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/moulded 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.

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 particular 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.

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

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.

BAKELITE LAMP HOLDER :

The two pin bakelite Lamp Holder with skirt shall be in accordance with ISS. & shall be erected on existing wooden block or 3 mm thick laminated sheet. with necessary connections.

DECORATIVE CALL :

The Call-bell should be of Decorative bell Ting Tong type & Box type operating on 250 V. should be erected on polished wooden block or laminated sheet.

The decorative call bell shall operate satisfactorily with a 10% of over voltage and under voltage considering normal voltage of 230 Volt. The call bell shall be completely erected on existing polished wooden block or laminated sheet by using chrome plated counter shunned head round steel screws. Necessary connection to supply wire shall be made firmly by soldering and necessary sleeking etc.

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

M.C.C.B. :

The triple pole moulded case circuit breaker shall be confirming to ISS and should be of approved category make. The breaking strength of MCCB should be 50 KA at 415 V having normal current rating upto 250 A with variable ltunal & magnetic release suitable to work on A.C. supply, 50 cys. The MCCB should be erected in 16 G.M.S. housing with suitable size angle in frame as per instruction & direction of Engineer in charge complete with all intend connection.

BUSBAR CHAMBERS :

The busbar chamber and busbar shall conform IS:375. The busbar chamber shall be fabricated with sheet steel of thickness not less than 3mm. having hinged doors. The chamber shall be made dust and vermin proof with th help of synthetic neoprene rubber gasket on all sides. The cover/door shall be secured to the box with cadmium plated iron screws. The busbar chamber shall be painted with a coat of primer red oxide paint and finished with two coats of enamel paint of approved shade.

The busbar shall be air insulated and made of high quality, conductivity and strength copper/alluminium as specified conforming to relevant Indian Standards and shall be of sufficient cross section as specified. The busbar shall be of 3 phases and neutral system with separate neutral and earth bar. The cross section of the neutral busbar shall be the same as that of the phase busbar for the capacities upto 200 Amp. and for higher capacities the neutral busbar must not be less than half the cross section of the phase busbar. The busbars shall be of rectangular cross-section designed to withstand full load current at the rated voltage. The busbar shall have uniform cross section throughout the length. The busbar shall be warped with coloured heat shrinkable insulated PVC sleeves/tape.

The busbar shall be firmly fixed on supports constructed from a suitable insulated materials such as phonolic lamination/DMC. The busbar supports shall be unbreakable, non-hygroscopic and sufficiently robust to withstand electro mechanical stresses produced in the event of short circuit. The busbar supports shall be placed at sufficiently close intervals to prevent busbar sag.

The minimum clearance to be maintained for rated voltages upto 600 volts shall be between phase to phase 32 mm. and phase to earth 25mm. The busbar shall be isolated with 3 mm. bakelite sheet to avoid any accidental contact.

The Connections to busbar of ratings more than 200 Amp. shall be made with clamping arrangement with bolts and nuts and for busbar of smaller ratings, use of holes drilled into the busbar shall be made. The bolts and nuts used for connections to busbar shall be of aluminium alloy or

tinned forged brass or tinned copper. Suitable precaution shall be taken against heating due to bimetallic contact. Tapping of connections from busbar shall be made with PVC insulated wire of suitable size for current capacities upto 100 Amp. and for higher current capacities solid conductor strip suitably insulated with PVC sleeve tape with soldered or crimped lugs.

The busbar chamber shall be erected on wall on polished teak wood block of width minimum 25mm. or on angle iron frame as specified and directed.

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

METAL CLAD DISTRIBUTION BOARDS :

The Metal Clad Distribution Boards shall have incoming of MCB 40 Amp double pole switch & out going MCB of 6 Amp to 32 Amp, operating & short circuit tripping elements of breaking capacity of10 KA conforming to ISS 8828/1996 with ISI Mark suitable size of neutral link of tinned copper busbar link with all necessary interconnecting. MCB should be erected in surface type in 16 G MS sheet cover complete suitable integral single piece construction with suitable category mentioned in tender schedule ''B'' and approved make as per list of tender booklet should be given on angle iron frame with necessary earthing.

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

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.

SEGMENT 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.

Supplying and erecting approved make time switch with single pole airbreak contacts suitable for 230 V.15/16A. complete with self starting motor driven clock 'ON' & 'OFF' automatic arrangement at any predetermined time during each 24 hours With nickle cadmium rechargable battery backup erected as directed. The approved make time switch with single pole air break contacts shall be suitable for 230 volts, with 15/16 Amp.

The timer switch having self starting motor driver clock .ON. & .OFF. automatic arrangement at any predetermined time during each 24 hours with nickle cadmium rechargeable battery backup erected in M.S. Box with locking arrangement. The timer switch shall be connected with necessary cable connection and having 1(One) year guarantee from the date of installation for any type of failure. The timer switch shall be approved before installation on site and the guarantee of fittings are one year after installation the such fittings for any failure, the contractor shall be responsible to repair or replace the same at his own cost. The rate shall be for a unit of One No.

DANGER NOTICE BOARD :

The danger notice board shall be as per IS:2557 Danger notice plates. The danger notice board shall indicate danger notice both Hindi and English and with a sign of skull and bone. Overall dimension of the board shall be 200mm. wide 150mm. high, 1.5mm. minimum thickness prepared from M.S. steel sheet. The plate shall be painted white with vitreous enameled paint on both front and rear surface of the plate. The letter, the figure, the conventional skull and bone shall be in signal red colour as per IS:5/1978 and shall be positioned on the plate as per IS:2551 - 1982. The danger plate shall have rounded corners. The danger notice board shall be affixed in a permanent manner with screwing with the help of chrome plate screws on four corners at the place and height 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.

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.

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STEEL COVER:

The steel cover cupboard should be manufactured from 14 SWG M.S. Sheet complete with locking arrangement and with lock and duplicate keys per cupboard and door handles. It should be erected with necessary support on wall with applying necessary support on wall with applying necessary red oxide and good quality of paint as directed and as per requirement & as per drawing attached.

XLPE PVC INSULATED CABLE 2, 3, 3½ & 4 core :

Scope :- 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.

Materials :- 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.

General :- 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.

Installation :- 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.

BRASS CABLE GLAND & LUG :

The cable gland shall be of polished brass, double compression type and ends shall be shrouded. The inner size of gland should be suitable to received suitable size of cables. The cable glands shall be heavy duty and shall be fixed with switch fuse unit with suitable brass washers with rubber ring/gasket.

The gland shall be erected with outgoing tails, insulating tape etc. complete in appropriate manner. The contractor shall drill holes for fixing glands.

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 be connected with 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.

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.

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.

LAMINATED SHEET COVER :

The laminated sheet shall be 2.5 mm. thick and erected to cover the fan hook or M.S. Box.

INDUSTRIAL EXCHAUST FAN :

The Industrial Exhaust fan shall conform Indian Standard Specification No. IS:2312-1991.

The exhaust fan shall be suitable for heavy duty with double ball bearing have a strong and robust motor with low power consumption and aerodynamic blades, low loss iron stampings.

The fan shall be suitable for operation on electric single phase A.C., 230 volt, 50 Hz power supply system. The enclosure of the fan motor shall be of the totally enclosed type. Stampings of fan motors shall be made from electrical steel sheet. The fan shall be fitted with two or more well balanced blades made from metal or other suitable materials. The blades and blade carriers shall be securely fixed so that they do not loosen in operation. Proper type of lubrication ball bearings shall be used to ensure a reasonable amount of silent operation. The means provided for securing the fan mounting or fan casing to a wall, partition or window shall be such as to provide a secure fixing without damage. The suitable size of capacitor complying IS: 1709-1960 shall be used.

The exhaust fan shall have mounted ring to give maximum volume under free air flow condition. The size in diameter air displacement capacity in m3/hour and speed of motor in rpm. and power consumption in watts shall be as specified.

The exhaust fan shall be erected in window or wall as per the instruction of in-charge electrical engineer.

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

M.S.LOURVE SHUTTER :

The Lourve shutter shall be of mild steel with powder coated finish. The size of shutter shall be as per the size of exhaust fan. The lourve shutter shall opens and shuts simultaneously with the 'ON' and 'OFF' of the fan due to air pressure.

The louver shutter shall be fitted on exhaust fan 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.

TERMINAL BOARD :

The terminal board of size as mentioned in tender should be of bakelite sheet with 15A kitkat pattern porcelain fuse unit. The terminal board should be suitable for erection on pole with suitable clamp of size 25mm x 3mm, brass stud with nuts, washer, etc. as required and as directed on site.

C.C. FOUNDATION FOR POLES :

The Cement concrete foundation shall be prepared in accordance with current specifications and as per instruction of in-charge-electrical engineer. The depth of pit shall very with planting depth of pole (length below ground) as per IS:2713-1964. The planting depth shall be 1.25M. for 7.5 M. pole, k1.50M. for 8.0M. to 9.0M. pole, 1.8dM for 9.5M. to 11.0dM pole and 2.00M for 12.00M. pole. The cross-section of pit shall be 600mm. x 600m. The C.C. foundation shall be started from the base plate of the pole and shall be filled upto depth of 150mm. below the ground level. Cement concrete mixture shall be prepared in the ratio of 1 part cement : 2 parts course sand : 4 parts gravel of 19mm. size. The cement concrete foundation shall be made in presence of representative of in-charge-electrical engineer. The C.C. shall be protected from premature drying by cluring for at least 7 days after pouring it with regular interval of time as instructed.

The pole shall be covered above the ground level by plinth of 30cm. x 30cm. x 30cm. of bricks shall be prepared as specified. The plinth shall be prepared with cement mortar containing 1 part cement : 3 parts of fine cement. The smooth plaster shall be prepared with minimum thickness of 150mm. to outer side and top surface. Necessary white washing shall be made after proper curing of plinth.

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.

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.

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

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)

INDICATING 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.

STREET LIGHT :

Supplying & erecting water tight M.S.Box of size 20 x 15 x 15 cms. to erect suitable kitkat fuse/ MCB to be erected on polished wooden board inside the box with hinged/ sliding door with rubber rings and erected on pole with suitable pole clamp, all duly painted with one coat of red oxide and two coats of paints (Cost of Fuse/ MCB shall be taken extra) The box shall be fabricated from 14 SWG CRCA sheet and shall have IP6J protection. The M. S. Box shall be suitable to install M.C.B with proper situation on polished wooden board. The box shall be with hinged doors with water proof rubber rings and shall be erected on R.C.C. pole with suitable heavy duty clamps with bolts, nuts and washers. The box and clamps shall be paint with one coat of red oxide and two coats of Alluminium paints. The rate shall be for a unit of One No.

Miniature circuit breaker single pole 6A to 32 A suitable to operate on 240 V AC system and having breaking capacity 10 KA to be erected in existing box confirming to IS 8828/ 1996 with ISI mark.- Cat.III The single pole miniature circuit breaker shall be 6 Amp to 32 Amp to operate on 240 volts A.C. system having breaking capacity of 10 KA. The M.C.B shall be erected in existing box with necessary fixing arrangement. The M.C.B. shall be confirming to IS 8828/ 1996 with ISI Mark. The M.C.B. shall be Siemens/ Havells/ L& T make only and shall be approved before installation on site and the guarantee of fittings are one year after installation the fittings, any failure shall be responsible to repair or replace for one year from the date of commissioning.

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.

TELEPHONE CABLE:

The unarmored cable of 0.6 mm thick tinned electrolytic grade copper conductor insulated and sheathed with PVC compound. The cable should confirm to BS 6746 with twisted pairs bunched together
In concertic layers. The telephone wiring should confirm to ITD S/WS
113 C/S/WS -114 CBC 7000 in existing pipe.

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.

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 overload 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.

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.

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.

LED INDDOR FITTING:

- The **supply voltage** or voltages assigned to the luminaire by the manufacturer.
- The **current** at the supply terminals when the luminaire has stabilized in normal use at the rated voltage and frequency.
- The number and rated wattage of the lamps. for which the luminaire is designed.

- The temperature assigned to a luminaire by the manufacturer to indicate the highest sustained temperature in which the luminaire may be operated under normal conditions.Symbol : **ta**.

- A ballast generally designed to be built into a luminaire but incapable of being mounted outside a luminaire without special precautions.

- Wiring generally inside the luminaire and delivered with it, which forms the connection between terminals for external wiring or supply cables and terminals of lampholders, switches and similar components.

- LED indoor fittings with LEDs of wattage **0.2 Watt to 0.5** Watt assembled on single MCPCB.

- Housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA polyester powder coated and high U.V. & corrosion resistance with diffuser and/or Polycarbonate optics with company mark/name 120 to 300 V,Power Factor more than 0.9, THD < 10 %, CCT 4000 K to 6500K, Uniformity ratio >0.7, Luminaire efficiency> 85 lumens/watt, LED driver efficiency > 85 % CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ Bridgelux (U.S.A.) make LED used for luminaire.

LED OUTDOOR FITTING :

- The **supply voltage** or voltages assigned to the luminaire by the manufacturer.

- The **current** at the supply terminals when the luminaire has stabilized in normal use at the rated voltage and frequency.

- The number and rated wattage of the lamps. for which the luminaire is designed.

- The temperature assigned to a luminaire by the manufacturer to indicate the highest sustained temperature in which the luminaire may be operated under normal conditions.Symbol : **ta**.

- A ballast generally designed to be built into a luminaire but incapable of being mounted outside a luminaire without special precautions.

- Wiring generally inside the luminaire and delivered with it, which forms the connection between terminals for external wiring or supply cables and terminals of lampholders, switches and similar components.

- LED outdoor fittings with LEDs of wattage 1Watt and above assembled on single MCPCB.

- efficiency more than 130 lm/w.

- 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 company mark/name engraved or embossed 120 to 300 V,Power Factor more than 0.95, THD < 10 %, CCT 5000 K to 5700K, Uniformity ratio >0.45, Luminaire efficiency> 85 lumens/watt . LED

driver efficiency > 85 %. CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ BridgeLux (U.S.A.) make LED used for luminaire.

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.

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 whereby 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.

DMC BOX & Bakelite connector :

Streetlight / wall mounting junction box compression molded from DMC (thermoset plastic) vertical sliding cover having locking with square head stud loop in / loop out in built terminal suitable for four core cable, waterproof of I.P. 54 protected with clamp or bolt nut & earth bolt of following size

1) 400 mm x 300 mm x 190 mm
2) 140 mm x 140 mm x 95 mm
3) 103 mm x 103 mm x 73 mm

CAT EYE :

made out acrylic styrene -acrylonitrile or high impact poly stern fitted with molded of methacrylate

(MNC) reflector cube corner reflector design CAT EYE

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.

WALL MOUNTED TYPE SPLIT AIR CONDITIONING :

Supply of nominal capacity air cooled wall mounted split AC of Voltas/Blue star /Daikin make with all accessories etc. complete as per the directions & instructions. Entire job includes the following:

a) Installation, testing and commissioning of following nominal capacity 2star / split / window units along with first charge of refrigerant gas and oil, vibration isolation pads etc.

b) 2 TR wall mounted split arc. .of Voltas / Blue Star/ Daikin make including scaffolding etc. complete

c) Hard Copper Refrigerant Piping between unit and air-cooled condenser of 5/8" Día & 1 1/8" die duly insulated

d) Electrical Cabling between indoor and outdoor units 6sqmm C x 1.5 sqmm (CU) with 10 SWG Earthing

e) M.S. Framework on terrace/ outside the premises for air-cooled condensers including the m.s. security grills/ catwalk fabrication work including all necessary civil required for with anchor fastener ,brackets for installation of Condensing Units of Voltas / Blue Star make including scaffolding etc. complete.

f) PVC drain piping of 25mm / 40mm dia duly connected to the external rain water pipe outlets including scaffolding etc. complete.

g) Necessary alterations to the existing t aluminum window shutter , glazing and frame work

including the civil work etc. complete in order to make it complete water and air tight.

FLOOR RACEWAY SYSTEM :

Floor raceway of hot dip galvanized / aluminum 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 raceways shall be laid with use of junction boxes fabricated from 14 g hot dip GI as per drawing.

CABLE TRAYS :

Cable trays shall be fabricated from Hot Dip GI and channels of 14 gauge and shall be powder coated
with 7 tank process if specified. The design shall be ladder type with optional cover. Shall be fixed or suspended from the ceiling with the help of suspenders which shall have adequate diameter to sustain the weight of the cables and channels. Also, if necessary anchor fasteners shall be used for grouting purpose.

The cable shall be laid side by side in trench with brick covering on all the three sides. The trench shall be such that sharp bends shall be avoided while laying the cable. The bedding of fine sand under the cable shall be not less than 6 mm. The trench shall be terminated in Manholes with specified size of R.C.C. hume pipes as shown in drawing. Cable markers shall be provided throughout the route of cable at 10 mtrs distance. The trenches shall be refilled after the cable are laid and the Ground level shall be done as per original after pressing the same. The cables shall be checked for insulation resistance and continuity tests shall be carried out.

CCTV CAMERA :

This specification covers the design, supply installation, testing & commissioning of the CCTV system for the whole premise.

The contractor shall supply and install CCTV system with all necessary accessories. The CCTV
System shall comprise of Dome Cameras, Varifocal /fixed lens Dome Cameras, Digital Multiplex Video Recorder, Monitor, Switcher etc. and other associated accessories.

The Outdoor Weather Proof Camera shall have built in 2.3 to 12mm Varifocal / fixed lens. The complete unit shall be housed in a Weather proof enclosure with integrated dome and base unit, both preferably made from injection moulded plastic. It shall be possible to adjust the camera head inside the dome in both the planes so that it can be wall and ceiling mounted. The camera shall operate on Dual Switching Power 24 V AC or 12 volts D.C.

The Fixed Dome Camera shall have built-in 3.6mm focal lens. The complete unit shall be housed in a

integrated dome and base unit, both preferably made from injection moulded plastic. It shall be possible to adjust the camera head inside the dome in both the planes so that it can be wall and ceiling mounted. The camera shall operate on Dual Switching Power 24 V AC or 12 volts D.C.

VARIOUS CODES FOR ELECTRICAL WORKS

APPLICABLE IS STANDARDS

1.	METERS (MEASURING) FOR ANALOG METERS	IS:1248-1986
2.	INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
3.	CODE OF PRACTICE FOR EARTHING	IS:3043
4.	H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
5.	SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
6.	GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4237-1967
7.	DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:2147-1962
8.	INSULATED CONDUCTOR RATING	IS:8084-1972
9.	ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:2675-1983
10.	MINIATURE CIRCUIT BREAKER	IS:8828-1978
11.	FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:9926-1981
12.	PVC INSULATED ELECTRIC CABLES HEAVY DUTY	IS:1554 (PART I)
13.	RECOMMENDED CURRENT RATING FOR CABLES	IS:3961(PART II)
14.	COPPER CONDUCTOR IN INSULATED CABLES AND CORES	IS:2982
15.	CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:8130
16.	MILD STEEL WIRES, STRIPS AND TAPES FOR ARMOURING CABLES	IS:3975
17.	PVC INSULATION AND SHEATH OF ELECTRIC CABLES	IS:5831
18.	ALUMINIUM CONDUCTOR FOR INSULATED CABLES	IS:1753
19.	PVC INSULATED AND PVC SHEATHED SOLID ALUMINIUM CONDUCTOR CABLES OF VOLTAGE RATING NOT EXCEEDING 1100 VOLTS	IS:4288
20.	RECOMMENDED CURRENT RATING FOR CABLE	IS: 961
21.	CODE OF PRACTICE FOR ELECTRICAL WIRING INSTALLATION SYSTEM VOLTAGE NOT EXCEEDING 650 VOLTS	IS: 732
22.	CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS GENERAL)ELECTRICAL INSTALLATION	IS: 1646
23.	RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:1653
24.	FITTINGS FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:2667
25.	FLEXIBLE STEEL CONDUIT FOR ELECTRICAL WIRING	IS:3480

26.	ACCESSORIES FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:3837
27.	PVC INSULATED CABLES (WIRES)	IS:694
28.	RIGID NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:2509
29.	FLEXIBLE (PLAYABLE) NON-METALLIC CONDUITS FOR ELECTRICAL INSTALLATION	IS:6946
30.	THREE PIN PLUGS AND SOCKETS	IS:1293
31.	CONDUCTORS FOR INSULATED ELECTRICAL CABLES AND FLEXIBLE CODES	IS:8180
32.	SPECIFICATION FOR CONDUIT FOR ELECTRICAL INSTALLATION	IS:9537-1980
33.	ACCESSORIES FOR NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:3419
34.	SWITCHES7	IS:3854
35.	PLUGS	IS:6538
36.	SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954
37.	HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
38.	GENERAL AND SAFETY REQUIREMENT FOR LIGHTING FITTINGS	IS:1913-1969
39.	CODE OF PRACTICE FOR LIGHTING PUBLIC THOROUGH FARES	IS:2944-1981
40.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS:3528
41.	WATER TIGHT ELECTRIC LIGHTING FITTING	IS:3553-1966
42.	MILD STEEL TUBULAR AND OTHER WROUGHT STEEL PIPE FITTING	IS:1239-1958
43.	LUMINARIES FOR STREET LIGHT	IS:2149-1970
44.	HRC FUSES HAVING RUPTURING CAPACITY OF 90 KA	IS:9224
45.	EXHAUST FAN	IS:2312-1967
46.	CLASS I CEILING FAN	IS:374-1979
47.	DANGER NOTICE BOARDS	IS: 2551
48.	CABINETS AND BOXES	UL 50