

applies to 250volts grade able The columns headed 'S' apply to runs of conduit which have distance not exceeding 4.2SM between draw in boxes, and which do not deflect from the straight by angle of more than 15° The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15°

- NOTE-2** In case if inspection type draw-in box has been provided and if the cable is first drawn through one straight conduit, then through the drawn box, and then through the second straight conduit, such systems may be considered as that of a straight conduit even if the conduit deflects through the straight by more than 15°.
- 25.1.4 Protection against dampness** - in order to minimize condensation or seatin inside the tube, all outlets of conduit system, shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects as far as possible
- 25.1.5 Protection of conduit against rust** - The outer surface of the conduit pipes including all bends, unions, tees junction boxes; etc., forming part of the conduit system shall be adequately protected against rust particularly when such system is exposed to weather in all cases no bare threaded portion of conduit pipe shall be allowed unless such bare threaded portion is treated with anti-corrosive preservative or covered with approved plastic compound.
- 25.1.6 Fixing of conduit** - Conduit popes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or any other approved plug with screws in an approved manner at an interval of not ore than one metre but on either side of couplers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm. from the centre of such fittings.
- 25.1.7 Bends in conduit** - All necessary bends in the system including diversion shall be done bending pipes, or by insuring suitable solid or inspection type normal bends, elbows or similar fittings or by fixing cast iron inspection boxes whichever is more suitable. Conduit fitting shall be avoided as far as possible. On conduit system exposed to weather, where necessary, said type fitting shaft be used. Radius of such bends in conduit pipes shall be not less than 7.5 cm. No length of conduit shall have more than the equivalent of four quarter bends from outlet, the bends at the outlets not being counted..
- 25.1.8 Outlets** - All outlets for fitting switches etc., shall be boxes, of suitable metal or any other approved outlet boxes for other surface mounting or flush mounting system.
- 25.1.9 Conductors** - All conductors used in conduits wirings shall preferably be stranded. No single core cable or nominal Cross - sectional area greater than 130 mm shall be enclosed In a conduit and used for alternating current.
- 25.1.10 Erection and earthing of conduit** - The conduit of each circuit or section shall be completed before „ conductors are drawn in. The entire system of conduit and permanently connected to earth conforming to the requirements specified under pipe in a workman like manner for a perfect continuity between each wire and conduit. Gas or water pipes shall not be used as earth medium. If conduit pipes are liable to mechanical damage, they shall be adequately protected.
- 25.2 Recessed Conduit wiring system with Rigid Steel conduits** - Recessed conduit wiring system shall comply with all the requirements for surface conduit wiring system specified in 6.5.2.1 to 6.5.2.4.
- 25.2.1 Making of chase** - The chase in the wall shall be neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired In the case of buildings under construction, chases shall be provided in the wall, ceiling etc., at the time of their construction and shall be filled up neatly after erection of conduit and brought to the original finish of the wall.
- 25.2.2 Fixing of conduit in chase** - The conduit pipe shall be fixed by means of staples or by means sof saddles not more than 60 cm. apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with a lunge radius which will permit easy drawing in of conductors. All threaded joints of rigid steel conduit shall be treated with some approved preservative compound to secure protection against rust.
- 25.2.3 Inspection boxes** - Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be mounted flush with the wall Suitable ventilating holes shall be provided in the inspection box covers.
- 25.2.4 Type of accessories to be used** - AM outlets such as switches and wall sockets, shall be either of flush mounting type or surface mounting type.
- (a) Flush mounting type** - All flush mounting outlets shall be of cast iron mild steel boxes with a cover of approved insulating material or shall be a box made of a suitable insulating material. The switches and other outlets shall be mounted on such boxes as would be approved. The mettal box shall be efficiently earthed with conduit by an approved means of earth attachment.
- (b) Surface mounting type** - If surface mounting type outlet box is specified, it shall be of any be through flexible conudits of the same size as the rigid conduit.
- 25.3 ConduitWiring System with Rigid Non-Metallic Conduits:**
Rigid Non-Metallic conduits are used for surface, recessed and concealed conduit wiring.
- 25.3.1 Type and size** - All non-metallic conduits used shall conform to IS : 2509-1963adb shall be used with the corresponding accessories (See IS : 3419-1965) specification for Fittings for Rigid Non - Mtailic Conduits).
- 25.3.2 Bunching off cables** - Conductors of AC supply and DC supply shall be bunched in separate conduits. The number of insulated cables that may tie drawn into the conduits are iveri in Table III. In this table space factor does not exceed 40 percent.

TABLE-III MAXIMUM PERMISSIBLE NUMBER OF 70 VOLTS GRADE SINGLE, GORE CABLE THAT MAY BE DRAWN INTO RIGID non-metallic conduits

Size of cable Nominal Cross sectional area mm ²	Number and	Size of Conduits (mm)					
		16	20	25 (Number of Cables Max)	32	40	50
1.0	1/1.12*	5	7	13	20	-	-
1.5	1/1.40	4	6	10	14	-	-
2.5	1/1.80	3	5	10	14	-	-
	3/1.06*						
4	1/2.24	2	3	6	10	14	-
	7/0.85*						
6	1/2.80	-	2	5	8	11	-
10	1/3.55*	-	-	4	7	9	-
	7/1.40*						
16	7-1.70	-	-	2	4	5	15
25	7/2.24	-	-	-	4	2	5
35	7/2.50	-	-	-	-	2	5
50	7/3.00*)	-	-	-	-	2	3
	19/1.80						

* For copper conductors only.

* For aluminium conductors only.

25.3.3 Conduit joints - shall be joined by means of screwed or plain couplers depending on whether the conduits are screwed or plain. Where there are long runs of straight conduit. Inspection type couplers shall be provided at intervals. For conduit fittings and accessories reference may be made to IS : 3419-1965.

25.3.4 Fixing of conduits - The provision of 25.1.6 shall apply except that the spacing between saddles or supports is recommended to be 60 cms for rigid non-metallic conduits.

25.3.5 Bends in conduit - wherever necessary, bends or diversions may be achieved by bending the conduits (See 6.5.3.9) or by employing normal bends, inspection bends, inspection boxes elbows or similar fittings.

25.3.6 Conduit fittings shall be avoided, as far as possible on outdoor system.

25.3.7 Outlets - All the outlets or fittings, switches, etc. shall be boxes of substantial construction. In order to minimise condensation or sweating inside inside the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, etc. as far as possible.

25.3.8 For use with recessed conduit wiring system the provisions of 6.5.2.1 to 6.5.2.4 shall apply

25.3.9 Heat may be used to soften conduit for bending and forming joints in case of plastic conduits. As the material softens when heated, fitting of conduit in close proximity to hot surfaces should be avoided. Caution should be exercised in the use of the conduit in locations where the ambient temperature is 500 C or above Use of such conduits in place where ambient temperature is 600 C or above is prohibited.

PVC INSULATED AND P.V. C. sheathed or T.R.S wiring SYSTEM

26.0 GENERAL

- This system of wiring is suitable for low pressure installation and shall not be used in places exposed to sun and rain nor in damp places, provided they are sheathed in the special approved protective covering and well protected to withstand dampness.

26.1 Attachment to walls and ceiling :

26.1.1 All cables on brick walls, stone or plastered walls and ceiling shall be run on well seasoned perfectly straight and well seasoned, perfectly straight and well varnished on four sides, teak wood or any approved hardwood battens not less than 10 mm in thickness, width of which shall be such as to suit total width of cables laid on the batten, prior to election, these shall be painted with one coat of varnish or approved paint of colour to match with surrounding. These battens shall be secured to wall and ceilings by flat head wood screws to false plug or phill plug at an interval not exceeding 75 cm. Wood plug can be used only with special approval of the Engineer in charge. The flat head wood screws shall be counter within wood batten and smoothed down with file.

26.1.2 Where wiring is to be carried out along the face of the rolled steel joists a wooden batten of adequate width shall first be laid on the same and dipped to it as inconspicuously as possible. The wiring should then be fixed to this batten shall be suitable bushes to prevent the abrasion of the cables.

26.1.3 Attachment to false ceiling : In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-in-charge

26.20 Link clips : Only aluminium alloy clips/joint clips shall be used. The thickness shall be 0.32 mm (30 SWG) for lengths of 50 mm to 80 mm. The width shall not be less than 8 mm in all these cases. Link clips/joint clips shall be so arranged that one single clip shall not hold more than two core or three single core T&S of PVC insulated and PVC sheathed upto 2.5 sq. mm above while a single clip shall hold a single twin core or two single core cables. The clips shall be fixed on varnished wood batten with iron pins and space at interval of 15 cm both in the case of horizontal and vertical runs.

26.3.0 Bends in wiring : The wiring shall not in circumstances be bent so as to form an abrupt right angle but must

- be rounded off at the corners to a radius not less than six times the overall diameter of the cable.
- 26.4.0 Protection of wiring from Mechanical Damage:**
- 26.4.1** In cases where there are chances of any damage to wiring such wiring shall be drawn complying with all the requirements of conduit wiring system.
- 26.4.2** Such protective covering shall in all cases be fitted on all down drops within 1.5m from the floor, or from floor level upto the switch board whichever is less.
- 26.5.0 Passing through floors :** All cables taken through floor shall be enclosed in heavy gauge steel conduit extending 1.5m above the floor or upto the switch board whenever is less and flush conduits or pipes shall be neatly bushed with porcelain wood or other approved material. The conduit pipes shall be security earthed.
- 26.6.0 Passing through walls :** When conductors pass through walls, any one of the following methods shall be employed. Care should be taken to see that Wires pass very freely through protective pipe or box and that employed. Care should be taken to see that Wires pass very freely through protective pipe or box and that wires pass through in a straight line without any twist or cross in wires on their ends of such holds.
- (a) A box of teak wood or approved hard wood extended through the hole thickness of the wall shall be buried in the wall and casings or conductors and casing or conductors shall be carried so as to allow 1.3 cm air space on the three sides of the casing of the conductor.
- (b) The conductors shall be carried in an approved heavy gauge solid drawn or lap weld conduit or in a portion of such a size that it permits easy drawing in, the end of conduit shall be neatly bushed with porcelain, wood or other approved material.
- 26.6.1** Where a wall tube passed outside a building so as to be exposed to weather, the outer end shall be mounted and angled downwards and properly bushed at the open end. The conduit shall be neatly arranged so that the cables enter them without bending.
- 26.7.0 Buried cables :** The TRS PVC sheathed cable shall not normally be buried directly in plaster. Where so specified in the special in the specification they may be taken in teak wood channeling of ample capacity or conduit pipe buried in the wall.
- 26.8.0 Stripping of outer covering :** While cutting and stripping of the outer covering of the cable shall be taken that the sharp edge of the cutting instrument does not touch the inner insulation of the conductors. The protective outer covering of the cables shall be stripped off near connecting terminals as far as practicable. Care shall be taken to avoid hammering on link clips with any metal instrument after the cables are laid. Where junction boxes are provided they shall be made moisture proof with a plastic compound.
- 27.0 PAINTING WORK IN GENERAL :**
- 27.1 Paints :** paints, oils varnishes etc. of approved make in original to the satisfaction of the Engineer-in-charge shall only be used.
- 27.2 Preparation of surface :** The surface shall be thoroughly cleaned and dusted before painting is started. The proposed surface shall be inspected by Engineer-in-charge or his authorised agent and shall have received the approval before painting is commenced.
- 27.3 Application :** Paint shall be applied with brush. The paint shall be spread as smooth & even as possible particular care shall be paid to revets, rivets bolts and cover lapping. Before drawing cut, it shall be continuously stirred in the sashier containers with a smooth stick while it is being applied. Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied.
- 27.4 Scope :** painting on old surface in indoor situations will not include prior coat except where specially mentioned in the schedule of work or special specification. However, where rust has formed on iron and steel surfaces the spots will be painted with one anti-rust primer coat.
- 27.5 Precautions :** All furniture fixtures, glazing floors, etc. shall be protected by covering. All stains smears, oil, shirig, dropping of every kind shall be removed. While painting of wiring etc. it shall be ensured that painting of wall ceiling etc. is not spoiled in any way.
- 27.6 Painting of conduit and accessories :** After installation surface of conduit pipes, fittings switch and regulator boxes, etc. shall be painted with two coats of approved enamel paint or aluminium paint as required to match the finish of surrounding wall, trusser, etc.
- 28. link clip :**
The clip for batten wiring shall be of Aluminium conforming to I.S. specification No. 2415-1975.

APPENDIX - 'A'

Important Clauses of Indian Electricity Rules, 1956. Following clauses of Indian Electricity Rule, 1956 shall in particular be taken care of in the execution of electrical works.

Clause No.	Subject
3. Authorisation :	
29.	Construction, installation, protection, operation and maintenance of electric supply lines and apparatuses.
31.	Cut-out on consumer's premises.
32.	Identification of earthed and earthed neutral conductors and position of switches and cutouts therein.
33.	Earthed terminal on consumer's premises.
34.	Handling of electric supply lines and apparatus.
41.	Distinction of circuits of different voltages.
42.	Accidental charge.
43.	Provisions applicable to protective equipment.
44.	Instruction for restoration of persons suffering from electric shock.
45.	Precautions to be adopted by consumers, owners electrical contractors. Electrical workmen and suppliers.
46.	Periodical inspection and testing of consumer's installation.
48.	Precautions against leakage before connection
50.	Supply to consumers.
51.	Provisions applicable to medium high voltage installations.
58.	Point of commencement of supply.
59.	Precautions against failure of supply; Notice of failures.
61.	Connection with earth, (low and Medium Voltage system.)
64.	Use of energy at high and extra-high voltage system.
67.	Connection with earth. (high & Extra-high voltage system)
68.	General conditions as to transformation and control of energy.
All clauses under Chapter VIII on Overhead Lines.	
137.	Mode of entry.
138.	Penalty for breaking seal.
139.	Penalty for breach of rule 45.
140.	Penalty for breach of rule 82.
141.	Penalty for breach of rules.

Signature of contractor/s

Executive Engineer
Division

APPENDIX - 'B'

Form of Completion Certificate

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief, it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General Specification for Electrical Works, 1972.

Electrical Installation at Voltage and system of supply

(1) Particulars of works :

(a) Internal Electrical Installation	No. Total Load or wiring	Type of system
--------------------------------------	-----------------------------	----------------

- (i) Light point
- (ii) Fan point
- (iii) Plug point
- (a) 3 pin 5 Amp.
- (b) 3 pin 15 Amp.

(b) others :

Description	HP/KW
-------------	-------

(a) Meters : (i)

(ii)

@X1 (iii)

(c) Other plants :

(d) If the work involves installation of over head line/or under ground cable :

- (a) (i) Type & Description of overhead line.
- (ii) Total length & No. of spans,
- (iii) No. of street light & its description
- (b) (i) Total length of under ground cable & its size
- (ii) No. of joint.

End joint :

Toe Join

St. through joint:

2) Earthing :

- (i) Description of earthing electrode
- (ii) No. of earth electrodes :
- (iii) Size of main earth lead :

3) Test Results :

(a) Insulation Resistance:

- (i) Insulation resistance of the whole system
of conductors to earth.

Megohms.

- (ii) Insulation resistance between the
Phase conductors and neutral.

Megohms.

Between phase R and neutral

Megohms

- | | | |
|--|-----------------------------|----------|
| | Between phase R and neutral | Megohoms |
| | Between phase Y and neutral | Megohoms |
| | Between phase B and neutral | Megohoms |
- (iii) Insulation resistance between the phase conductors in case of polyphase supply.
- | | | |
|--|---------------------------|----------|
| | Between phase R & phase Y | Megohoms |
| | Between phase Y & phase B | Megohoms |
| | Between phase B & phase R | Megohoms |
- (b) Polarity Test:
Polarity of non linked single pole brache switches.
- (c) Earth continuity Test:
Maximum resistance between any point in the earth continuity conductor including metal conduits & main earthing lead.
- d) Earth Electrode Resistance.
Resistance of each electrode.
- | | |
|-------|------|
| (i) | Ohms |
| (ii) | ohms |
| (iii) | ohms |
| (iv) | ohms |
- (e) Lighting protective System :
Resistance of the whole of lighting protective system to earth before any bonding is effected with electrode and metal in/on the structure.

ohms

Signature of Supervisor

Signature of Contractor

Name & Address

Name & Address

SPECIFICATIONS

All Specification standard publication etc. specified mean the latest standards, publication etc. pertaining to electrical and should conform to the following wherever applicable.

- 1) Indian Electricity Act. 2003 with its amendments.
- 2) Indian Electricity Rules 1956 and its amendments.
- 3) Indian Electricity supply Act 1948.
- 4) Regulation for Electricity Equipment in building by I.E.F. Landon.
- 5) The Factory Act, 1948 and its amendments.
- 6) I.S. 732-1982 Part -1, II & III code of practice for Electrical wiring and filings in buildings for low and medium voltages
- 7) I.S. 4064-1976 H.D. Air break switches and fuses for Voltages not exceeding 1100 volts.
- 8) I.S. 3043 - Earthing code of practice for
- 9) I.S. - 1554Part-1970 PVC insulated (Heavy duty) Electrical Cables for working voltages upto and incfading 110 volts
- 10) I.S. .694-1964 Part-11 - PVC insulated cable with Aluminium conduits (revised) for voltages upto 110 volts.
- 11) IS: 5908 -1970 - Electrical installations in buildings method of measurements of.
- 12) I.S.: 4237 -1967 - General requirement for switchgear and control gear for voltage not exceeding 1000 volts.
- 13) IS.: 1653 -1964 - rigid steel conduits for electrical wiring (revised)
- 14) IS : 2509 -1973 - Rigid steel conduits for electrical installation (First revision)
- 15) IS : 1248 -1967 - Bayonet landholders (First revision)
- 16) IS : 418 -1957 - Tungston - Filament General service electric lamps (Third revision)
- 17) IS : 374 -1966 - Fans and Regulators, ceiling type, electric (second revision)
- 18) IS : 2667 -1964 - Filings for rigid steel conduits for electrical wiring.
- 19) IS : 3419-1976 - Fining for rigid non-metallic conduits (First revision)
- 20) National Electric Code, 1986.

Signature of contractor/s

Executive Engineer
Division

ANNEXURE-I

Abstract of the Wiring Rules of the Institution of Electrical Engineer

(Referred to in the specification)

DEFINITION (See clause 2 of the Specification)

Systems:

All electrical system in which all the conductor and apparatus are connected to a common source of supply.

- (1) **Earthed:** Effectually connected, to the general mass of the earth. Solidly earthed without the intervention of a fuse, switch, circuit - breaker, resistor reactor or solenoid.
- (2) **Uninsulated Conductor:** A conductor without provision, by the interposition of a dielectric or otherwise, for its insulation from earth.

- (3) **Bare:** Not covered with insulating material.

- (4) **Dielectric:** any material which offers high resistance to the passage of an electric current.

- (5) **Bunch Conductor:** When more than one conductor is contained within a single duct or groove or when they are run enclosed and spaced and not spaced apart from each other.

- (6) **Points:** In wiring as per IS : 5908 -1970 - Method of measurements of electrical installation in buildings.

- (7) **Switch board:** Assemblage of switchgear with or without instruments, but the term does not apply to a group of local switches in a final sub- circuit where each switch has its own insulating base.

Note : In the electricity (Factories Act) special regulations, 1908 and 1944 the term "Switchboard" includes "Distribution board."

- 8) **Single pole switch:** A switch suitable for closing and or opening a circuit on one phase or pole only.

- 9) **Linked switches:** A switch the blades of which are so linked mechanically as to make break all poles simultaneously or in a definite sequence.

- 10) **Fuse Switch:** A switch the moving part of which carries one or more fuses.

- 11) **Three Wire System :**

a) **Outer Conductor :** Those between which there is the greatest difference of potential. This use of the word outer must not be confused with the use of the word when applied to the external conductor of a concentric main.

b) **Neutral Conductors :** The term includes the neutral conductor of a 3 phase 4 wire system, the conductor of a single phase or d. c. installation which is earthed by the supply undertaking (or otherwise at the source of the supply) and the middle wire or common return conductor of a 3 wired.d. c. or single phase a.c. system.

- 12) **Semi enclosed machine :** One in which the ventilating openings in the frame are covered with -

- a) Girds expanded metal or wire gauze, with openings of less than 1/4 inch but not less than so as to obstruct free ventilation.
- b) Wire gauge, in which the openings are less than 1/4 inch but not less than 3/32 inch (diameter or width):
- c) Screens with smaller openings than the above.

- 13) **Totally - enclosed Machine:**

One in which the enclosing case and bearings are dust proof and which does not allow circulation of air between the inside and outside of the case.

- 14) **Pipe Ventilated Machine** : An enclosed machine in which the frame is so arranged that the ventilating air may be conveyed to it through a pipe attached to the frame the ventilation opening maintained by the fanning action produced by the machine - itself.
- 15) **Forced draught machine** : An enclosed machine in which the ventilating air supply is maintained by an independent fan external to the machine itself.
- 16) **Protected Machine** : One having end shields and in which is free access to the interior without opening doors or removing covers.

SWITCHES AND CIRCUIT BREAKERS

(See clause II of Specifications)

17) Switches and Circuit Breakers :

Switches and circuit breakers (rules 2b, 36 and 37) whether fixed separately or combined with lamps, holders or fittings, must comply with the following requirements :

- (a) Overheating must not take place at the point of contact or elsewhere, when the full current flows continuously.
- (b) They must be so constructed or arranged that the contacts cannot accidentally close when left open.
- (c) The basis must be of incombustible, nonconductive and moisture proof material.
- (d) Circuitbreaker as must be so arranged and placed that no combustible material is endangered by their action.
- (e) Unless placed in an engine room or in a compartment arranged for the purpose, they must have their live parts covered. The covers must be of incombustible material and, must be either non-conducting or of rigid metal and clear of all internal machinery. For more than 6 amperes, at pressures exceeding 125 Volts metal covers must be lined with insulating material.
- (f) In positions where they are liable to injure or come into contact with goods, they must be further protected by an open fronted box or other suitable guard.
- (g) Handles must be insulated so arranged that the hand cannot touch live metal, or be injured through and adjacent face blowing.
- (h) Switches having a handle projecting through an opening in the cover, must not be used.

Signature of Contractors

**Executive Engineer
Division**

SECTION F-14 A GENERAL REQUIREMENTS

1.1 Scope of works :

The work covered by electrical specification consists supplying and installing, electrical wiring system complete in strict accordance with this specification and the applicable drawing and subject to the terms and conditions of the contract. It includes . .

- (a) Conduit and wiring system for fans, lighting points bells, clocks sockets, etc. including fixing of lighting fixtures and fans etc. • and miscellaneous points.
- (b) Conduit and wiring system for exhaust fans, power sockets etc.
- (c) Panel boards, distribution boards, switch fuse units.
- (d) Complete power and lighting cable systems.
- (e) Grounding system.
- (f) Conduits system.
- (g) Street lighting system.
- (h) Other miscellaneous electrical work.

1.2 Completeness of Contract:

Any work fittings accessories or apparatus which may not have been specifically mentioned in the specification but which are necessary in the equipment for efficient working of the plant should be deemed to be included in the contract and should be executed and provided by the contractors. All plant and apparatus should be complete in all the details, where such details, are mentioned in the specifications or not.

Three prints and one permanent negative of each of the finally approved drawings incorporating all the modifications proposed by the Department should be submitted. No modifications should be made in a drawing already approved by the Engineer-in-charge without his prior consent.

Approval of the contractor's drawing will not relieve the contractor of any part of his obligation to meet all the requirements of the contract.

1.3 Guarantee:

The performance of all the equipments and the installation should be guaranteed at least a minimum period of one year from the date of taking over the installation by the Department. All equipments must comply with the relevancy IS-BS specifications.

1.4 Interchangeability :

All corresponding parts of similar plant and equipment should be interchangeable in every way.

1.5 Tools:

All special tools required for dismantling and assembly of the equipment covered by the contract shall be supplied as obligation under the contract. ^

A list of to be supplied by the Contractor should be submitted along with the tender.

Signature of contractor/s

Executive Engineer
Division

SECTION F-2A

Specifications for Electrical Installation in Buildings

1. GENERAL:

1.1 These specifications relate to the electrical installations in the buildings of P.W.O. Electrical. The specifications cover general requirements to be fulfilled. These general specifications are supplemented by the specifications for the particular buildings separately attached.

1.2 These specifications are governed by the General conditions of the contract attached hereto.

1.3 APPLICABLE RULES AND REGULATIONS:

1.3.1 Installation shall be carried out conformity with regulations for electrical equipments of buildings, published by the Institute of Electrical Engineers London (14th Edition 1966 and as amended upto date) herein after referred to as the I.E.E. wiring regulations. Where these specifications, or the special specifications for the particular building attached hereto are at variance with the I.E.E. regulation shall also comply with the requirements of the Indian Electricity Act, 1910 as amended upto date rules issued there under and also the regulations for the Electrical Association of India. Where not specified otherwise, the installation should generally follow the Indian standard codes of practice and in their absence the relevant British Standard of practices. All the materials shall comply with the relevant Indian Standard of British Standard specifications.

1.4 DEFINITIONS:

1.4.1. The definitions of terms in the I.E.E. Regulations shall apply in general.

1.5 DRAWINGS:

1.5.1. The preliminary drawings only indicate the general scheme of requirement. The exact position of all points, control switch boxes, runs of wiring and/or conduits joint boxes, inspection boxes, mains, and sub-distribution boards, mains etc. shall be got approved Engineer-in-charge. All circuits shall be clearly numbered in wiring diagrams and building plans. The detailed design of a switch-board, special fixture or any other part of the electric installation as may be called for by the engineer-in-charge shall also be supplied by the Contractor and should be got approved by the Engineer-in-charge. Three sets of completion drawings and wiring diagrams showing the installations as executed shall be supplied by the contractor along with the completion certificate.

1.6 MATERIALS:

All materials shall be new and of the best quality conforming to the relevant I.S.B.S. specifications. They must be the products of reliable manufacturers of many years or standings. All like parts of materials shall be interchangeable. In case of equipments such as circuit breakers, switch fuses etc. a descriptive and illustrated literature shall accompany the tender. The names of manufacturers of various materials shall be furnished in proforma in Appendix-1. Samples of materials wherever required should be deposited with the Engineer-in-charge. All materials shall be rust-proof or rendered rust proof by application of suitable paints. The supply of all equipments, switchgears etc. shall be complete with accessories, filings and mountings as may be required for their proper performance, and as specified in the relevant I.S.-BS Code of Practice and standards.

1.7 WORKMANSHIP:

1.7.1. Good workmanship and neat finished appearance are the prerequisites for complying with the clauses of these specifications. With a view to ensure fine workmanship the tenderers shall employ licensed wiremen with an experience of not less than 5 years in the type of work they are engaged. The work should be done under supervisions of licensed Electrical Supervisors with good educational qualifications and considerable experience.

1.7.2. Tenderers shall furnish the names of Supervisor and their wiremen who will be engaged in this work, with details of their experience.

1.8 CO-OPERATIVE WITH CIVIL AND OTHER WORKS CONTRACTORS :

1.8.1 The tenderer after the award of the contract, shall co-operate with the civil and other contractors and shall coordinate his work of the other contractors with the least amount of dislocation and interference to the other works. Tenderers shall go through the drawings carefully and shall furnish the Engineer-in-charge with all the details of openings in the walls etc they may be required for concealing any of the electrical equipments or accessories. Where the contractor fails to furnish such information as may be required for the purpose of concealing the equipments etc. they shall be made at his (Contractor) cost and expense. Any alteration to parts of the building shall be made good at the contractors expense and brought to the original shape finish and colour.

1.9 TESTING

The electrical contractor shall be completely responsible of the testing and commissioning of those installations covered by these specifications in compliance with the standard procedure, in obtaining permission of the Government Electrical Inspector. Any modification which is demanded by Government Electrical Inspector shall have to be carried out within the scope of the contract. The contractor shall submit four copies of drawings of installations as per regulations for shall be provided by the contractor for carrying out the installation work. All test shall be carried out in the presence of the Engineer-in-charge or his authorized representative and his approval obtained for the test results.

1.10. COMPLETION CERTIFICATE AND MAINTENANCE GUARANTEE:

1.10.1. After the completion of the installation and contractor should furnish a certificate in the proforma in Appendix-III, at the time of taking over the installation by the Department. The installation shall be guaranteed for period of 12 months from the date of taking over by the Department. During the period of guarantee all defects in material or workmanship shall be rectified or rectified or replaced free of cost to the Department.

1.11 TENDERER'S ABILITY

1.11.1. In order to enable the Department to assess the ability of the tenderer to execute the work, the tenderer shall furnish evidence of his experience and capacity to carry out the magnitude and nature.

1.12 RATES:

1.12.1. The rates of items shall include all taces, transport, loading and unloading charge and all such charges that may the market are not entertained Break up figure as required in the schedule of work shall also be furnished. As far as possible indigenous materials only shall be included for supply. Where It is unavoidable, imported items may be in-

cluded and tenderer should clearly indicate materials, quantity, rate and amount of these items.

1.13 STORAGE SPACE :

No covered storage space will be provided- by the Department. The contractor has to make his own arrangement. However, the Department may give an open space near the place of execution where the contractor can build his own stores for executing the work.

1.14 DEPARTURE FROM SPECIFICATIONS:

The tenderer should clearly indicate departure, if any, from the specifications with reasons for the same.

1.15 EXTRA ITEMS:

Rates for extra items shall generally be derived from the rates already available in the schedule. Where it is not possible, the rates shall be mutually agreed upon and contractor shall, furnish a detailed analysis of the rates claimed by him.

2. TECHNICAL SPECIFICATION :

2.1 Supply System :

The wiring installation shall be suitable for 3 phase 4 wire, 400-440 V 50 cycles system of supply Colour code of different phase shall be followed as per standard.

2.2 Wiring for Light and Fans :

2.2.2. Looping system of wiring shall be adopted. No joints shall be made at intermediate runs of cables and where they are unavoidable, such joints shall be through approved mechanical connections.

2.2.2 Point wiring :

Point wiring shall consist of the branch wiring from the board together with the controlling switch or push as far as and including the ceiling rose or any other approved connectoe or socket, outlets. In case of more than one light being controlled by one switch, the wiring upto the ceiling rose of the first light including the switch shall be considered as a Primary point. Loop wiring from light shall be considered as a 'Secondary' point and rates shall be quoted separately, including final connections to fixtures and plugs.

2.2.3 Conductors :

No conductor for final sub circuit wiring for light and socket outlets shall across-section less than that of 2.5 sq.m (aluminium)

2.2.4 Loading :

No final sub-circuit radiating from the fuse board of a sub-distribution board and wires with 25 sq. m. (Al) cable shall carry more than 10 lights, fans or socket outlets or a connected load of 800 watts whichever is greater. The following wattages may be assumed for estimating the load on each sub-circuit unless otherwise known or specified.

Incandescent lamps	100 watts
Ceiling fans	60 watts
5-A Socket Outlets (lighting)	100 watts
4. ft. fluorescent tube	50 watts
5. ft. fluorescent tubes	100 watts

In each sub-distribution board at least-one way preferably two ways shall be left spare for future requirement. A wiring diagram giving the exact Utilisation of the ways shall be prepared and fixed in the sub-distribution board itself or any other easily accessible place. The ways of sub-distribution boards shall be accordingly numbered.

2.2.5 Local Control Switches (General) :

Local control switches for circuit carrying net less than 5-5 shall be piano type and shall conform to relevant I.S. Standards. The switch shall be 'ON' when the knob is in the down position. All local control switches shall be connected in the phase or live conductor only and in the natural conductor, switches shall be fixed in iron cled box and shall be so placed that the centre of the switch box is 1.3 mtr. from the finished floor level unless otherwise stated. All switch boxes shall be provided with 1/8" thick perspex cover fixed to the switch box with chromium plated counter sunk screws (brass).

2.2.5A Switches (Two Way) :

- Two way switch shall be piano type single pole, double throw, 250V, suitable for flush mounting and of 5A capacity as per the drawings. All switches shall be recessed in an embeded metal box.
- Each box shall have suitable outlet for fixing conduits directly.
- Each box shall have perspex cover painted inside with the wall colour, if required.
- Each switch shall have suitable for the position in a stairway wiring.

2.2.5.B Switch Boxes (General) :

Electrical circuits shall be written suitable on the cover of all switch boxes, as approved by the Engineer-in-charge (elect) whenever different phase are terminated in a switch box bakelite partition shall be provided. Each cash shall be provided with a G.I. Earth stud nut and washers for earth connectors.

2.2.6. Ceiling Rose :

Ceiling rose shall be used on circuits having a normally exceeding 200V. Only one flexible cord shall be attached to a ceiling rose. Only 3-pin 5A socket outlet shall be provided in lighting circuits. All socket outlets be provided with a control switch and they shall be mounted in switch boxes in an approved manner.

2.2.7. Fittings:

These shall be of approved type as specified in the tender schedule. The subcircuits leads should terminate in a ceiling rose or conductor in the fitting and internal connection made therefrom. Wherever these fitting are suspended they shall be done so through the conduits and ball and socket joint. All fittings shall be grounded by a G.I. conductor not less than 16 S.W.G.

2.2.8. Flexible wiring :

Flexible cords of not less than 23/0076 size be shall be used. The weight of suspension road shall be governed by I.E.F. Regulations.

2.2.9. Ceiling Fans:

All ceiling fans shall be wired to ceiling rose and suspended from a hook shackle or clamp and insulated from the same. All joints in the suspension road shall be screwed and means of split pins. The fan clamps supplied by the Contractor shall be suitable for the ceiling or roof member as the case may be. For concrete

roofs, fan hooks shall be buried in concrete during concrete during construction in an approved manner and securely bound to the reinforcement.

2.2.10 Conduits and Earthing :

All conduits feeding lighting and circuits shall be provided with earth continuity G.I. conductor as specified for power wiring. All conduits shall be as specified for power wiring.

2.2.1 Point wiring:

Point wiring power shall be as defined under section 2.2.2 and shall include the switches and sockets.

2.3.2. Loading :

All distribution board for power wiring shall be not less than 15 A per way. Loading per way shall not exceed normally 100 watts. The following loads may be assumed if exact figure are not known.

3-Pin 15A Outlets	1.000	Watts
3-Pin 5A Outlets	100	Watts

2.3.3 Wiring for Motors :

2.3.3.1 Final sub-circuits loop in motors shall be connected to separate ways of the Distribution board even if the current in the sub-circuit is less than 15A. No looping is permissible.

2.3.3.2 All wiring shall be carried in H.G. conduit as specified in I.S. specification for gauge for different sizes of conduit. When the motor is resiliently mounted flexible with approved adopters shall be used for the last few feet. Where cables are used sufficient loop shall be left.

2.3.3.3 All switch fush units controlling circuits feeding motor shall be provided with H.R.C. fuses or as specified.

2.3.3.4 The frame of every motor and its association control gear shall be earthed by two separate and distinct connections to earth connector shall be capable of earing 3 times the rating of fuse or 1.1/ 2 time the setting of the circuit breakers but in no case than No. 8 S.W.G. or 7064" or equivalent cross section of copper. Where practicable, the earth connections shall be visible for periodical inspection. Gas or water pipes shall not be used for earth connections.

2.3.3.5 Socket Outlets and Control Switches f A and 15A :

All socket outlets shall be of 3 pin type, the third pin being connected to the earth stud of nearest distribution board by separate earthing wire. The socket shall conform to I.S.: 1293/1938, 'single pole, piano type. Each

socket outlets shall be provided with a control switch of appropriate rating and as specified. The switch and socket shall be mounted inside the iron clad box provided with 1/8" perspex cover as directed by the Engineer-in-charge or as specified in schedule of quantities. Inside switch box ample space shall be available around switches for connection wires to switches. All socket outlets for power shall be mounted at the skirting level otherwise specified or as directed by the Engineer-in-charge.

The three phase plug receptacles shall have their earth terminals connected by independent earth wires to ring main strip on the building. In buildings where explosion proof fixtures are installed single phase plug receptacles as well as light points shall be connected to ring main ground bus installed in the building by separate earth wires of approved size.

Socket outlet shall have some provision not to receive the matching plug unless the grounding pin is in correct position. The grounding pin of the plug shall make the contact first and break the contact last at the time of inserting or removing the plug respectively.

The grounding terminal shall be connected to the enclosed metal body providing G.I. stud, nut washers welded to the box.

Each unit shall be suitable for flush mounting as required and indicated in the applicable drawings.

Combination unit socket outlet and switch shall be complete with necessary internal wiring. The switch/socket shall be mounted on M.S. bracket enclosed in a box.

2.4 Conduit Wiring :

2.4.1 Where conduit wiring is adopted type and size of the conduit shall be as indicated in the drawing. The minimum of the conduit shall be 19 mm.

2.4.2 The contractor shall thoroughly study the structural of the buildings and wherever, necessary shall in consultation with Department's representatives at site, make suitable adjustments in the cable routings, earthing arrangements, and location boxes, fitting etc. with a view to avoid interference with any part of the building, structure, equipment or any other work in the building or to effect any improvement in the arrangement.

2.4.3 Protection of conduit against rust:

Conduit shall be given two coats of oxide paint before they are placed in position. All exposed conduit shall be planed after installation with the colour as approved by the Engineer-in-charge. This do not apply to galvanized conduit.

2.4.3.A. Protection against insects and damp :

In order to minimize cocensation or sweating inside the conduit, system shall be properly drained any ventilated in such a manner as to prevent the entry of insects.

2.4.4. Conduit shall first be installed as a complete system without cables and shall be continuous from outlet to outlet from fitting to fitting and mechanically and electrically connected to all boxes and fittings.

2.5. SPECIFICATION FOR POWER CONTROL AND TELEPHONE CABLES:

I. SCOPE:

i. The specifications cover the supply and medium voltage power and control cables either in ground or trench depending on the conditions at site including accessories for the same. The work in general, consists of supplying, laying jointing terminating and connecting all. 1.1. KV APLSTS PVC power and control cables.

ii. The contractor shall supply all accessories including jointing and terminating materials, compound, tapes supporting materials, cleats cables lugs, concrete stable, bricks sand, cable markers etc. as required to make the installation work including digging and filling of the trenches as required.

II. SPECIFICATION:

i. All power cables to be supplied mentioned as 'APLSTS' in the Schedule should be mass impregnated, non-draining, paper insulated lead sheathed, double steel tape armored and must comply with the latest IS 1BS specifications.

- (ii) All cabling materials such as cable compound, cable lugs, taped shall be of approved quality acceptable to the type recommended by the manufacture of the cable for which it is used and approved by the Department.
- (iii) installation of all equipment shall also conform to the applicable. Codes and practice as per the IS and shall be executed to comply with the latest Indian Electrical rules as regards the safety, payable of equipments and other assential provisions specified therein.
- iv. Only approved make of cable shall be used. ICC and CCI will be preferred,
- v. The cables shall generally be laid as per is Code of practice.

III. GENERAL RULES CABLE LAYING :

- i. Installation shall be carried out in a neat workmen like manner by skilled experienced and completent workmen in accordance with the standard practices.
- ii. Cables shall be laid preferably in one length to avoid joins. If straight joints are found necessary, these can be introduced with prior approval of the Engineer-in-charge. The cost of the straight joint however, shall not be borne by the Department. But in no case joint shall be within the conduit G.I. pipe and duct.
- iii. Proper care should be exercised in handling the cable to avoid formation of kind etc. and should it become necessary a cable be bent to a radius not less than 20 times the overall diameter of the cable.
- iv. Method of installation, routing of cable etc. shall in every case be subject to the Department's approval and the contractors shall modify and or certifiat no extra cost to the Department's any portions of the installtion which do not meet with the Department's approval. All damages to the civil and other works on this account shall be made good by the contractor at no extra cost to the Department.
- v. The electrical contractor while notifying the building contractor for such work shall furnish the proper drawms, dully explaining the work involved of indicate at situ actual work to be carried out as may be required by the building contractor. The electrical of any such work as the electrical work with this to the same has been completed.
- vi. Where cables pass through hume pipes, contractor shall fix hard wood bushed round the cables at Jhe ends of hume pipes. Where the cables pass through -the floors or chambers and in such situations as the Engineer shall require, the contractor shall seal cable holes in a manner approved bt Engineer-in-charge. Where cable pass through roads nallahs, etc. cables must be protected by class 'A' Hume pipe of diameters not less than 6. (15cms)
- vii. The cable routs shall be the shortest and these shall be minimum inference with built up areas, lawns etc.
- viii. Care shall be exercised for providing suitable props other service lines on earth at the time of excavation. Where cutting of a lawn inevitable it should be with the approval of the Engineers-in-charge.
- ix. Excavation of the trenches shall be executed with verticle sides and the treanches shall be kept as straight as possible. The exact location of each trench shall be settled by the Engineer-in-charge. On the site when the contract is in a position to commence each portion of the work. The trench shall be not less than 1/2 meter wide and 90 cms deep. If more, cables are to be laid, the width should be suitably increased.
- x. After the cables are laid, the treanch shall be filled in layers, the each layer being weel rammed by spraying • water and consolidated and sufficient allow/ance made for settelment. The extra earth over the trench should be removed from the place of trench to a place as decided by the Engineer-in-charge at site.
- xi. Ends of cables shall be property sealed to prevent entry of mositure prior to installation.
- xii. Where it is as specified as 1/2 core cables the 1/2 core shall be a netural conductor having reduced section.
- xiii. For all multicore cables each core and tails shall be brought not, marked and or coloured in on approved manner.
- xiv. Cables termination shall be done with suitable compression brass glands in the case of PVC cables and cast iron trifurating boxes in the case pf APLSTS cables. The armour should be connected to the right main earth building with duplicate earth wfres as per the .relevant IS/BS specification. The core insulation over each conductor shall however be retained through out the run of the conductor upto the end where lungs shall be fitted thereon for connections. The lungs shall by fitted by means of approved solder and the such as aleap and Eyer No. 7 liberally used. The joint shall be mechanically strong and pressure tested.

26 DISTRIBUTION BOARDS AND PANELS.

General Requirements :

- 2.6.1 All distribution panels shall comply with I.E.E. Rules 60-61 A clear distance of 0.91 b metre in front of the switch board shall be kept. Where bare connections of attachment are provided at the back of the switch board the space behind the panel shall be together less than 0.299 metre or more than 0.762 m^in width there shall be a passage way from the further outstanding part of any attachment or conductor. If the space behind the switch board exceeds 0.70 main width there shall be a passge way from either end of the switch board clear to night of 1.928m width 0.299 m. All wiring connection shall be made neatly and securely.
- 2.6.2 For corciots carrying more than 10 Amps, tin-ied cable sockets shall be used, all connections shall be so made as to form own diagram Circuit shall be clearly numbered to correspond-to wiring daigram. Names of the distribution boards shall be painted as directed by the Engineer-in-charge. All the which fuse units and isolators D.Bs. shall be complete with earthing studs lugs neutral bar ink. H.R.C. fuses and of aproved make.
- 2.6.3 Skelton type panels shall have a rigid from work adequately braced and supporting frames adequately braced over which sheet metal shall be nearly secured. All switches, distribution boards etc. shall be neatly arranged On the panels and all connections made from the back of switches. The panels shall be rendered dust and vermin-proof. The interior of the panels shall not be accessible to unauthorised persons.
- 2.6.4 All cubical type panels shall have rigid supporting frames adequately braced over shich sheet metal shall be nearly secured. All switches, distribution boards etc. shall be neatly arranged on the panels and all connections made from the back of switches. The panels shall be rendered dust and vermin-proof. The interior of the panels

- shall not be accessible to unauthorised persons.
- 2.6.5 The recess type boards shall be embedded in wall in cupboard with a metal hinged door with locking arrangement. In all recessed conduit work all distribution boards shall be recessed. Where recessing is not possible, free standing panel may be provided as approved by the Engineer-in-charge.
- 2.6.6 All individual components the switch fuse units D.Bs. etc. shall be connected by earth connected by earth continuity wire of appropriate size with the main earth bus of the D.B. etc. The panel switches of D.Bs. shall be earthed by the less than 2 distinctive paths to earth. Earthing of metallic parts of exposed metal shall not be effected through any structural metal work which houses the installation. Where metallic parts are not required to be earthed and are liable to become alive should the installation of the contractor become defective such metallic parts shall be separated by durable non conducting material from any structural work.
- (a) Power panels shall be 3 phase, 4 wire, 400/230 volts for the distribution of 3 phase or single phase power loads.
- (b) Lighting panels shall be 3 phase 4 wire 400/230 volts for single phase lighting load distribution on all 3 phase.
- (c) All panels shall be done of protected front type with no mechanical or electrical defects.
- (d) Bus bars shall be of electrolytic copper or aluminium as specified and the properly tinned sizes as indicated on applicable drawings as required.
- (e) All knock outs for branch circuits entire shall be drilled and filled as required, for lighting panels the top and bottom cover plates shall be removable type.
- (f) Main disconnect device for all panel boards shall be of switches of disconnect type and of the size as indicated shall be mounted directly below the panel or through a short thread conduit of required size.
- (g) The main disconnect for all panel boards shall have an entry suitable for PVC Armoured cable from bottom.
- (h) All panel boards shall be provided with an earthing terminal and lug for connection to the grounding system.
- (i) Temperature rise of all electrical parts shall not be more than 300c With full load amperes at room temperature.
- (j) All bases and supports of current carrying parts shall be of moisture resistant insulating material and shall not be adversely affected by arcing
- (k) The locations of panels shown in the drawings are only tentative; panels may be located at a place approved by the Engineer-in-charge,
- (l) All civil works connected, with fixing such as grouting chasing and making good shall be the tenderers responsibility.
- (m) Wires adequate capacity with proper size of lugs shall be used for inter connections.
- (n) Panel should be self supported on angle channel iron frame work. It should be preferably of bolted construction in case bolted or grouted rigidly after leveling and alignment
- (o) The cupboard and D. B. should be of such size so to be accommodated in the existing room as per 1.5 rules and I.S. codes of practice for installations of Medium voltage switch gear.
- (p) Fabrication drawing showing the detailed dimensions and panels and its components indicating the frame work, earthing positioning of switches, O.Bs. cable boxes, adopter chambers etc shall be furnished to the Engineer-in-charge for his approval. All material to be got approved by the Engineer-in-charge. Panel should be guaranteed for satisfactory operations for a period of one year after handing over.
- (q) The panel should be painted with anticorrosive paint suitable for humid and salty atmosphere on two coats to primer.

Switch Gears, powers panels D. B. And S.F. Us.

2.6.8 The main busbar shall have continuous current rating as specified with neutral bar having half of full load rating of the phase busbar, the Sizes of the bus bars shall be so selected that the current density in bar does not exceed 150 amps, per sq. m. for copper The length of Bus-bar chamber should be as suitable length to fix all the switches etc. as per the prevailing standards, clear spacing of two adjacent buses shall be 1 a/2 " minimum bar should be tinned all along with colour coated 11 KV grade PVC tape The maximum internal of support for each unsupported length shall exceed 600 mm.

The bus bar shall be of copper/aluminium and fabricated to the relevant standards specification In case aluminium bus bar is used special with high conductivity aluminium bus bar alloy E 91 C frame conforming to E.S.S 2898 shall be used. The current density shall not exceed 800A per sq. inch. Hylam barriers will be provided over the joints to prevent any short circuit.

The bus enclosures shall be made out not less than 16 gauge M. S. sheet construct on with angle iron support. All interconnections between bus bars S. F. Us and O. Bs shall be of adequate size and details of such inter connection shall be furnished to the Engineer-in-charge for his approval.

The busbar shall be air insulated extensible type rectangular one. The bus bars chamber shall be dust tight by providing gaskets secured properly so as to render it veritain proof

The combination fuse switch unit should comply with IS 4064 BSS61 and BBS 2510 wherever applicable. It should be suitable to accommodate High Rupturing capacity cartridge Fuse links complying with IS 2208 or BS 88 and having a certified rupturing capacity of not less than 35 MVA at 4440 volts (ACS duty). The switch gear (panels D, Bs. etc. shall be installed generally as per IS-Part -1 3072 and as specified and shown in drawings.

All fuse switch units shall be provided with non-deteriorating HRC fuse links complying with IS 2208-1962 and having rupturing capacity of 35 MVA at 415 volts or as specified. shall be provided for each circuits as well as for the board.

All switches above 60 amps, rating shall be provided with suitable size adapted boxes. All switches mounted on the top of the busbars shall be provided with detachable type reverse entry adapter boxes. Suitably engraved tables

A meters sector switches and LMH metre shall be provided where specifically mentioned. Small wiring for the inter-connecting shall be colour coded and provided with numbered teases for easy identification of circuits.

- (a) The distribution boards should be totally enclosed metal clad complying with B. S. 214. The M. S. sheet steel enclosures for recessed D. Bs. shall be of not less than 14 gauge.

- (b) The D. B. shall be with hinged door and the locking arrangements as approved by the Engineer-in-charge.
- (c) All the components shall be enclosed in the enclosure. The mounting of D. B. shall be got approved by the Engineer-in-charge before carrying out the installation.
- (d) The D. B. shall have proper size cut outs for conduits entry or cable entry as required and these shall be made on site.
- (e) Adequate spacing shall be provided inside the D. B. for easy removal of the fuses and carry out the inter connection.
- (f) A set of insulating barriers have to be provided between incoming breakers switches and fuses.

Switchfuse Units:

- (a) All the D.P.T.P. and T.P.N. Switch fuse units shall be totally enclosed iron clad quick make, quick break type to best Indian make conforming to the I. S. or I.S. 3185 specifications. All the switch fuse units shall have mechanical interlock with a door, so that the door cannot be opened when the switches are in ON position. The switches should be of double break isolation type to ensure safety.
 - (b) Each T.P. & T.P.N switch fuse unit shall be earthed with two distinct earth connections.
 - (c) Suitable insulator shall be provided between phase.
 - (d) There shall be suitable neutral link in the fuse box.
 - (e) All T.P. and T.P.N. switch fuse units shall be rated for 500 volts and D.P. (required for single phase supply) and S.P.N. switches for 250 volts.
 - (f) The H.R.C. cartridge fuse shall conform to U.S. 88 (1952)
- The O.C.Bs. ACS shall be suitable for 400/440 volts 3 phase capable of interrupting a fault MVA of not less than 31. The circuit breaker shall conform to the BSS-936 1940. BSS 3659 with such tripping arrangement as may as required under special specifications for the building. Efficient and fool - proof mechanical interlocking shall be provided for the safe operation and maintenance. The rate be inclusive of the first filling of oil.

2.7 Instrumentation :

The instruments and meters wherever necessary shall be housed in special sheet steel box located between switch fuses units and bus bar chambers. The instruments etc. shall be mounted on the hinged cover with their dial flushed. All instruments shall have protective H. R.C. fuse links. All interconnections and small wiring shall be neatly dressed arranged and duly coloured for easy identification of circuits.

Meters shall be provided as required in the Schedule, Meters shall be dead head and be suitable for 400/440 volt 3 phase 4 wire 50 c/c (unbalanced load) supply. Each section switch shall be 3 point and of minimum 250 volts grade with silver tipped contact suitable for metering circuits, current transformers shall be of 5VA burden and commercial metering accuracy. Indicating lamps shall be panel mounting type preferably of 250V grade. Every unit shall be prewired and interconnected to the system for its required indicating performance. Indicating lamps shall have independent circuit fuse.

2.8 FIXING OF LIGHTING FIXTURES :

1. Location of fixtures their manner of fixing mounting height etc. are indicated in relevant drawing. Actual location and levels shall however be arrived at site in co-ordination with other service etc. and prior approval of the Engineer-in-charge regarding the actual location Manner of fixing shall be obtained before the work is taken up in hand.
2. In all cases the contractor shall provide necessary interconnection wiring earthing painting etc. all necessary for complete installation. The contractor shall also test and commission the fixtures during completion of the work.
3. General arrangement of fixtures layout is indicated in drawings. Care shall be taken to see that all light fixtures are in a row in a room or particular area, are in absolute line and plumb and are symmetrically disposed with respect to finished surfaces of walls columns beams etc.
4. The inter-connections wiring from the light outlet point upto the fixture shall be carried out by means of flexible copper wire of section not less than 1.5 mm²
5. All fixtures suspended by means of conduits shall be done with all and socket joints or as per approved design.

2.9 Telephone system :

1. Empty conduiting shall be done, recessed or exposed to surface along with pull boxes, junction boxes and telephone outlet boxes, in areas and location as indicated in the relevant drawing as per materials and methods as described in regard to conduiting under section "Wiring in conduits" except the G.I. pull wires of gauge not less than 20 SWG shall be kept pulled through conduits in all sections so that in future telephone wires can be pulled easily
2. Location shown on the drawing are approximate and final location shall be decided in the field by the Engineer-in-charge.

Signature of contractor/s

Executive Engineer
Division

SECTION-G

SPECIFICATION FOR EARTHING &

1. Installation of Earthing Plates :

All installation of earthing shall conform to Indian Electricity Rules, IS - 3043 latest edition and I.E.E. the copper earth plates should be tinned before installation. The earth plates of copper 60 cm x 60 cm x 3.515 mm thick size as mentioned in the schedule be in separate pits at least 150 cms to 300 cms. away from the building at a depth necessary to reach moist earth surface but with a minimum depth of 2.5 mtr from the finished ground level upto the top vertical edge of earth electrode. The earth plate shall be thoroughly cleaned to remove all dirt from the surface and be tinned properly for electrical contact with the main ground. Each earth pit should be provided with 38 mm. dia G.I. pipe 2.5 Mts. long or more depending upto the depth of pit, put over the vertical edge of earth plate (with top end of pipe provided with a closed coupler.) Alternative layers of salt and coke shall be provided surrounding the plate. The pits shall be filled when the plates are in position and with the approval of Engineer-in-charge.

To facilitate watering the pit, a concrete compartment should be made with funnel with mesh and cover plate as per rules provided in ISI regulation. The masonry enclosures shall be 25 cm x 25 cm x 25 cm (deep) with C. I. lid of 23 cm x 30 cm x 30 cms. size. After installation, the earthing resistance of each earth plate should be measured by resistance megger in the presence of Engineer-in-charge, three days after the completion of earthing work, and the value should conform to regulations.

Signature of contractor/s

Executive Engineer
Division

-- List of Approved Products --
As per Separate Booklet Attached.

LIST OF THE APPROVED PRODUCT ELECTRICAL PRODUCTS (FOR THE YEAR 2013-2014)

LIST OF THE APPROVED PRODUCTS

CHAPTER - I

WIRING

1.1 SHOCKPROOF ACCESSORIES

(A) Concealed / Surface Type

Any 'I.S.I.' marked Which is Approved by Department

CATEGORY - I

(1) ALLWYN - APPROVED

M/s Allwyn Electricals Industire
78, Kakad Industrial Estate,
Lady Jamshedji Road,
Mahim - Mumba - 400016

2. SAFECON'S

M/s KALA ELECTRICAL INDUSTRIES,
12/A, Eagal Market, 90 Feet Road, Saki
Naka, Mumbai - 400072

3. MILLION & MILLTEC

M/s. Mutha Electricals
1940/4, Khadia Cross Road,
Gandhi Road, Ahmedabd - 01

4. LEGEND & WIT

M/s. VINAYAK ELECTRICAL INDUSTRIAL
Dal Mill, Opp. Charch, Behind Sonis Wadim
SURENDRANAGAR - 363001

5. VIMAL

M/s Solanki Industries
22/180, Motilalnagar,
Opp. Old best colony,
Goregaon [W], Mumbai

CATEGORY - II

1 VINAY

M/s Vinay Electricals, 18-A, Singh Industrial
Estate, Bldg. No.1, Rammandir Road,
Goregaon (W), Mumbai - 40014.

CATEGORY - III

(1) TOYAMA

M/s. Toyama Electric Ltd
36(A), Kiadb Industrial Estate,
Hoskote, Banglore - 562114

(2) ORPAT

M/s. Ajanta Industrial Estate, Rajkot
Highway Post Box No. 115, Morbi

(B) Mini Modular Type [Approved]

1. ANCHOR [NOVA / XL]

Anchor Elect. P.Ltd
Marathon Innova C Wing,
Opp. Penivisula Corporate Park,
Opp. G.K.Marg, Lower Parel [W],
Mumbai

2. POINTER

H.O. B-15, Atlanta Evershine, Evershine
Nagar, Malad [W], Murnbai - 400064

3. PRISM - POINTER

M/s Prism Industires
H.O. B-15, Atlanta Evershine, Evershine
Nagar, Malad [W], Mumbai - 400064

4 ORPAT

M/s. Ajanta Industrial Estate, Rajkot
Highway Post Box No. 115, Morbi
Rajkot

5. VIMAL

M/s Solanki Industries
22/180, Motilalnagar,
Opp. Old best colony
Goregaon [W], Mumbai

6. GELCO - Cat. II

GELCO ELECTRONICS PVT LTD
6,7,8 & 16 Amarnath Estate,
Nr. Krishna Gopal Estate,
Naroda Road, Ahmedabad - 380025

(C) Modular Type [APPROVED]

1. L&T ORIS

M/s LARSON & TURBRO LIMITED

501, SAKAR-I, OPP GANDHIGRAM RAILWAY
STATION, AHMEDABAD - 380009

2. LEGEND & WIT

M/s. VINAYAK ELECTRICAL INDUSTRIAL
Dal Mill, Opp. Charch, Behind Sonis Wadim
SURENDRANAGAR - 363001

3. INDOSIMON

M/s. EON Electric Limited
B/88, Sector 83, NOIDA - 201305
U.P., INDIA

4. RANI

M/s Param Switchgear (p) Ltd
11. CSG Anand Niketan, New Delhi-110021

CATEGORY - I

1. PRECISION

M/s Precision Electricals Shiv Sagar estate,
A-Block (Basement) Dr. A.B.Road Worli,
Mumbai - 400018

2. POINTER - ITALIA

M/s PRISM INDUSTRIES H.O. B-15, Atlanta
Evershine Nagar Malad (W),
Mumbai - 400 064

3. ALEX

M/s Alex Industires, 3, Neminath Industrial
Estate no.3 Navghar Road,, Vasai [E] D.st.
Thane - 401210

4. PRISM - POINTER

M/s Prism Industires
H.O. B-15, Atlanta Evershine, Evershine
Nagar, Malad [W], Mumbai - 400064

5. VIMAL

M/s Solanki Industries
22/180, Motilalnagar,
Opp. Old best colony
Goregaon [W], Mumbai

6. S.G

CATEGORY - II

1. ANCHOR-RIDER

M/s Anchor Electrical P.L., Marathon Innova,
C- Wing, Opp. Peninsula Corporate Park,
Of. G.K.Marg, Lower Parel (W),

2. GELCO

GELCO ELECTRONICS PVT LTD
6,7,8 & 16 Amarnath Estate,
Nr. Krishna Gopal Estate,
Naroda Road, Ahmedabad - 380025

3. POINTER - SPECTRA

M/s. PRISM INDUSTRIES, H.O. B-15,
Atlanta Evershine Nagar, Malad (W),
Mumbai - 400 064

4. ELLYS

M/s ELLE Electrical P.L., Cama Industrial
Area, Walbhat Road, Next to Rajaram
Tarphe, Goregaon (E), Mumbai - 400063

5. HI-FI

M/s Aerolite Industries, 5, Sati Industrial
Estate, I.B. Road, Goregaon (E),
Mumbai - 400063

6. WONDER [EVER/PLAYBOY/COOLICY/ FORTUNE / DASH/ GOLD/]

M/s Wonder Industries, G-14, O.I.D.C.
Udhyog Nagar Industrial Estate, GIDC,
Ringanwada, DAMAN (U.T)

7. ALLWYN

M/s ALLWYN ELECTRICAL INDUSTRIES,
78, kakad Industrial Estate, Lady Jamshedji
Road, Mahim, Mu.bai - 400016

8. INDOASIAN

M/s Indo Asian Fusegear Limited, 203-
204, Shreedhar Avenue, 11, Sardar Patel
Colony, Nr. Sardar Patel Statue, Naranpura,
Ahmedabad

9. VINAY

M/s Vinay Electricals, 18-A, Singh Industrial
Estate, Bldg. No.1, Rammandir Road,
Goregaon (W), Mumbai - 40014.

LIST OF THE APPROVED PRODUCT ELECTRICAL PRODUCTS (FOR THE YEAR 2013-2014)

10. LEADER

M/s Leader Electrical P.L., Leader House, 9-B,
Mahal Industrial Estate, P.B.No. 9483,
Mahakali Caves Road, Andheri (E),
Mumbai - 400 093

11. LK

L.K. Switchges, 165, G.I.D.C. Makarpura,
Baroda - 390001

12. NORTHWEST

North West Switchgear Ltd., 14/3, Mathura
Road, Faridabad Haryana - 121003

13. MK

CATEGORY - III

1. HAVELL'S - CRABTREE

M/s Havell's India Ltd, 202-205, SHIVALIK II,
Nr. Shivrangani Cross Road, Satellite
132 Ft. Ring Road, Ahmedabad - 380015.

2. TOYAMA

M/s. Toyama Electric Ltd
36(A), Kiadb Industrial Estate,
Hoskote, Bangalore - 562114

3. ANCHOR [ROMA / WOOD / AVE]

Anchor Elect. P.Ltd
Marathon Innova C Wing,
Opp. Penivisula Corporate Park,
Opp. G.K.Marg, Lower Parel [W]
Mumbai

4. PHILIPS

M/s. Philips Electronics India Ltd, 7, Justice
Chandra Madhab Road, Kolkata - 700 020

5. ABB

M/S ABB Limited 2nd Floor, Est Wing,
Khanija Bhavan, 49, Race Course Road,
Bangalore - 560 001

6. ORPAT

M/s Ajanta Limited,
Orpat Industrial Estate,
Rajkot Highway, Po.Box No. 115
Morbi

7. SALZER

M/s SALZER EKELECTRONICS LTD,
Samichettipalayam, Coimbatore-641047,

8. C&S GEWISS

M/s. Control & Switchgears Contactors LTD.
9th Floor, HERITAGE, Nr. Gujarat Vidyapith,
Ashram Road, Ahmedabad-380 009.

1.2

RIGID PVC PIPES / OVAL PIPES & FITTINGS.
FIA Approved & ISI marked
Which is Approved by Department.

1. VRAJ

M/s VRAJ PLASTIC INDUSTRIES,
41,42&43 Amarnath Estate, Nr. Gokulesh
Petroleum, Narol Cross Road,
Ahmedabad - 382 405

2. PRECISION

M/s Precision Plastic, Shiv Sagar estate,
A-Block (Basement) Dr. A.B.Road Worli,
Mumbai - 400018

3. NIHIR

M/s. NIHIR POLYMERS INDUSTRIES, 62,
Umed Part Society, Sola Road, Ghatlodia,
Ahmedabad - 380 061.

4. HIMA / AMIT

M/s Hima Sales Corporation, Opp. Relish
Pharma, Nr. Nilkanth Hotel, Ta. Kalol,
Dist. Gandhinagar. RAKANPUR

5. VINAY

M/s Vinay Electricals, 18-A, Singh Industrial
Estate, Bldg. No.1, Rammandir Road,
Goregaon (W), Mumbai - 40014.

6. POLYCAB

M/s Polycab Wires Pvt. Ltd., HICO House,
1st Floor, 771, Pandit Satwalekar Marg,
Mahim (W), Mumbai - 400016

7. BLP

M/s. Bhaglaxmi Plastic Industires, 32,
Asharva Ind. Estate, Opp. Khodiyar Estate,
Narol, Ahmedabad

8. POWER FLOW INDIA / CROWN PLAST

M/s. CROWN INDUSTRIES
Plot No 6, Opp. Torrent Power Sub Station,
B/11, Shahwadi Bus Stop, Narol
Ahmedabad - 382405

9. NINE / ADITYA

M/s Aditya Polymers,
199/200/4, Opp. Encore Industires, GIDC
Phase II, Naroda, Ahmedabad

10. MARUTI

18, Kamal Estate, Bombay Conductors,
VATVA, AHMEDABAD

11. PRESTO PLAST

M/s. HARSH POLYMERS PVT LTD
1/11C, Proctor Road,
Grant Road, [East]. MUMBAI - 400007

12. SHRINATH

13. AMIT

Amit Electro Plast,
431, 4th Floor, Sarvodaya Comm. Center
Salapas Road, Nr. G.P.O., Ahmedabad

14. MAXCELPLAST

M/s Maxcel Plast 133, Shree Ram Ind. Estate,
B/h C.M.C. Anup Eng. Compound. Nr. Soni's
Chawl Cross Road, ODHAV,
Ahmedabad-382415

1.3

**OVAL / CASING & CAPING &
PVC TRUNKING**

1. VRAJ

M/s. VRAJ PLASTIC INDUSTRIES
42, Amarnath Estate, Nr. Gokulesh Petrol Pump
Narol Cross Road, Ahmedabad - 382405

2. PRECISION

M/s Precision Plastic Shiv Sagar estate,
A-Block (Basement) Dr. A.B.Road Worli,
Mumbai - 400018

3. NIHIR

M/s. NIHIR POLYMERS INDUSTRIES, 62,
Umed Part Society, Sola Road, Ghatlodia,
Ahmedabad - 380 061.

4. HIMA / AMIT

M/s Hima Sales Corporation, Opp. Relish
Pharma, Nr. Nilkanth Hotel, Ta. Kalol,
Dist. Gandhinagar. RAKANPUR

5. VINAY

M/s Vinay Electricals, 18-A, Singh Industrial
Estate, Bldg. No.1, Rammandir Road,
Goregaon (W), Mumbai - 40014.

6. POLYCAB

M/s Polycab Wires Pvt. Ltd., HICO House,
1st Floor, 771, Pandit Satwalekar Marg,
Mahim (W), Mumbai - 400016

7. MODI'S

M/s. Modi's Group of Companies
34, Palace manor, 31 & 32,
BAfour Road, Kelly's
Chennai - 600010.

8. 9 - NINE / AADITYA

M/s. Aaditya Polymark,
199/200/4, Opp. Encore Industries
G.I.D.C. Phase - II
Naroda - Ahmeabad, 382330

9. MARUTI

18, Kamal Estate, Bombay Conductors,
VATVA, AHMEDABAD

10. PRESTO PLAST

M/s. HARSH POLYMERS PVT LTD
1/11C, Proctor Road,
Grant Road, [East]. MUMBAI - 400007

LIST OF THE APPROVED PRODUCT ELECTRICAL PRODUCTS (FOR THE YEAR 2013-2014)

11. **POWER FLOW INDIA / CROWN PLAST**
M/s. CROWN INDUSTRIES
Plot No 6. Opp. Torrent Power Sub Station,
B/11, Shahwadi Bus Stop, Narol
Ahmedabad - 382405

12. **SHRINATH**

13. **M.K.**

14. **AMIT**

Amit Electro Plast,
431, 4th Floor, Sarvodaya Comm. Center
Salapas Road, Nr. G.P.O., Ahmedabad

15. **MAXCEL PLAST**

M/s Maxcel Plast 133, Shree Ram Ind. Estate,
B/h C.M.C. Anup Eng. Compound, Nr. Soni's
Chawl Cross, ODHAV,
Ahmedabad-382415

2.1 LAMPS & FITTINGS FILAMENT LAMPS / FLOURESCENT TUBES

CATEGORY - I

ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT

CATEGORY - II

1. **ARYA**

M/s.Arya Filaments P.L., 344, Vishnupuri
Annex. A.B.Road, Indore - 452 001

2. **GE**

M/s GE India Industrial Pvt. Ltd., 405,
"Kirtiman", Kinariwala House, B/H Citibank,
Off. C.G.Road. Ahmedabad - 380 009

3. **BAJAJ**

M/S Bajaj Electricals Limited, 106, 1st Fl.,
Sakar -III, Nr. Ashram Road, Navrangpura,
Ahmedabad 380 014

4. **OSRAM**

M/s Osram India P.L. Delhi Road, Sonipat -
Haryana - 131001

5. **ANCHOR**

M/s Anchor Electrical P.L., Marathon Innova,
C- Wing, Opp. Peninsula Corporate Park,
Of. G.K.Marg, Lower Parel (W), MUMBAI -13

6. **JILCO**

M/S JAIN INDUSTRIAL LIGHTING CORP.
B-70/22, DSIDC Complex,
Lawrence Road, New Delhi - 35

7. **INDOASIAN**

M/s Indo Asian Fusegear Limited, 203-
204, Shreedhar Avenue, 11, Sardar Patel
Colony, Nr. Sardar Patel Statue, Naranpura,
Ahmedabad - 380014

CATEGORY - III

1. **SURYA**

M/s. Surya Roshni Ltd., (Lighting Division)
308, Shefali Centre, Nr. Paldi Char Rasta,
Ahmedabad - 380006

2. **PHILIPS**

M/s. Philips Electronics India Ltd, 7, Justice
Chandra Madhab Road, Kolkata - 700 020

3. **CROMPTON**

M/s. Crompton-Greeves, C.Q. Hube, 6th
Floor, Dr. Annie Besant Road, Worli,
Mumbai - 400030

4. **HALONIX**

M/s. Halonix Limited
59A, 59D, Noida Special Economic Zone,
Phase - II, Noida,
Dist. Gautam Budhnagar - 201305 [UP]

5. **WIPRO**

M/s Wipro Ltd, A/210, Fairdeal House, Opp.
St. Xavier's Ladies Hostel, Navrangpura,
Ahmedabad

6. **HPL**

M/s B/707, Premium House,
Nr. Gandhi Gram
Rly. Station, B/H Natraj Cinema, Ashram
Road, Ahmedabad - 380009

2.3 SODIUM WAPOUR LAMPS

CATEGORY - I

ANY ISI MARKED WHICH IS
APPROVED BY DEPARTMENT

CATEGORY - II

1. **ARYA**

M/s.Arya Filaments P.L., 344, Vishnupuri
Annex. A.B.Road, Indore - 452 001

2. **SHAKTI**

M/s Shakti Fixture Industries 212/B,
Bombay Talkies Compound Malad (W),
Mumbai - 400 064

3. **ANCHOR**

M/s Anchor Electrical P.L., Marathon Innova,
C- Wing, Opp. Peninsula Corporate Park,
Of. G.K.Marg, Lower Parel (W),
MUMBAI - 400013

4. **PUSKAR / AKSHAR**

M/s ALIANT Electicale P.L.
Plot No. 72 N, Pologround Industrial
Estate, INDORE-452015 (MP) INDIA

6. **BAJAJ**

M/S Bajaj Electricals Limited, 106, 1st Fl.,
Sakar -III, Nr. Ashram Road, Navrangpura,
Ahmedabad 380 014

7. **OSRAM**

M/s Osram India P.L. Delhi Road, Sonipat -
Haryana - 131001

8. **JILCO**

M/S JAIN INDUSTRIAL LIGHTING CORP.
B-70/22, DSIDC Complex,
Lawrence Road, New Delhi - 35

9. **VAPOLITE**

M/s ALIANT Electricals P.L.
Plot No. 72 N, Pologround Industrial
Estate, INDORE-452015 (MP) INDIA

CATEGORY - III

1. **SURYA**

M/s. Surya Roshni Ltd., (Lighting Division)
308, Shefali Centre, Nr. Paldi Char Rasta,
Ahmedabad - 380006

2. **GE**

M/s GE India Industrial Pvt. Ltd.,
405, "Kirtiman", Kinariwala House, B/H
Citibank, Off. C.G.Road. Ahmedabad -09

3. **PHILIPS**

M/s. Philips Electronics India Ltd, 7, Justice
Chandra Madhab Road, Kolkata - 700 020

4. **CROMPTON**

M/s. Crompton Greeves, C.Q. Hube, 6th
Floor, Dr. Annie Besant Road, Worli,
Mumbai - 400030

5. **HALONIX**

M/s. Halonix Limited
59A, 59D, Noida Special Economic Zone,
Phase - II, Noida,
Dist. Gautam Budhnagar - 201305 [UP]

6. **HAVELLS'**

M/s Havell's India Ltd,
202-205, SHIVALIK II, Nr. Shivranjani Cross
Road, Satellite 132 Ft. Ring Road,
Ahmedabad - 380015.

7. **WIPRO**

M/s Wipro Ltd, A/210, Fairdeal House, Opp.
St. Xavier's Ladies Hostel, Navrangpura,
Ahmedabad

8. **C&S GEWISS**

9. **SHAKTI**

2.4 COMPACT FLOURESCENT LAMPS

CATEGORY - I

1. **ANCHOR**

M/s Anchor Electrical P.L., Marathon Innova,