TENDER DOCUMENT

TENDER No.: DLI/ENGG/MNKTALA/001

FOR

RENOVATION OF EXISTING EMPLOYEES STATE INSURANCE CORPORATION (ESIC) HOSPITAL AT MANIKTALA - KOLKATA, WEST BENGAL

VOLUME – IIB

ADDITIONAL SPECIFICATIONS

EXECUTING AGENCY

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TENDER DOCUMENT
(VOLUME-II)

(Scope of Works, Technical Specification, List of approved makes, Tender Drawings)

NIT NO. : DLI/NRO/PMD/JOKA/001

RENOVATION OF EXISTING EMPLOYEES STATE INSURANCE CORPORATION (ESIC) HOSPITAL AT MANIKTALA

ISSUED TO

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ENGINEERING PROJECTS (INDIA) LIMITED
SCOPE COMPLEX, CORE –III, LODHI ROAD,
NEW DELHI:110003
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1. Introduction

1.1 Information about the site :
An Existing ESIC Hospital Building at Maniktala comprising of Basement and 6 storeys.

1.2 SCOPE OF WORK

In the First phase 4th and 5th floor of ward block are to be upgraded.

The Scope of work covers

1. Dismantling of existing floors, doors and windows etc.

2. Laying of new flooring in wards, toilets, aluminum windows, doors, painting, false ceiling, plumbing, electrical, Fire detection, nurse call bell system, and furniture items

GENERAL TECHNICAL SPECIFICATION :

2.0 GENERAL SPECIFICATION

2.1 The work in general shall be carried out as per CPWD specifications, 1996 (volume I to VI) (updated with correction slips issued up to last date of submission of tender) and text of revised CPWD specifications for cement mortar, cement concrete and RCC works, 2002 unless otherwise specified in the nomenclature of the individual item or in the particular specifications for civil works and CPWD specifications, 1994 for Electrical works (Internal) and 1995 for Electrical works (External) (updated with correction slips issued up to last date of submission of tender).

2.2 All Electrical installation shall comply with the requirements of Indian Electricity rules, 1956 and Indian Electricity Act-1910 as amended up to date and bye laws of authority of State Government or any other department.

2.3 All mechanical works related to Public Health Engineering will conform to the requirements of manual of Water Supply by the Ministry of Urban Development and various Indian Standards as listed there-in.
2.4 All electrical works will conform to various Indian Codes as listed in the Technical Specifications.
2.5 For the items not covered under the specifications as stated above, the work shall be done as per relevant IS Codes.
2.6 For the items not covered under any of the specifications stated above, the work shall be executed as per Manufacturer’s specifications/ General Engineering Practice and / or as per direction of Engineer in Charge.

2.7 ADDITIONAL PARTICULAR SPECIFICATION
In the absence of any definite provisions or any particular issue in the aforesaid specification, reference to be made to the latest codes and specifications of BIS, IRC, BS, ASTM, AASHTO and CAN/CAS in that order. Where even these are silent, the construction and completion of works shall conform to sound Engineering practice as approved by Engineer in Charge. In case of any dispute arises out of the interpretation of the above, the decision of the Engineer in charge shall be final and binding on the contractor.
Where ever reference is made in the contract to specific standard codes to be met by the materials, plants and other supplies to be furnished and work performed and tested, the latest edition or revision of the relevant codes in effect shall apply, unless otherwise explicitly stated in the contract. Where such standards and codes are national, or related to a particular country of region, other internationally recognized standards which ensure a substantially equal or higher performance than the standards and codes specified will be accepted subject to the Engineer in charge prior review and written approval. Differences between standards must be fully described in writing by the contractor and submitted to the Engineer in Charge at least 15 days prior to the date when contractor desires the Engineer in Charge’s approval. If the Engineer in Charge determines that such proposed deviation do not ensure substantially equal performance, the contractor shall comply with the standards specified in the documents.
3. TECHNICAL SPECIFICATION FOR ELECTRICAL WORK

SCOPE

This specification covers supply of materials, fabrication, and erection, testing and commissioning of Electrical system as per BOQ. Applicable provisions and conditions of contract shall govern the work under the Section.

GENERAL

The power supply system in the building & retail outlet stations shall be made available at 415/240 Volts, 50 Hz., A.C. 3 phase 4 wire, earthed neutral from local Electric Supply Authority.

All supply and installation work shall be carried out as per specification and in accordance with the construction drawings and shall conform to requirements called for in the Indian Electricity Rules 1956 with its latest amendment, Indian Electricity Acts and all relevant codes and practices issued by the Bureau of Indian Standard as amended up-to-date. The work shall also comply with the provisions of the general or local set of legislatures and regulations of any local or other statutory authority which may be applicable.

The Contractor for electrical work must possess valid Electrical contractor's License endorsed by the Licensing Board, Directorate of Electricity of concerned State Government for the type of work he shall execute.

The work to be provided for by the Contractor, unless otherwise specified, shall include but not limited to the following:

i: Furnish all labour, supervision, services, materials, supports, scaffolds, construction equipment, tools, plants and transportation etc required for the proper execution of the job as per drawings, specification and schedule of items and get all necessary tests on materials and work conducted at their cost.

ii: Notwithstanding the electrical layout shown in the drawing, the contractor shall obtain further approval of the layout at site from the Consultant / Engineer-in-Charge before commencement of the work.

iii: Furnish samples of materials on display board at site for approval including arranging necessary tests on samples, as directed by the Consultant / Engineer-in-Charge in an approved Laboratory.

iv: To extend facilities to the Consultant / Engineer-in-Charge to inspect work and assist them to obtain samples, if they so desire.

v: Furnish general arrangement drawings of the switchboard and other fabrication items, which the Consultant / Engineer-in-Charge may direct for their approval.

vi: To employ a full time experienced supervisor having electrical supervisor's certificate of competency endorsed by the Licensing Board, Directorate of Electricity of concerned State to supervise the work. The
Consultant / Engineer-in-Charge have the right to stop the work if the contractor's supervisor is not present when the work is being carried out.

vii: To keep the appropriate Electrical Inspector & supply authority be informed from time to time as per the execution programme of the work shall be the responsibility of the contractor and he shall be responsible to ensuring that all work passes their approval.

viii: To provide all incidental items not shown or specified in particular but necessary for proper execution of works in accordance with the drawing, specification and schedule of items.

ix: To maintain the work and keep them maintained till handed over to the owner in proper working condition.

x: Co-ordinate with all agencies including those engaged by the owner for proper execution of the job.

MATERIALS

Materials shall be of the approved make & quality. A list of materials of approved brand and manufacturer is indicated in the annexure. If the list of materials mentioned above stipulates two or more or alternative brands/makes of any product, the decision as to which brand/make shall be used in the work shall be taken by the Consultant/ Employer and the contractor shall provide the brand/make so selected without any extra cost.

In case, materials are required to be obtained from any manufacturer other than those listed on account of non-availability then prior approval from Consultant will be necessary, supported by relevant test certificates qualifying the required standard. Further tests as directed by the Consultant shall also be carried out by the contractor at their own cost, if required.

Contractor shall obtain approval from the Consultant/ Employer of sample of all materials before placing order and the approved sample shall be carefully preserved on the display board in an appropriate manner at the site office for verification by the Consultant/ Employer.

For standard bought out items, the sizes manufactured by the firms listed shall prevail when there is discrepancy in the sizes mentioned in the schedule without any financial adjustment.

SPECIFICATIONS

Unless specifically mentioned otherwise, all applicable codes and standards published by the Bureau of Indian Standard and all other such publication as may be published by them after construction work starts, shall govern in respect of design, workmanship, quality and properties of material and method of testing.
SAFETY

All equipment shall be complete with approved safety devices wherever a potential hazard to personnel exists and with provision for safe access of personnel to and around equipment for operation and maintenance functions.

Special care shall be taken to ensure against entry of rats, lizards and other creeping reptiles which may create electrical short circuit inside live equipment.

DRAWINGS

On completion of all work the contractor shall furnish three copies of Ammonia print along with the original tracing of the following “As built” drawings to the Consultant without any extra cost.

I: Wiring diagram for final power / lighting distribution system showing the rating/ size of switchgear, cables, conduits, lighting fixtures and all accessories for individual installation.

ii Detailed general arrangement drawings of the switchboard complete with dimension in metric units.

iii Drawings showing the route of conduits and cables with sizes, lengths, sources and destination of all cables with the circuit designation number, etc.

iv Drawings showing the balancing of phases with connected load in each circuits, etc.

TEST CERTIFICATES AND INSTRUCTIONS

Unless specifically mentioned otherwise, the contractor shall furnish, in duplicate, Manufacturer’s Test Certificate with the delivery of the equipment to the Consultant and Instruction Manual in English for operations and maintenance of equipment wherever required.

TESTING AND COMMISSIONING

Before each field test, the contractor shall obtain the permission from the site engineer and all tests shall be conducted in the presence of duly authorised representative. Records of each test shall be prepared immediately after the test and this record shall be signed by contractor's representative conducting the test and the site engineer attending the test. Copies of their record in quadruplicate shall be handed over to the Consultant/ Engineer-in-Charge.

A certificate in quadruplicate shall be furnished by the contractor countersigned by the certified supervisor under whose direct supervision the installation was carried out and the owner's site engineer. This certificate shall be in the prescribed forms in addition to the test certificate required by the Local Electric Supply Authorities. Recommended completion certificate’s Format is given in Appendix ‘A’.
COMPLETION OF WORK

Each item of the electrical work shall be considered as complete in all respects only after obtaining permanent service connection from local power supply authority, energising, testing and final commissioning of the complete installation as directed by the Consultant/Engineer-in-Charge.

Payment on each item of electrical work shall be made as per measurement and proportionate to the quantum of work completed. In the event of any dispute with regard to the proportion of work complete, the decision of the Consultant/Engineer-in-Charge shall be final and binding to the contractor.

PREAMBLE TO THE SCHEDULE OF WORK

The successful tenderer shall carefully go through the Clauses of Invitation to Tender, Specification, Schedule of Work and drawings and shall include in his rates any sum he may consider necessary to cover the fulfillment of the various clauses contained therein. Unit prices stated in the schedule of work against the item of work shall be inclusive of all installation, accessories and consumables necessary to complete the said work within the contemplation of the contract. Beyond the unit prices no extra amount will be paid for incidental contingent work and materials.

The quantities mentioned in the schedule of work are probable quantities and it must be clearly understood that the contract is not a lump sum contract, that the probable quantities, the value of the entire tender are only indicative and Employer does not in any way assure the tenderer or guarantee that the actual quantity of work would correspond to the probable quantities in the tender.

No change in unit rate will be admissible on any variation of quantity.

TECHNICAL SPECIFICATION FOR WIRING SYSTEM

SCOPE

This specification covers supply of materials, erection and commissioning of distribution wiring, connection to distribution boards, cable laying, earthing and miscellaneous items. Applicable provisions and conditions of contract shall govern the work under the section.

GENERAL

Work to be provided for by the Contractor, unless otherwise specified, shall include but not be limited to the following:

i: Furnishing of labour, materials, supports, scaffolds, transportation, etc required for the work.

ii: To provide all incidental items not shown or specified in particular but reasonably be implied or necessary for successful completion of the work in connection with the drawings, specification and schedule of items.

iii: To provide all supervision for proper execution of the work.
iv: To conduct and bear all costs in respect of any test advised.

After completion of supply and installation of wiring system and earthing, if any defect in the material or workmanship is found by the Consultant / Engineer-in-Charge, the contractor shall remove the same and supply better and approved materials at his own cost.

All precaution against theft and fire shall also be taken by the contractor.

MATERIALS

All materials used in the work shall be ISI approved quality and in its absence conforming to the IS Specification.

WIRING SYSTEM

The electric load of all lights, power outlets, etc. shall be balanced across the three phases.

Generally the final loading of any sub-circuit for lights and fans shall not exceed 800 watts and shall not be connected to more than total 10 fans, lights, socket outlets, etc. Bell push if operated at low voltage shall be fed from a separate circuit of distribution board.

The 16 Amps sub-circuit for power shall be connected to a maximum one 16 Amp. socket outlet or two 6 Amp. socket outlets.

A power circuit shall always be originating from a distribution board or MCB DB and the same shall run in a separate conduit.

The point wiring shall mean wiring from one way of distribution board to point of utilisation of electricity i.e. where the load is applied and this shall include complete wiring from distribution board, supply and fixing of switch board, controlling switches, ceiling rose, batten holder and socket outlet, etc.

Insulated or covered earthing conductors where used, shall have green insulation braiding or covering as appropriate. Under no circumstances shall the colour green be used for other than earthing conductor. In addition where it is required, cables of different colours be used. For identification purposes the following system shall be employed:

<table>
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<th>Color</th>
<th>Purpose</th>
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<td>Red or any colour (other than black or green)</td>
<td>For phase or switch wire</td>
</tr>
<tr>
<td>Black</td>
<td>For Neutral</td>
</tr>
<tr>
<td>Green</td>
<td>For earth</td>
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Unless otherwise mentioned in the schedule of quantities, single way porcelain/ bakelite terminal connectors with nickel plated brass inserts and screws to suit the conductor size shall be used for intermediate wiring/ joints in junction boxes and in switch boards or by any other method approved by the Consultant/ Engineer-in-Charge.
Distribution wiring in conduit to light, fan, plug points etc. shall be done in looping in system. In this system, no joints or connections shall be made anywhere of the system except at terminating points such as, at terminals of switches, ceiling roses, etc. and in case of socket outlets, at the socket terminals. Intermediate wiring joints of neutral wire in junction boxes will not be permitted.

In the looping back system of wiring on hard wood batten, the wiring shall be done without any junction or connector boxes on the line. All intermediate joints or connections shall be made in the switch board only. Intermediate wiring joints of neutral wire in the junction box will not be permitted.

CONDUIT WIRING

All conduit shall be ISI marked and finished with galvanised or stove enamelled surface. All conduit accessories shall be conforming to IS:2667-1988 and be threaded type. Conduit less than 20mm in diameter shall not be used. All conduits shall be 1.4 to 1.8 mm thickness below 32 mm dia. and 1.6 to 2.2 mm thickness for 32 mm dia. and above.

The conduit for each circuit shall be erected complete with necessary bushes before drawing in of any wire. Galvanised M.S. Spacer of 3 mm thick minimum shall be used between the conduit saddle and fixing surface. The saddle shall be fixed at an interval of not more than 750 mm apart for vertical run and 600 mm apart for horizontal run.

The joint in conduits shall be made by means of threaded couplers and threaded accessories only to ensure electrical continuity throughout. All pipes after cutting, the threading shall be carefully reemed out with special reamer to remove any burr and then painted immediately with an anti-corrosive preservative after removing all traces of oil or grease. Junction boxes shall be provided with gasketed covers to render them dust and damp proof. The conduit accessories having pull outlet for conductors shall only be used in all conduit installation.

Where specified, P.V.C. conduit conforming to IS: 7537 (Part-III) shall be used. The thickness of P.V.C. conduit shall be adequate to withstand mechanical injuries. PVC conduit accessories conforming to IS: 3419-1976 shall be used along with P V C conduit.

The entire conduit system shall be effectively earthed by means of suitable earthing conductors and the resistance from any point to earth shall not be more than one OHM.

After installation of conduit pipes and fittings are completed in all respects, the exposed outer surfaces of the conduit and accessories shall be painted with two coats of approved enamel paints or aluminium paint over a coat of red oxide primer as required to match the surrounding wall finishing. To protect against rust the bare thread portion shall be painted with anti-corrosive preservative.

CONCEALED WIRING

This system of wiring shall comply with all the requirements of surface conduit wiring system specified in Causes 5.1 to 5.6 in addition to the following points:
**Making of chase**: The chase in the wall shall be filled up neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired. In 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. Specially for ceiling, conduit shall be laid before casting.

**Fixing of conduit in chase**: The conduit in chase in the wall shall be fixed by means of staples or by means of 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 long radius which will permit easy drawing of PVC insulated wires. All threaded joints of conduits shall be treated with some approved preservative compound to secure protection against rust.

**Inspection boxes**: Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be provided with inspection box covers.

**Types of accessories to be used**: All outlets, such as switches, wall sockets, etc. may be either flush mounting type or of surface mounting type. The outlet box shall be mounted flush with the wall. The metal box shall be effectively earthed with conduit by an approved means of earth attachment.

**Fish wire**: 1 x 18 SWG G.I. wire inside the conduit and accessories to be provided with an extension of 250 mm at both the conduit ends.

**Conduit laying in floor/ roof slabs before casting**: M.S./ G.I./ rigid PVC (as specified in BOQ) shall be laid straight as far as practicable and properly placed including binding with the steel reinforcement rods with 22 SWG G.I. binding wire so that proper positions of conduits are maintained.

While laying the conduits for concealed wiring in the ceiling / beams / columns / walls before casting, the contractor shall ensure that both ends of the conduit are plugged by means of dead-end sockets or otherwise to prevent the entry of any foreign material against conduit choking.

All precaution must be taken while laying the conduits in the slabs, R.C. walls, columns, etc. and the contractor shall rectify at his own cost, if any defects are found during process of drawing cables through the concealed prelaid conduits.

Each M.S. / G.I. conduit shall be provided with protruding length of 150 mm on free end of the conduits with sockets under the bottom level of slab/ beam.

Each rigid PVC conduit shall be provided with protruding length of 150 mm on free end of the conduits under the bottom level of slab/ beam.

There shall be no intermediate joints in one straight run of conduit.

All ceiling outlets shall be terminated in a round M.S./ G.I. circular box (80 mm depth minimum)/ deep box to suit standard size ceiling rose or/ and rectangular M.S. junction box or Fan Hook Box as the case may be.
It will be mandatory for the contractor to get the layouts approved by the Engineer-in-charge/Consultant, measurements are checked when the conduits are laid and bound to steel reinforcement rods, before he can release the work for casting of slabs/ floor/ beams etc.

**Connector Boxes, Draw-in-Box, Junction Boxes :**

These shall be constructed from 16 SWG M.S. sheet and have M.S. cover. Minimum size for connector box is 150mm x 100mm and for Draw-in-Box is 100mm x 100mm with required depth upto 80mm.

**Fan Hook Box :** These shall be 100mm dia x 80mm depth, constructed from 14 SWG M.S. sheet and provided with one 12 mm dia. M.S. rod of 300mm long having 'U' bend inside the box.

**Painting :** Both inside & outside wall of switch board, connection box, draw-in-box and other M.S. accessories shall be painted with two coats of anti-corrosive paint in addition to other painting instructions given elsewhere.

**WIRES**

Unless otherwise mentioned in the schedule of quantities, only single core PVC insulated / PVC insulated & sheathed cable consisting of multistrand / flexible copper conductor and of approved manufacturers conforming to relevant I.S. shall be used for wiring in conduit system.

The maximum number of wires drawn in one conduit shall not be greater than the recommended number given in the Table – 1 given in this section.

**P V C INSULATED WIRING LAID ON HARD WOOD BATTEN**

Unless otherwise mentioned in the schedule of quantities only single core PVC insulated wire of 1100 volts grade consisting of multistrand copper conductor conforming to I S :694 shall be used for exposed batten wiring.

All P V C wires shall run on well seasoned perfectly straight hard wood batten varnished on four sides but not less than 10mm finished thick and the width of which is such as to suit total width of cables laid on batten. Prior to the erection, these shall be painted with one coat of varnish. The battens shall be screwed to the walls and ceiling by flat head wood screws to wood plugs or other approved plugs at an interval not exceeding 750mm. The flat head wood screws shall be counter sunk within wood batten and smoothened down with a file.

Link clips shall be conforming to IS:2412-1975 and these shall be so arranged that one single clip shall not hold more than four single core P V C insulated wire upto 2.5 sq. mm, above which a single clip shall hold two single core wire. The clips shall be fixed on varnished wood batten with brass pins spaced at intervals of 100mm in the case of horizontal runs and 150 mm in the case of vertical runs. The link clips shall be made of heavy tinned brass sheet or Aluminium sheet, the thickness being not less than 27 gauge.

Where wires pass through walls/floors these shall be protected from mechanical injury by means of rigid steel conduit. The end of the conduit shall
be neatly bushed with bakelite. The conduit shall extent 1.5 mm above the floor and flush with the ceilings or walls.

After erection, the P. V. C. wiring along the batten shall be painted with one coat of synthetic enamel paint of an approved colour.

INSTALLATION AND WIRING OF DISTRIBUTION BOARD/ MCB DISTRIBUTION BOARD.

Where fixing of distribution board/ MCB DB on double teak wood board is specified only hinged type wooden board with brass hinge shall be provided and the size of the board shall be such as to match the size of the Distribution board/ MCB DB. A minimum margin of 25 mm shall be provided on all sides of the distribution board/ MCB DB. The outgoing circuit shall be taken out through a horizontal slot at the rear side of the distribution board/ MCB DB enclosure.

Where fixing of Distribution board/ MCB DB on M.S. frame is specified, the frame shall have sufficient mechanical strength to carry the weight of the DB./ MCB DB.

Where fixing of Distribution board/ MCB DB will be of concealed type, the chase in the wall shall be neatly made and be of ample dimensions to permit the DB to be recessed in wall and flushed with finished wall surface.

The cable / wires shall be connected to the terminal only by soldered or crimped lugs, unless the terminal is of such a form that it is possible to securely clamp them without cutting away of cable strands.

All bare conductors shall be rigidly fixed in such a manner that a clearance of at least 25 mm is maintained between conductors and material other than insulating material.

EARTHING

All non current carrying metallic part of various electrical equipments as well as cable armouring, metallic conduit, cable racks/ trays, brackets, supporting structures, etc. shall be effectively earthed by not less than two separate and distinct earth connection in accordance with Indian Electricity Rules, and the relevant Indian Code of Practice for earthing 3043-1987.

EARTH ELECTRODE

PIPE ELECTRODE

The earth electrode for earthing station shall comprise G.I. pipe 'B' Class of 50mm internal diameter and 3 Mtr long in one single piece with holes 12mm dia on all sides at 150 mm centre, upto a minimum height of 2.5 metre from bottom. Removable caps / wire mesh funnel shall be provided at the top of pipe to facilitate pouring of water. Suitable clamps made of 40mm x 6mm galvanised M.S. flats complete with bolt and nut shall be provided with the electrodes at 100 mm from the top end for connecting earth conductor. No joints will be allowed in the earth electrode. The electrode shall be driven at least 2 metre clear from masonry structure and the distance between two
Electrode shall be not less than 2 metre when installed in parallel and preferably placed twice the length of the electrode i.e. 6 metre. A masonry inspection pit of inside dimension 300mm x 300mm x 300mm deep (unless otherwise stated) shall be built with 125 mm thick cement mortar (6:1) brickwork both inside and outside plastered with 20 mm thick and neatly cemented 1.5 mm thick, inside top and outside around the top of the earth pit, so that the top of the G.I. pipe is 250 m below the finished ground level and the opening on top shall be provided with C.I. manhole ring having lockable C.I. cover fixed & flush with the outside finished ground level.

**PLATE ELECTRODE**

Where plate electrode for earthing is to be employed, the size of the plate shall not be less than 600 mm x 600 mm x 6.3 mm for G.I. plate in thickness and 600 mm x 600 mm x 3.15 mm thickness in case of copper plate.

The plate shall have a drilled hole 14 mm dia. at the centre. The G.I. flat of not less than 40 mm x 6 mm (1 no. 25 mm x 6 mm G.I. flat for lightning conductor installation) should be connected to the plate by means of a 65 mm long 12 mm dia galv. bolt, double nuts using double galv. washers. In case of copper plate, copper flat of not less than 25 mm x 6.0 mm shall be used as the earth lead. The flat shall first be fastened on one side of the plate, leaving adequate length of flat, which shall be taken over to the other side i.e. to the earth busbar, switchboard, pole, continuous earth wire for O.H. line, service bracket, lightning arrester or the object to be earthed and be fastened as per the details of IS:3043-1987. No joint on the earth lead conductor is permitted. Every care shall be taken to ensure that the ends of the wire/ flats have been securely clamped by the bolt on cleaned surface of the plate and establish a good electrical contact.

The plate shall be buried vertically at a minimum of 3.6 M below the ground level for sandy soil and 2.0 m below the ground level for normal soil. In order to place the same at the prescribed depth, the dimension of pit to be excavated shall be 900 mm x 900 mm x 4 m deep. The G.I. plate shall be placed in position by the contractor only after the inspection of excavated pit and approval is obtained from the Consultant/ Employer.

After placing the plate the earth lead conductor shall be protected by means of a continuous length of G.I. pipe (Class B) having 50 mm dia (minimum) bore or route depending upon the size of the lead, right from the plate upto a height of 600 mm metre (2 ft.) above ground level. The whole length of pipe shall be filled with bituminous compound of approved make and brand. The molten compound shall be poured from the top end of the pipe and topped upto overflowing.

A masonry inspection pit for the earth station of inside dimension approximately 300 mm x 300 mm x 300 mm depth (unless otherwise stated) shall be built with 125 mm thick cement mortar (6:1) brickwork with 1st class bricks, both inside and outside plastered with 20 mm thick and neatly cemented 1.5 mm thick, inside, top and outside around the top of the earth pit. The opening on top shall be provided with C.I. manhole ring having lockable C.I. cover fixed and flush with the outside finished ground level.

Electrodes shall be buried at least 2 metre away from masonry structure/building/pole or object to be earthed. However, earthing electrodes for L.C.
installations should be as close to the down conductors as possible. Electrodes when installed in parallel, shall not be placed less than 2 metre apart and preferably placed at distance greater than 6 metres.

All the excavations shall be duly back filled, dressed and rammed.

**EARTH BUSBAR**

**GALVANISED M.S. FLAT**

Unless otherwise specified in the schedule of quantities, the earth busbars shall be of heavily galvanised M.S. Flat of cross section 50mm x 6mm having adequate number of drilled holes with 10mm galvanised steel bolts, nuts, plain and spring washers for securely connected the earth leads and the continuity of conductor. The busbar shall be fixed on wall, having clearance of 6mm from wall with spacing insulators with 13mm dia G.I. rag bolts, spaced about 50mm apart.

**COPPER FLAT**

To be used, as specified in the schedule of items, where earthing requirements are more stringent, with use of brass bolts, nuts, washers for connections.

**EARTH LEAD CONDUCTOR**

The earth lead for each electrode shall be 7/10 S W G stranded G.I. wire connected securely to the earth electrode and earth busbar. The earth lead shall be mechanically protected with a continuous length of 25mm dia G.I. Pipe (Class 'B') right from the electrode to the earth busbar and the pipe shall be filled with bituminous compound.

Galvanised M.S. Flat earth conductor directly buried in ground shall generally be taken at a depth of 600 mm and shall be provided with one coat of bituminized paint, one layer of half lapped bituminized tape and a final coat of bituminized paint to prevent corrosion.

The earth conductor when laid inside building/ sub-station shall be taken either exposed on cable racks/ trays, walls, ceiling, etc. or embedded in concrete depending on installation. Galvanised M.S. saddles clamped to M. S. flat spacers with tapped holes shall be used for clamping earth conductor. Flats shall be supported at intervals not exceeding 500 mm and stranded wires at intervals of 300mm.

Connection of earthing leads to earth electrodes and termination of flat earth continuity conductor to equipment shall be made by means of bolting. Connection of stranded earth wire to earth bus as well as to equipment shall be made through crimping type lugs and bolting. Jointing and tapping of flat earth conductor shall be done by means of welding.

The earth resistance from any point of the earthing system shall not be more than one ohm.
WORKMANSHIP AND INSTALLATION WORK

The workmanship shall be of good commercial quality and all supply material and installation work shall be completed to the full satisfaction of the Consultant/Engineer-in-Charge.

CEILING FANS AND REGULATORS

The ceiling fans and regulators shall conform to IS: 374-1979. The fans shall have totally enclosed capacitor start and run motors suitable for operation on 230/240 Volt, single phase, 50 Hz. A.C. system. The regulator shall have an ‘ON’ -‘OFF’ position next to the lowest speed contact and shall be provided with at least five running positions.

EXHAUST FANS

The Exhaust fans shall conform to IS:2312-1967 and suitable for operation on 230/240 Volt single phase. 50 Hz. A.C. system. The fans shall be ring mounted type designed to give maximum air volume changes under free air flow conditions.

SWITCHES

Light and fan switches shall be rated for 6 amp. 250 volts and of Piano-key type and suitable for flush mounting on sheet steel board with moulded bakelite cover (manufactured by switch manufacturer). The switches shall be of approved make & acceptable to the Consultant/Engineer-in-Charge. The switches shall comply with relevant I.S.

SOCKET OUTLET AND PLUG

These shall be of 3 pin type and of rating 6 amps (for light) and 16 amps. (for power). Each socket outlet shall be complete with controlling switch and plug top. Protective fuse links shall be provided with 16 amps. power socket outlet. The socket outlets shall have piano-key type switches of approved make and acceptable to the Consultant/Engineer-in-Charge. The socket outlet and plug shall comply with the relevant I.S. specifications.

SWITCH BOXES

Sheet metal (16 SWG) switch boxes/ connection boxes with 3 mm thick bakelite top cover flushed in wall by housing the box after cutting brick wall. Sheet metal boxes shall be treated against corrosion by passivation or other approved method.
TUBULAR POLE/G.I. PIPE POLES

Where tubular steel pole are specified (either swagged or stepped), the same should be manufactured and supplied as per I.S. 2713 part I to III - 1980. Where G.I. pipe pole are specified the same should be approved to I.S.

LOOP-IN JUNCTION BOX

The junction boxes shall be drip proof type dust and verminproof construction fabricated from 2mm thick sheet steel having internal dimensions of 200 x 150 x 130mm depth for single phase distribution system and 250 x 200 x 130 mm depth for three phase distribution system. These shall have moulded bakelite base connector block with anti-vibration nickel plated brass terminals of suitable size and rating and porcelain fuse fittings.

MANUFACTURER'S DRAWING

The successful tenderer shall submit for approval General arrangement and dimensioned drawings for Power and Lighting distribution switch board, Motor Control centre, Bus-duct arrangement, Miniature circuit breaker distribution board, Distribution board, Interlocked Switch socket outlets, Clock switch control panel, T P Power Cable junction box and cable rack etc. as required in three sets before commencing manufacture.

WORKMANSHP AND INSTALLATION WORK

The workmanship shall be of good commercial quality and all supply materials and installation work shall be completed to the full satisfaction of the Consultant/ Engineer-in-Charge.

CONTRACTORS RATE TO INCLUDE

Apart from other factors mentioned elsewhere in this contract, the rates for the above shall include for the following:

i: All labour, materials, tools and construction equipment required for fabricating and fixing of above stated items.

ii: Scaffolding including erection and removal.

iii: Making good of all damaged civil work, if any.

iv: Necessary modification of pre-laid conduit including supply & fixing of Metal/ PVC conduits and accessories, chase cutting, etc. as required to complete the work.
4. PARTICULAR TECHNICAL SPECIFICATION FOR FIRE FIGHTING AND PREVENTION SYSTEMS

01.00 PORTABLE FIRE EXTINGUISHERS.
01.01 All the portable extinguishers shall be of free standing type and shall be capable of discharging freely and completely in upright position. Each extinguisher shall have the instructions for operating the extinguisher on its body itself and shall be supplied with initial charge with accessories as required.

01.02 Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns and shall be painted with durable enamel paint of fire red colour, conforming to relevant Indian standards or NFPA standard 10.

01.03 The Water CO₂ type extinguisher shall comprise of suitable thickness sheet body coated with leaded tin alloy internally and externally (by electrolytic deposition process), an inner container, a CO₂ gas cartridge, a plunger rod for CO₂ release and other accessories. It shall conform to IS:940.

01.04 Foam type extinguisher shall comprise of suitable thickness sheet steel body coated with leaded tin alloy internally and externally (by electrolytic disposition process), inner receptacle of lead coated brass, polished gun metal fittings with a locked handle. It shall conform to IS:10204.

01.05 Carbon-di-oxide type extinguisher shall comprise of high pressure steel cylinder body with wheel type valve, braided reinforced hose, non-conducting horns and accessories, wheeled trolley or mounting clamp, etc. It shall conform to IS:2878.

01.06 Dry chemical extinguisher shall comprise of suitable thickness sheet steel body coated with leaded tin alloy internally and externally (by electrolytic deposition process), an inner container, a carbon-di-oxide gas cartridge, a plunger rod for carbon-di-oxide release, a high pressure hose, a nozzle, a nozzle holder, wall mounting brackets and other accessories. It shall confirm to IS:4861 or IS:4308.

01.07 Any other kind of portable fire appliances provided shall confirm to NFPA standard 10 and of approved make.

02.00 FIRE WATER PUMP
02.01 The pump shall be of horizontal centrifugal type and designed for continuous operation at its best efficiency point. The pump shall have continuously rising head characteristic from operating point towards shut-off. The drive unit of the pump shall be suitably rated, so that the same can take the load of full open condition. The pump set alongwith its drive unit shall run smoothly without undue noise and vibration. Parts of pump like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal.

02.02 Under certain conditions, there may be occasions when fluid flow through the pump would be reversed, as in case of loss of power to the pump drive. The pump should be so designed that the impellers and other accessories are not damaged under such conditions of flow reversal. The coupling between pump and motor shall be of pin bush type.

03.00 ELECTRIC MOTOR.
03.01 Notwithstanding anything stated in this specification, the motor has to satisfy the requirement of the mechanical system during normal and abnormal conditions. All induction motors shall be of squirrel cage type and shall conform to the latest applicable Indian Standard (IS:325) & IEC.

03.02 The motors shall be suitable for continuous duty in the specified ambient temperature and the enclosure shall be dust proof as per IS:4691 and equivalent to IP-22 (for Motor above 15 KW) or IP-54 (for Motor 15KW & below). The starting current of the motor at rated voltage shall not exceed six (6) times the rated full load current subject to tolerance as given in IS:325.

04.00 PUMP STARTING PANEL.
04.01 The panel should be of free standing floor / wall mounting consols as required and out of CRCA sheet steel. Suitable terminal blocks shall be provided for termination of external cable / wires. The panel feature shall be able to match the system description or philosophy for water based fire protection system.

04.02 The panel shall be suitable to accept electric feeding of 440 (±10%) Volts, 3 phase & 50HZ (±5%) A.C. supply. The panel shall have the visual indication for power supply and of pump status. The starting interlock of the pump motor shall meet the system philosophy. The starter for Fire Pump shall be of Star-Delta type and that of Jockey Pump shall be of D.O.L. type.

04.03 The make of components and SLD of the panel shall be in accordance with the approval of Purchaser / Architect / Consultant.

05.00 HYDRANT / LANDING VALVE.
05.01 The Hydrant Valve (Alloy Steel) should conform to IS:5290 type ‘A’ and should be suitable for indoor or outdoor installation. The hydrant valve must be completed in all respect i.e. with blank cap & chain. It should have flanged inlet suitable for 80mm Nb and oblique type female instantaneous coupling outlet of 63mm size to receive male coupling as per IS:903.

06.00 PIPING
06.01 Mild Steel Black Pipe should be as per IS:1239, Part-I, medium grade / IS:3589 (6mm thick). The complete piping system should withstand hydraulic test pressure equal to 1.5 times of maximum working pressure. Piping to be laid overground shall be supported properly on wall / column / beam / floor to suit site condition. Piping to be buried underground shall be provided with protection of the outer surface, against soil corrosion by using one wrap of 3mm thick anticorrosion tape.

06.02 Outer surface of overground pipes shall be thoroughly cleaned of mill scale, rust etc. by wire brush, there after, one coat of red lead primer shall be applied. Finally two coats of synthetic enamel paint of approved colour shall be applied.

07.00 BRANCH PIPE WITH NOZZLE
07.01 The Branch Pipe (Alloy Steel) with Nozzle should conform to IS:903. The branch pipe should have male inlet connection of 63mm size at one end and other end should be threaded with a nozzle of 18mm bore.

08.00 HOSE WITH COUPLING.
08.01 63mm size controlled percolation hose should conform to IS:8423 / IS:636 and of 7.5M/15M long. Both the end of the hose should be properly riveted and G.I. wire bounded with pair of male & female Alloy Steel Hose Coupling as per IS:903.

09.00 FIRE SERVICE INLET (4 -WAY / 3 -WAY).
09.01 Fire Service Inlet connection should generally conform to IS:904 and complete with four / three 63mm dia instantaneous type gunmetal inlets with built-in check valves and 150mm Nb / 100mm Nb connection for installation with the fire main.

10.00 SWINGING HOSE REEL.
10.01 First aid fire fighting swinging Hose Reel should conform to IS:884 and complete with reputed make 20mm dia rubber hose of 30 M / 33 M. long. It should be powder coated and should be complete in all respect i.e. with swivel joint, nozzle, etc.

11.00 SLUICE VALVE / GATE VALVE
11.01 Valves 40mm and below shall be heavy pattern gunmetal valves with cast iron wheel tested to 16 Kg./Cm² pressure. Valves shall be leader or equivalent make.
11.02 Sluice Valves 50mm and above shall be cast iron double flanged with non rising spindle. Sluice valves below ground shall be provided with suitable valve chamber. Sluice valves in exposed locations i.e. pumps house etc. shall be provided to with cast iron wheels. Sluice valves shall conform to IS:14846 class PN 1.0 / PN 1.6. Sluice valves shall be of approved make.

12.00 BUTTER FLY VALVE.
12.01 The valve shall be of cast iron double flanged with lever operated. The valve shall generally conform to IS: 13095, Class PN 1.0 / PN 1.6 and shall be of approved make.

13.00 NON-RETURN VALVE
13.01 Non-Return valve shall be of cast iron double flanged & Swing Check type. The valve should have a permanent “Arrow” inscription on its body to indicate direction of flow of water. The valve shall generally conform to IS: 5312. The pressure rating of the valve shall be in accordance with the system design and the make shall be of approved type.

14.00 ANALOGUE ADDRESSABLE TYPE FIRE ALARM SYSTEM.
The fire detection and alarm system shall be designed to facilitate accurate identification of the source of heat / smoke / fire in their early stages to minimize occurrences of false alarms due to faulty equipments, electrical transients, system faults etc.

Facilities are provided to constantly monitor and check the following circuits and fault conditions:

The power supply to the loop/s
For open-circuit, short-circuit, earth fault and any other fault condition in the loop wiring
For communication failure and errors in all cards and loops.
For faults in keyboard.
Monitoring of all devices status to create a table of each 1 analogue channel for event analysis

All devices i.e. Detectors, MCP’s, etc. shall be installed on the same loop.

Any event i.e. Fire, fault or warning shall be recorded with time, date and place of occurrence in the memory of FACP.

Provision shall be done at the fire alarm control panel to silence the alarm sounders but the visual indication shall remain until the system is reset.

The main fire alarm control panels shall be located either in the Control Room or at the Ground Floor. The main FACP shall be capable of accommodating 99 detectors and 99 devices per loop.

All major component of fire alarm system shall be product of a single manufacturer and shall conform to the requirement of EN 54 / NFPA 72, LPCB / UL approved and be designed in line with EN 54, BS 5839, NFPA 72 Fire alarm systems CODE OF PRACTICE FOR SYSTEM DESIGN, INSTALLATION AND SERVICING. The power supply breakers for FDA system shall be marked “ DO NOT DISCONNECT FIRE ALARM SUPPLY ”

The Fire Alarm System consists of the following elements.

1) **Analogue Addressable Photo-Electric Smoke Detectors** for the above and below false ceiling areas pertaining to Meeting Rooms, Cabins, Stores, Offices, Open Work-station areas and areas alike.

2) **Analogue Addressable Thermal Detectors** to detect unusual rate of rise of temperature for Basement areas, Electrical installation areas, Kitchen, Pantries and areas alike.

3) All fire sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change.

4) If the Fire Alarm Panel determines that the sensor is in alarm, the Fire Alarm Panel shall command the sensor LED to remain on to indicate alarm.

5) Each sensor shall be capable of being tested for alarm via command from the Fire Alarm panel.

6) Each sensor shall respond to Fire panel scan for information with its type identification to preclude inadvertent substitution of another sensor type. The Fire Alarm panel shall operate with the installed type but shall initiate a mismatch (trouble) condition until the proper type is installed or the programmed sensor type changed.

7) Each sensor shall respond to Fire Alarm Panel scan for information with an analogue representation of measured fire related phenomena (smoke density, particles of combustion, temperature). Such response proves end-to-end sensor including the operation of the sensor electronics.

8) The detector shall meet the requirements of either EN 54 or shall be listed with LPCB. It shall be possible to test the detector’s working both from the
panel as well as locally by means as designed by the Contractor and approved by the Engineer-in-charge. The approved coverage per detector for unhampered areas shall not be less than 50 Sq. M. The detector shall be capable of being reset automatically after any alarm condition.

9) **Addressable Manual Call Points** are proposed to be installed at each Exit Staircase, Lobby areas on each floor to comply with relevant standard / norms or recommendation of local fire brigade authority.

10) Each device shall be assigned a unique address via easily understood decade (01 to 99) switch. Address selection via binary switches or by jumpers is not acceptable. Devices that take their address from their position in the circuit are unacceptable because if devices are later added, existing addresses, descriptors and commands need to be reprogrammed.

11) Each device shall contain screw terminals with rising plates for positive termination suitable for 1.5 Sq.mm. copper conductor wire.

12) The Fire Panel shall be capable of displaying the address of the occurrence of the smoke and shall be capable of activating Hooters. It shall have the provision for external actuation like ventilation fan control, fire damper control, if any and system should provide Open Protocol in case connectivity is required with BMS (Building Management System).

   It shall be possible to program the Fire Panel such that meaningful alphanumeric descriptions can be assigned to each Detector Address. This shall be useful in identifying the location of Fire very quickly and easily.

13) It is important to note the ESSENTIAL REQUIREMENT from the system mentioned as under. As it has been stated the SYSTEM REQUIREMENT ARE ESSENTIAL IRRESPECTIVE OF WHETHER ANY OF THE DEVICES OR COMPONENTS MENTIONED ARE PRESENTLY BEING USED AS PER BILL OF MATERIAL / QUANTITY OR A FUTURE REQUIREMENT.

   Every detector should be loop powered and addressable by itself.
   Every Manual Call point should be loop powered and addressable by itself.
   Every Sounder / Hooter should be loop powered and addressable by itself.

   Every Linear Beam Detector should be loop powered and addressable by itself.
   Every Zone Monitor Interface (for connecting to Conventional detectors and Devices) should be loop powered and addressable by itself.
   No separate power supply should be used for the Sounders / Hooters which are supposed to be only loop powered. The system thus is general will be based on only loop cable.
   No separate Addressable interface unit / module should be used for the Sounders / Hooters which are supposed to be self Addressable type.

   No separate Addressable interface unit / module should be used for the Zone Monitor Interface (for connecting to Conventional detectors and Devices) which are supposed to be self Addressable type.
   Every Module in general Monitor module, Mini / Micro Monitor Module, Control Module, Isolator Module etc. should be loop powered and addressable by itself.
   Panel configuration should strictly follow EN – 54 in terms of failure of devices if quantity are more than 512.
The alarm sounder shall consist of necessary solid state electronic circuit or printed circuit card, suitable to accept impulse from fire alarm panel. If required, necessary line matching transformer shall also be included with the sounder. The speaker of the sounder shall preferably be housed in a suitable box.

15.00 P.A. SYSTEM
15.01 Suitable Public Address System comprising micro phone & amplifier unit shall be coupled with the fire alarm system in such a way that the P.A. System will come into operation in case of fire alarm, having the manual override facilities.

16.00 SAFETY SIGNAGE (EXIT SIGN WITH ARROW / FLOOR NUMBER & FIRE ORDER)
16.01 The “Exit” Board & “Arrow” marking to indicate direction of escape route shall be of size 150mm X 300mm & 150mm X 150mm and Floor Number shall be of size 150mm X 200mm. The signage shall be of Photoluminescent nature. The signage shall get charged from the existing light present in the area and shall come alive to glow as soon as the light goes out by the luminous crystals containing mainly zinc sulphide in protective glass-like shell which is non toxic & non radioactive or non hazardous. The intensity of glow in the dark of the said signage shall decrease continuously but should last not less than 4 hours and strongest glow should produce during first 30 minutes of darkness.

16.02 The Fire Order should be on Acrylic sheet of approximate size 450mm X 300mm. The Fire Order / Notice should be printed by bright lettering.

IT WILL BE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN NOC FROM DIRECTORATE OF FIRE SERVICES AFTER SATISFACTORY EXECUTION OF THE WORK.
CODES & STANDARDS.

All the systems and equipments within the scope of this tender shall be of reputed proven makes, designed and manufactured in accordance with the stipulations of latest versions of Indian Codes or recommendations of W.B.F.S / T.A.C. / F.O.C. / N.F.P.A.

When an equipment is offered conforming to standards other than those listed below, it shall be clearly brought in Schedule of Deviation.

01. IS:1646 : Code of practice for fire safety of building (general), Electrical Installations.
02. IS:1648 : Code of Practice for fire safety of buildings (general), Fire Fighting Equipment and its Maintenance.
03. IS:3034 : Code of Practice for Fire of Industrial Buildings, Electrical Generating and Distributing Stations.
04. IS:884 : First Aid Hose Reel for Fire Fighting ( For Fixed Installations).
05. IS:2171 : Portable Fire Extinguisher, Dry Powder Type.
06. IS:2878 : Portable Fire Extinguishers, CO2 type.
07. IS:1239 : Part - I : Mild Steel Tubes (upto 150mm).
      : Part - II : Mild Steel tubulars and other wrought steel pipe fittings.
08. IS:778 : Gunmetal gate, globe and check valves for general purposes.
10. IS:14846 : Sluice Valve for water works purposes (50 to 1200mm size) – Specification.
11. IS:5312 : Swing Check type Reflux (Non-Return) Valves.
12. IS:940 : Portable Fire Extinguisher, Water CO2 Type.
13. IS:10204 : Portable Fire Extinguisher, Foam Type.
15. IS:1520 : Horizontal Centrifugal Pumps for clear, cold and fresh water.
17. IS:8423 : Controlled Percolation Hose for fire fighting.
19. IS:2062 : Structural Steel (Fusion / Welding Quality ).
26. IS:3589 : Mild Steel Tubes (200mm and above).