered as a part of agreement. The Water cooler shall be of approved make as specified in the tender booklet.

WATER FILTER CUM PURIFIER

The water filter Cum purifier shall be with ultraviolet technology (Sintex silver line model or equivalent symphony / crystal / vide cone model)

The general specification given in the tender booklet shall also be considered as a part of agreement. The Water filter cum purifier shall be of approved make as specified in the tender booklet.

Solar Street Light :-

Product Summary:
All in One Solar Street Light is a new age and compact lighting solution integrating Solar panels, LED light, a Lithium-based battery, and a PIR motion sensor. This light incorporates proprietary ielecssol LED driver technology which combines world-class battery charging technology with high efficient microprocessor-based electronics. All in One Solar Street Light uses a PIR motion sensor to adjust the LED light brightness. If no movement is detected for more than 1 minute, the brightness is reduced to one-third. This intelligent brightness control coupled with maintenance- free Lithium-based battery technology provides longer backup time and better battery life. Due to its compact size, this light can be easily mounted on a pole top by anyone. The light has automatic dusk to dawn operation and needs negligible maintenance once installed. The All in One Solar Street Light uses high-quality material and is designed as per Indian environments.

Specifications:
LED Wattage – 30W
Solar Panel – 100 Watt Mono Perc
Battery – 12.8V, 42Ah Lithium Ferro phosphate Battery
Motion Sensor – Provided
PIR Motion Sensor -12M Range
Autonomy – 18Hrs. backup*
Dusk to Dawn Operation (light will be Auto ON-OFF)
Adjustable mounting bracket to change the direction of All in one light
Dimming Operation – Light will glow in the fullbright mode for the rst 4 Hrs, After 4 Hrs. Light will Dim to 33% power and motion sensor for the detection of motion. If any motion is detected 12M area around the, then it will glow in full mode for 2 min, After that, it will again come to 33% power.
Warranty – 18 Months

Indications:
Battery Low indication – Red LED blink
Solar panel charging to Battery indicator – Green LED blink
Full Charge indication – Green LED continuous Glow

Certifications:
Approved by MNRE Lab
IP65 Approved

Recommended Pole length – 5 to 6 Mtr.
Recommended Pole Dia – It should be Below 76MM OD
Dimension L x B x H- (1360 x 340 x 60)mm
Weight – 19kg