MHSC

MINE HEALTH AND SAFETY COUNCIL

Electrical, Solar and UPS Solutions for the MHSC Offices

BID No.: MHSC 012/2025-26

ELECTRICAL AND ELECTRONICS SERVICES

STANDARD GENERAL AND TECHNICAL SPECIFICATION

Standard General and Technical Specification - Electrical and Electronic Services

1. GENERAL

- This Standard General and Technical Specification defines the electrical installation's general conditions and technical standards as specified in the DetailedSpecification and Drawings.
- Where the term "Engineer" is used hereinafter, it shall mean the Consulting Engineer or his authorised representative.
- Where the term Electrical Contractor is used, it shall refer tothe Contractor appointed in terms of this contract.
- The terms "Contract," "Work," "Works," or "Installation" shall mean the contractor works specified in this contract.
- The Electrical Contractor shall carry out the complete contractor works as indicated in and per the Specification and Drawings, and shall provide and install all items necessary for the proper functioning of the installation, even though such items may not be specifically referred to in the Specification and Drawings.
- The Electrical Contractor must work under the leadership of the principal contractor appointed by the client.
- Where any statement in the Detailed Specification is at variance with statements in the Standard General & Technical Specification, then the statement in the Detailed Specification shall take precedence.

2. DRAWINGS

Contract Drawings

The drawings accompanying this specification are as stipulated in the Detailed Specification hereof.The working drawings of the Principal Contract shall, however, consist of:

- The Engineer's drawings
- The Architect's drawings
- The Structural Engineer's drawings, as applicable
- The Engineer's drawings of other disciplines, as applicable
- The drawings of other service installations that are relevant for coordination and installation purposes
- The installation drawings of other contractors, where applicable

All drawings and layouts shall be regarded as diagrammatic, and all positions and dimensions shown on drawings shall be verified on site.

The Electrical Contractor shall liaise with the principal contractor before starting work on any section to ensure that he is in possession of the latest drawings. Should any discrepancybe found between the Electrical Contractor's drawings as issued by the Engineer and those in possession of the Principal Contractor, the matter shall be referred to the Engineer for clarification.

No extra time or budget will be allowed for alterations or making good resulting from a lack of verification.

Shop Drawings for Approval

- Three copies of all shop drawings shall be submitted to the Engineer for approval, and to demonstrate compliance with the contract documents.
- Shop drawings are any drawings, diagrams, schedules, performance charts, and other such data prepared by the Electrical Contractor, or his Supplier, manufacturer or distributor, and which illustrate some portion of the contract works.
- Approval of shop drawings by the Engineer does not relieve the Electrical Contractor of his responsibility for compliance with the Specification, nor does it relieve him of his responsibility for errors or omissions in shop drawings.

As-built drawings

The Electrical Contractor shall ensure that any deviations from the Construction drawings are noted and returned to the Engineer to update the originals.

3. PRIME COST (PC) ITEMS

The contractor shall take delivery of, unpack, clean, assemble, store, protect, and install all PC items as directed by the Engineer. He shall be responsible for all such items until the contract works are completed and handed over. Tenderers shall make an allowance for this at their tender price.

4. CONTINGENCIES

Where a contingency sum is included in the Form of Tender, this shall be expended only on written instructions from the client.

5. TESTS AND INSPECTIONS

The Electrical Contractor shall arrange for all necessary installation tests and inspections required by the relevant Authorities and shall allow fees and charges payable to these authorities for such tests and inspections.

The Electrical Contractor shall attend on the Engineer during all site equipment inspections and advise the Engineer in good time of the proposed completion of works so that these may be inspected before installation. All tests and assessments by the Engineer shall be to his satisfaction.

6. EXISTING INSTALLATION

Where the Works involve alterations and/or additions to existing works, these works, where operational, shall be kept in full continuous operation throughout the period of the Contract.

The Electrical Contractor shall decide on all the necessary temporary connections. Contractors are to make allowances for this in their tender prices.

Should the electrical contract form part of an existing installation, the electrical contractor shall visit the site to acquaint himself with all aspects of the installation before submitting a price.

7. BUILDERS WORK

Where the principal contractor requests the Electrical Contractor to provide a temporary power supply and any other such work for the building operations, then such work shall be provided.

8. MATERIALS, TOOLS AND EQUIPMENT

All materials and equipment used in the electrical installation shall be of recent design and manufacture, of the best quality available, and shall, wherever possible, carry the latest mark of the South African Bureau of Standards.

- Where called for by the Engineer, samples shall be submitted.
- The Electrical Contractor shall make all his own arrangements regarding the transport of labour and materials and shall provide his plant and tools.
- Materials and equipment on site shall be suitably stored to avoid any possible deterioration or damage through any cause whatsoever. Any replacement or rectification required, due to non-compliance in this regard, will be for the Electrical Contractor's account.
- All conduits, outlet boxes, distribution board trays, etc., shall be fixed in position by the Electrical Contractor and built in by the principal contractor. Where, in exceptional cases, this is not possible, chasing will be permitted.
- The Electrical Contractor shall do chasing with power-driven chasing machines or sharpened hand tools.
- The Electrical Contractor shall advise the principal contractor promptly of the requirements forall chases and openings in building work.
- Chases for conduit installation shall be so executed that, after installation, the outer face of the conduit is not less than 12mm from the finished plastered surface.
- Chasing into walls where mortar and/or bricks have not been properly cured will not be permitted.
- Chasing into face brick or plastered walls and concrete structures will not be permitted without prior consent. The Electrical Contractor will be held responsible for any damage to the principal contractor’s work due to non-compliance.

9. ELECTRICITY SUPPLY

- **Application**

  Unless otherwise specified, the Engineer will apply to the Local Supply Authority (Council) for an electrical service connection and will make all the necessary arrangements for payment directly by the Employer/Client.

- **Connection of Supply**
  The Main Electrical Contractor shall ensure that the Consumer's main circuit breaker complies with the Supply Authority's requirements and Code of Practice.
  He shall allow attendance on the Supply Authority when the supply is connected, ensuring the service connection is not delayed.

- **Supply Authority's Metering**
  Unless otherwise specified, the Supply Authority's metering panel and equipment shall be incorporated in the Main Board or other boards as applicable.

The Electrical Contractor shall ascertain and establish the correct space and all other requirements of the Supply Authority for the accommodation of their meter panel or equipment, shall provide the necessary links in busbars or any other requirements for metering CT's, and shall provide all the required cables, jumpers and connections between such metering equipment and the Consumer's equipment.

10. LOW VOLTAGE DISTRIBUTION BOARDS

A. General

- All distribution boards shall be purchased from a specialist manufacturer, who shall also install and fit the switchgear and equipment and carry out all internal wiring. The electrical contractor shall install and connect the boards in the positions indicated on the drawings.
- Unless otherwise specified, the same firm shall manufacture all distribution boards.
- The electrical Contractor shall ensure that all distribution boards fit into and can be installed in the spaces set aside for them and can be moved through doors and access routes on the site.
- All distribution boards shall be supplied complete with all internal wiring to terminal blocks, labels, earth bars, statutory notices, holding down bolts, fixing brackets, and everything necessary for satisfactory operation of the board.
- Outer fittings of all boards shall be protected against damage and defacement until immediately before final testing and commissioning. Any damage to external paintwork shall be made good by the Contractor.

B. General Construction and finish

- All distribution boards shall be of totally enclosed sheet steel construction, free of distortion, and, unless otherwise specified, fully front accessible and ventilated.
- Sheet steel shall be bent and braced, as necessary, to provide a rigid square frame support for all components. All corners shall be suitably welded. All steelwork shall be ground smooth, shall be free of rust, scale, slag, burrs and grease, and shall be suitably rustproofed, primed, and finished in powder coating, colour to approval. Interiors of boards shall be white, and plinths shall be black.

- Equipment shall be neatly and accessibly set out, adjustable chassis-mounted, flush behind readily removable rigid sheet steel panels of 1,6mm minimum thickness, with close-fitting cut-outs to toggle surrounds, push button surrounds, etc.
- Indicator lamps shall be similarly mounted, with coloured glass only fixed to the panel. Instruments shall be flush-mounted on hinged panels.
- Time switches shall be mounted behind flat hinged doors, with catches and Perspex windows, and meters shall be mounted behind 3mm thick, flat Perspex windows. All reset buttons shall be accessible from the panel front.
- Readily removable panels, with returned edges, shall be accurately fitted and secured to the frame using locating pins and indicating turn-catches, or with dome nuts and welded studs. Suitable chromed handles shall be provided to facilitate panel removal.
- Doors, where called for, shall be readily removable, with flush-type rigid construction, with concealed hinges, sliding bolts, and flush-type lockable catches to approval, all locks being master-keyed. Two keys shall be provided for each lock. Door width shall not exceed 700mm.
- Where future equipment is pre-fitted, this shall include installing pre-drilled chassis, cutting out in the panel with suitable blanking plates, and adequate busbar extension.
- Non-combustible barriers shall be provided to separate sections of boards fed from different transformers or sources of supply and to isolate each main incoming circuit breaker where the fault current exceeds 15kA.
- A group of 3 phase and neutral busbars or conductors crossing a ferrous metal barrier shall do so through a standard opening. Under no circumstances shall a single conductor be surrounded by a continuous ferrous metal.
- On completion of the installation, the Contractor shall supply and mount the wiring diagram for that respective board behind a suitable panel of each distribution board.
- All distribution boards with terminating cables shall have suitably sized, rigid gland plates, top and or bottom. These gland plates shall be bonded to the framework or earth conductor.
- Joints in busbars, where necessary, shall be by means of bolted fish plates. Bolts used for jointing or supporting busbars shall be of high tensile phosphor bronze or high tensile plated steel, minimum 9,5 mm diameter, and used with flat and spring washers.
- Neutral bars shall have the same cross-sectional area as the phase bars up to a maximum of 160 mm2. The earth bars shall be effectively bonded to the metal framework of the board.
- All busbars and any other uninsulated connecting links shall be taped or sleeved by the board manufacturer except at joints and take-offs, which shall be taped after the installation of boards and cables. Correct colour coding shall be maintained.

C. Wiring

- All distribution boards shall, unless otherwise specified, be fully wired internally by the board manufacturer with colour-coded, single-core copper, PVC-insulated cables, 600/1000-volt grade. Wiring shall be neatly done, suitably laced, fixed clear of exposed terminals, and run square to the sides of the board.
- Wiring shall be rated to suit the capacity of the associated switchgear.
- Where aluminium cables are to be terminated at circuit breakers, fuse switches, etc., suitable connecting studs shall be provided to facilitate connection.
- Circuits on multiphase distribution boards shall be balanced over the phases.

D. Pre-fitted space and spare fuses

- Unless otherwise specified, space only and mounting facilities shall be provided for 30% future expansion of isolators, MCBS, CFS, time switches, and meters and 60% future expansion of contactors and relays.
- 100% spare fuses shall be supplied, unless otherwise specified, and mounted behind a hinged panel, inside the distribution board, specially marked as such.

E. Labels

- All labels shall be engraved, laminated plastic board type, black letters on white background, 6mm minimum height letters, sans-serif capitals. Labels shall be inserted into slotted holders and held in position by soft glue.
- Each distribution board shall be provided with a label stating the name, size, and origin of the feeder cable, e.g., "Sub Main Board. D—Fed from Main Board with 240 mm2 x 4-core copper PVC SWA cable."
- All distribution board sections, main switches, isolators, MCBS, meters, etc., shall be labelled individually as per specification. For example, circuit breaker labels shall state the type of circuit, location, and number, time switches shall be labelled as to times of operation, meters shall be labelled as to multiplication factor, etc. In addition, index cards shall be mounted outside the panels, providing information about the circuits.
- The index card shall provide typed information behind a clear plastic panel and screwed into position.
- All equipment inside the board, e.g. contactors, relays, etc., shall be marked as to their function corresponding with circuit numbers on relevant drawings.

F. Shop Drawings

- As soon as is practicable after the contract has been awarded, the Electrical Contractor shall submit dimensioned layout drawings of all distribution boards to the Engineer for approval; such approval will be obtained in writing before the commencement of distribution board manufacture. Approval by the Engineer of drawings shall not relieve the Contractor of his responsibility for any deviation from the requirements of this

Specification.

- Drawings shall show elevations and sections and shall be fully dimensioned. Equipment layouts, with labelling thereof, shall be shown. Busbar layout and sizes shall be indicated. The drawings shall be fully annotated to indicate compliance with the specification. Wiring diagrams shall be included.

G. Inspection and Approval

- The engineer shall inspect all distribution boards upon completion of manufacture, but only after inspection and acceptance by the Contractor and prior to dispatch from the manufacturer's works. The Contractor shall advise the Engineer before such completion and approval.
- Distribution boards may only be delivered to the site after inspection and approval by the Engineer. Such approval, however, shall not relieve the Contractor of his responsibility for any deviation from the requirements of this Specification.
- All distribution boards shall be approved by and comply with the regulations of the Supply Authority. It shall be the responsibility of the Contractor to establish and provide such requirements and obtain approval where necessary.

11. CABLES

A. Paper Insulated Cables

- Paper-insulated cables, unless otherwise specified, shall have
  - high conductivity stranded copper conductors, and shall be
  - 600/1000-volt grade, paper-insulated, oil- oil-impregnated and
  - drained, lead-covered, double steel tape armoured and served to
  - SABS Specification 97.
- Cables shall be terminated in approved compound filled end-boxes with glands, and screwed filler plugs. The lead sheath shall be effectively bonded to the gland by means of a wiped solder joint. Conductors shall be cut inside the box and connected to the outgoing tails by means of solid-centre ferrules or solid connection studs and/or rods. Tails shall be taped first with varnished cambric tape and finally with one layerof PVC tape in phase-distinguishing colours. Cable terminations shall generally be carried out only by qualified cable jointers, following best practice.

B. PVC Insulated Cables

- PVC insulated cables, unless otherwise specified, shall have high conductivity stranded copper, or solid aluminium conductors (if specified) and shall be 600/100-volt grade, PVC insulated and bedded, steel wire or aluminium strip armoured, and PVC sheathed to SANS Specifications, as amended.
- Cables shall be terminated in approved mechanical clamping glands with shrouds.
- The armouring of PVC insulated cables is not acceptable as an earth conductor, and

stranded copper earth wire shall be run with each cable in compliance with SANS 10142 Regulations for the Wiring of Premises, whether specific reference is made thereto in the Detailed Specification of the Specification.

- The earth wire shall be neatly strapped to cable at 600 mm intervals shall be bonded to the armouring at both terminations and shall be bolted to earth terminals of equipment at both ends.

C. Mineral Insulated Copper Covered Cable

- Mineral insulated, copper covered (MICC) cable (MICC or Pyrotenax) and accessories, where called for in the Specification, shall be 600 Volt grades, to BS 3207.
- Cables shall be terminated in pot seal glands according to the manufacturer's recommendations, and cable tails shall be served with the manufacturer's neoprene sleeving. The Contractor shall take all necessary precautions to prevent moisture ingress into the mineral insulating materials of the cable. MICC cable shall indicate a minimum insulation resistance of 1 mega-ohm immediately prior to pot seal termination.
- Where MICC cable enters a motor, or any other appliance that is likely to move or vibrate, a 360-degree expansion loop shall be formed in the cable immediately prior to point of entry.

D. Installation of cables

- The Electrical Contractor shall supply cables and shall install them in positions as indicated in the Specification and/or the Drawings, in a workmanlike manner, and generally in accordance with accepted standards, shall be installed and fixed as prescribed in the latest SANS Regulations.
- Where cables are installed side by side, there shall be a minimum spacing of 60mm between cables, unless otherwise specified. All cable routes shall be confirmed with the Engineer prior to commencement of installation.
- No joints in cables will be permitted, unless approved by the Engineer. Jointing shall be done with acceptable jointing kits, by a qualified cable jointer.
- Cables required to be fixed horizontally, shall be supported on suitable cable trays, installed level, and shall be strapped thereto in such a manner that any cable may readily removeable without interference with other cables.
- Cables required to be fixed vertically, shall be clamped with approved clamping devices to adequate cable ladder or uni-strut supports, mounted against vertical surfaces.
- Low voltage (LV) cable installed in ground, shall be buried at a minimum depth of 600mm below finished ground level.
- Medium voltage (MV) cable installed in ground, shall be buried at a minimum depth of 800mm below finished ground level.
- Cables shall be bedded in river sand or sifted soil (free of clay), from 75 mm below to 75 mm above cable, prior to backfilling of trenches. 50 mm thick precast concrete slabs, measuring approximately 300 mm x 600 mm and engraved "Danger-Gevaar", shall be laid

over 75mm soil bed covering MV cables along the entire route of such cables.

- Suitable cable markers shall be installed above all underground cable routes. Such markers shall be positioned at each change in direction of cable, at both ends of sleeves crossing roads or tracks, at entry or exit from buildings, and at 30m intervals on straight runs.
- M.I.C.C. cable shall be installed on surface only, unless otherwise specified, run square to finished surfaces, and neatly and adequately saddled thereto.
- All LV and MV cables were installed shall be permanently labelled at both ends indicating the source, cable size and rated voltage of the cable.

E. Cable Trays, Cable Racks and Cable Basket

- Cable trays unless otherwise specified, shall be of 1,6 mm minimum thickness, slotted, galvanized sheet steel construction, with 25 mm minimum returned edges, supported by means of rigid "L" or "T" galvanized angle brackets, at intervals to suit width of tray and weight of cables to be supported, and at both ends of each length. Cable tray shall be installed straight, and level, and adequate supports shall be provided to avoid sagging of tray.
- Cable racks shall be of ladder configuration, made up of galvanized angle iron, slotted angle or roll formed steel sections to approval. "Rung" spacing shall correspond to the shortest saddle fixing centres required for the supported cables. Cable racks shall be installed thereto with suitable clamp.
- Cable basket unless otherwise specified, shall be of 1,6 mm minimum thickness, slotted, galvanized sheet steel construction, with 25mm minimum returned edges, supported by means of rigid "L" or "T" galvanized angle brackets, at intervals to suit width of basket and weight of cables to be supported, and at both ends of each length. Cable basket shall be installed straight, and level, and adequate supports shall be provided to avoid sagging.
- All cable trays, cable racks and cable basket shall be bonded and earthed.

12. CONDUIT

A. General

- Unless otherwise specified, all conduits shall be black enamelled heavy gauge steel, welded or solid drawn with a minimum of 20 mm external diameter and to the latest SABS Specification.
- All joints shall be screwed, and only steel couplings will be accepted. Where accepted by the Local Authorities, innovative systems, e.g. "Easilok" or "Bosal" or equivalent may be used.
- Conduit boxes and fittings shall be black enamelled, malleable iron, while switch boxes, plug boxes and draw boxes shall be galvanized heavy gauge pressed steel.
- If specified in Detailed Specification of the Specification, PVC tubing may be used. Such tubing and its accessories shall also comply with the latest SABS specification.
- Where conduit and conduit fittings are installed in positions exposed to

the weather or in moist surroundings, then they shall be galvanized. Exposed threads shall be suitably protected.

- Flexible conduit may be used only when specified in Detailed Specification and may be both plain hot-dip galvanized, or hot-dip galvanized, and PVC served.
- In all cases an earth wire shall be run externally with the flexible conduit and secured to the terminations at each end.

B. Conduit installation

- Conduits shall be carefully examined, before installation, to ensure that there are no defects or internal obstructions. Conduit shall be installed generally in accordance with the Standard Regulations for the Wiring of Premises, and outlet boxes securely bonded to earth, with joints, terminations, etc. internally bevelled, smooth and free of burrs.
- Conduit threads shall be cut clean, and of enough length to permit fitting entries being butted.
- Where bending of conduits is necessitated, this shall be carried out with standard conduit bending tools, care being taken to ensure that conduit cross-section is not distorted, and that enough radius is allowed so as not to subject conductors to undue mechanical stress when drawing-in of wiring.
- Termination of conduit shall be by means of screwing and lock-nutting to, or lock- nutting on inside and outside, and bushing on inside of box or appliance, or press- fitting into socket in the case of "Cheyney" pre- socketed box. Alternatively, conduit may be terminated by means of a coupling and brass male bush. Solid brass bushes, only, shall be used.
- Conduit crossing expansion joints shall do so at right angles to expansion joint, shall be cut and separated, and provided with an outer sleeve extending 150mm either side of the joint, and suitably taped to prevent ingress of cement/water. An earth wire shall be run across the expansion joint and shall be bonded to the first conduit box on either side of the joint.
- Draw boxes or draw trays shall be installed only where necessary, and shall be positioned as inconspicuously, but accessibly, as possible, to the Engineer's approval.
- Conduit in dividing walls between shops, and conduit to light switches on office floors, shall only be installed as vertical drops, via back-entry boxes flush with ceiling unless otherwise specified.
- Conduit for future requirements shall be terminated in boxes with overlapping cover plates and fitted with stout galvanized draw-wire. Where such conduit is, however, required to project from wall or slab, it shall be galvanized, fitted with coupling and plugs, and sealed with waterproofing compound.
- The Electrical Contractor shall ensure that all conduit work is timeously completed, so as not to delay building operations, and shall advise the Engineer, in good time, of such intended completion, that it may be inspected prior to being covered up. The Contractor

shall attend on the Engineer during all such inspections.

- Prior to building finishes being applied, such as plastering, screeding, painting, etc., the Contractor shall ensure that all conduit runs are continuous and clear of obstructions. Damage to building finishes, resulting from non-compliance in this regard, will be to the Contractor's account.
- Flush and Surface conduit Installation:
    - All conduit and conduit fittings, unless otherwise specified, shall be installedflush, concealed in concrete, walls, ceiling spaces etc.
    - Conduit in concrete shall be timeously installed, spaced well apart, and firmly secured, with joints suitably sealed against ingress of cement/water, and outlet and draw boxes installed level, and adequately secured to shuttering. Installationof large conduits or sleeves, or installation of large concentrations of conduits, shall be carried out to the Structural Engineer's approval; such approval to be obtained prior to commencement of work.
    - Conduit in concrete surface beds shall be installed well clear of ground, by utilizing suitable spacer pieces. Conduits installed below surface beds, or in ground, ash fill etc., shall be galvanized, and shall be encased by Builder in 75mm concrete all round. It shall be the responsibility of the Electrical Contractor to advise the Builder timeously of this requirement, and to ensure that such requirement is duly executed. Any additional work resulting from non-compliance in this regard, will be for the Contractor's account. Conduit in brick walls shall be timeously built in.
    - Conduit in roof spaces shall be run parallel and square to roof truss members. Conduit in roof/ceiling spaces shall be run in a horizontal plane, directly above ceiling support members, and shall be adequately supported, independently of ceiling support members, unless otherwise specified.
    - Conduit installed on surface, where specified, shall be installed generally, in aneat and workmanlike manner, run square to finished surfaces, and shall be neatly and adequately saddled thereto.

13. POWER SKIRTING

- Power skirting, finished in baked enamel, the colour of which will be specified, shall consist of a sheet metal wiring trunking with three separate wiring channels for each of power, intercom and telephone services. Unless otherwise specified, the power skirting shall be mounted at skirting height and installed to the Engineer's approval.
- The power skirting shall be manufactured out of 0,9 mm minimum thickness sheet metal with dimensions 55 mm deep x 160 mm high in 2,450 mm lengths. The skirting shall have fixed partitions dividing it into three compartments with removable covers, one for the power compartment and a second covering both the intercom and telephone compartments together.
- Where the skirting is mounted in situations having provisions for specified modular sub-divisions, then the covers shall be provided to suit the module and a separate cover spanning all channels shall be provided centrally on each module line.
    - The end pieces, internal and external corner pieces or offset pieces shall

be factory made.

- The power skirting shall be installed with the power compartment at the top and shall be fixed to the wall, curtain wall or skirting in an approved manner. The power skirting shall generally be installed after the floor screeding has been completed but prior to any other floor finishes such as carpets.
- The Electrical Contractor shall install feeder conduits to the power skirting as indicated on the drawings. These conduits shall be run in the floor and set up behind the skirting terminating in a flush conduit box and fixed to the skirting. Wiring shall be fed through an opening punched or drilled into the skirting. Under no circumstances shall wiring be passed over sharp edges.
- Where spare conduits are specified, these are to be left empty and fitted with draw wire. Wiring in power skirting shall be laced together neatly in groups and care taken to ensure that loose conductors do not obstruct the fitting of front covers.
- Where a run of power skirting is interrupted by doorways, etc., suitable conduit jumpers shall be installed to bridge the break in the power skirting run. Minimum sizes for bridging conduits shall be 32 mm for each of telephone and power channels unless otherwise specified.
- The sections of power skirting base channel shall be screwed or bolted together to provide earth continuity. In addition, one green insulated copper earth wire of cross-section not less than half the area of the largest conductor, but not less than 2,5 mm^2 shall be run along the entire length of the power skirting, and each separate base section of channel shall be bonded thereto.
- The earth terminal of each switched socket or other electrical appliance or equipment fed from the power skirting shall be earthed by means of a copper jumper crimped or soldered to the unbroken earth conductor. Other approved means of earthing connections may be used provided they are also acceptable to the Supply Authority. The main earth wire in the power skirting shall be connected to the earth terminal of each distribution board feeding thepower skirting.
- The power skirting shall be delivered to site with adequate protective covering and care shall be taken in storage and handling to prevent damage.
- Switched sockets used in the power skirting shall be 15A - 3 pin 100 mm x 500 mm nominal size, supplied and installed by the Electrical Contractor and shall be flush mounted in the power skirting.
- Provisions for switched sockets which are mounted in the power channel of the skirting shall be by means of suitable brackets which secure the switched socket to the basic channel, free from the cover. The covers shall be pre-punched for the face of the switched socket at suitable intervals.
- The removable cover shall in addition be screwed to the cradle of the switched socket, acting as the cover plate. No separate cover plates shall be used. All pre-punched covers shall be delivered to site complete with blanks. Blanking off shall be done in an approved manner, flush and neat in appearance and finished in same colour as power skirting. The fixing screws for blanks shall be painted the same colour as skirting. These blanks are only to be removed by the Electrical Contractor where a switched socket is required to be installed.Brackets shall be fitted in the power channel by the Electrical Contractor at every socket provision, regardless of whether a switched socket is installed.

14. FLOOR CHANNEL

- Unless otherwise specified underfloor wiring, channels shall be 200 mm wide x 32 mm high and have 3 compartments, normally with the centre compartment for electrical services and outer compartments for intercom and telephone services. Unless otherwise specified each of the compartments shall have openings at 500 mm intervals to facilitate the installation of pedestal units. The openings shall be fitted with screwed cover plates to allow for easy removal.
- Flush crossover boxes, junction boxes and angle bend boxes shall be supplied as indicated on the drawings complete with fixed internal barriers and removable bridging pieces to allow for crossover of the services.
- Floor pedestal units shall be either two or three compartment aluminium units as specified. These pedestals shall have separately removable cover plates for access to electrical, intercom and telephone compartments.
- Unless otherwise specified all pedestal, units shall be supplied complete with a 15A - 3 pin switched socket outlet and blank cover plates fitted to the other compartments. A waterproofing gasket shall be supplied complete with the pedestal unit.
- The Electrical Contractor shall supply and install the floor channel and junction boxes in the positions as indicated on the drawings.
- The Electrical Contractor shall mark out positions of floor channel, and the Principal Contractor will provide level screed beds on which the Electrical Contractor shall install floor channel. Alternatively, floor channel shall be assembled and laid into position on un-screededslab by Contractor and levelled and grouted by the Principal Contractor.
- It shall remain the Electrical Contractor's responsibility to ensure that the floor channel is finally positioned to specification and he shall maintain constant liaison with the builder in this regard.
- Conduit connections to floor channels shall terminate at junction boxes only. Angled risers, to the rear of the power skirting, shall be provided to each floor channel termination at power skirting, and shall consist of a separate riser for each compartment.
- Riser sections, to the rear of distribution boards, shall be provided to each floor channel termination at distribution boards.
- Circuit wiring to the switched sockets shall only be drawn into the Electrical compartment of the channel and the Electrical Contractor is to ensure that a constant rotation of the service compartments are adhered to. Provision shall be made for a pedestal installation at each 1500 mm module and enough wiring shall be allowed for.
- Under no circumstances will joints in the wiring be allowed in the channel other than at pedestal units or junction boxes. An earth wire shall be installed with each run of electrical floor channels which shall be bonded to each junction box through which it passes.
- Earth connections from each pedestal socket shall be crimped to the main earth wire. The earth wire shall not be cut anywhere along the length of the channel.
- Draw wires shall be installed for the entire length of the intercom and telephone compartments.
- Shop drawings of all floor channel installations shall be timeously submitted to the Engineer for approval, and such approval shall be obtained in writing prior to commencement of manufacture.

- Exact routes and dimensions of floor channel shall be checked on site prior to preparation of workshop drawings and manufacture.

15. WIRING TRUNKING

- Galvanized sheet metal or plastic wiring trunking, the types and sizes of which will be specified, shall be supplied and installed by the Electrical Contractor in the position indicated on the drawings.
- The wiring channels shall generally be 2500 mm long complete with junction pieces, endpieces, corners, T-pieces, brackets and supports and snap-in covers etc.
- Wiring channels shall unless otherwise specified, be installed level and parallel to or perpendicular to finished surfaces. Covers shall be accurately cut to fit squarely and neatly at joints, corners, partitions, etc., and shall not be installed prematurely.
- Conduit feeders to and links between wiring channels shall terminate directly into the channel at accessible outlets using screwed or bushed entries. Care shall be taken to ensure that wiring does not pass over any rough edges.
- Unless otherwise specified, channels shall be installed with the open side facing upwards. When channels are mounted open end downwards, suitable supports shall be provided to support the wiring.
- Suitable hangers shall be provided where channels are suspended. For concealed flush-mounted channels, snap-in covers shall overlap the open face of the channel. Liaison with the Builder shall be maintained where channels are to be flush-mounted in ceiling slabs or suspended ceilings.
- An earth wire shall be installed in each run of ceiling channel and bonded to each section of metallic channel. Crimped jumpers shall be taken from this primary earth wire and placed on whatever equipment is installed on the channel.

16. WIRING

- All wiring shall be carried out in accordance with the Standard Regulations for the Wiring of Premises and using PVC-insulated single-core copper conductors bearing the SABS mark. Wiring shall be delivered to the site in sealed coils with the labels intact.
- No joints will be allowed in the wiring other than at junction boxes, outlet points, distribution boards etc., and all wiring shall be carried out using the "loop-in" system. Enough tail lengths or loops shall be provided where outlets are wired for future equipment.
- Unless otherwise specified in the Detailed Specification, the following minimum standard PVC insulated conductors and earth wire sizes shall be used for various types of circuits.

Circuit Type/Three Single Phase	PVC Conductor Earth wire phase size (mm^2)	size (mm^2)
Lighting	2.5	2.5
16A switched sockets	4.0	2.5
Geysers	4.0	2.5
Console air-conditioners	6.0	4.0
Stoves	10	6.0
General connections		
up to 15A	2.5	2.5
Pylons & signage	2.5	2.5
Motors up to 1,5kW	2.5	2.5

- For lighting circuits, an earth wire may be called for by the Supply Authority. For wiring in non-metallic conduit, a separate 2.5 mm earth wire shall be provided.
- Unless otherwise specifically called for, no open wiring will be allowed.

17. EARTHING

- The Electrical installation shall be thoroughly and effectively earthed in accordance with the Standard Wiring of Premises and to the satisfaction of the Local Supply Authority.
- Separate copper earth continuity conductors shall be run with the feeders, from the main board to all distribution boards, between distribution boards, from distribution boards to sub-circuits and with final sub-circuits.
- Only one earth conductor is required per group of cables or with conductors run in one conduit provided the copper earth conductor shall be half the cross-sectional area of the largest conductor with which it runs up to a maximum of 70 mm^2.
- All hot and cold-water pipes and all waste-water pipes shall be effectively bonded using copper tape clamped by means of brass bolts and nuts.
- Earthing shall be provided across all pressure reducing valves, at water heaters and across all non-metallic waste traps at basins, sinks, etc.
- Metal roofs, gutters and downpipes shall be bonded together and earthed.
- All terrestrial aerials and communications equipment shall be earthed.

18. LUMINAIRES

A. Outlets

- Unless otherwise specified, all lighting outlets for surface-mounted fittings shall be terminated in standard round conduit boxes to which the fitting shall be screwed. Outlets shall be installed in the positions indicated on the drawings and shall always be accessible for wiring.
- Outlets for recessed fittings shall, unless otherwise specified, be surface type – 130 x 86 x 41 mm steel or PVC boxes fitted with 5A, 3-pin, single-phase un-switched socketswith matching cover plates. These outlets shall generally be fixed against theceiling slab over or to the roof truss members and in positions adjacent to the fittings. The fittings will be provided with flexible cords and plug tops.
- Outlets above inaccessible plasterboard ceilings. As above, and only if they will be accessible for future maintenance. A joint box or jointing in an inaccessible ceiling isnot acceptable. Where required, a 5A, 3-pin socket on a flexible cord set will be provided to access the 230V power supply.

B. Installation

- The fittings shall be mounted in the positions indicated on the drawings and, where surface-mounted, should be mounted asymmetrically with respect to ceiling panels and building features. Shouldthe fittings not be mounted in the positions indicated for whatever reason, the matter should be referred to the Engineer forclarification.
- Surface-mounted fittings shall be installed with their mounting bases or hanging strips flat against the ceiling or wall fixed directly to the conduit box. Additional supports for heavier type fittings shall be to the approval of the Engineer.
- Surface fluorescent fittings mounted directly to ceilings shall be mounted hard up against the ceiling and secured in the middle and near both ends. Fittings longer than 2400 mm and wider than 200 mm shall have double fixings at each point.
- Fluorescent fittings installed in continuous rows shall be close coupled by means of locknuts and bushes or nipples. For fittings mounted on wiring channels, approved adaptors shall be used. Where fluorescent fittings are suspended on pendants these shall consist of 20 mm diameter conduit pieces of the required length which may be used for wiring to the fitting. At least two pendants are required per fitting.
- Recessed fluorescent fittings shall be dropped into the openings provided and plugged into the socket outlets.
- Recessed downlighters shall be secured within openings in the ceilings with mounting brackets supplied with the fittings.

C. LED Lighting Installation

- Each LED driver shall have a separate 230V feeder cable. Joints in cables or at driver terminals are not allowed, i.e., one wire per terminal.
- The lighting outlets provided for LED lighting in recessed, inaccessible ceilings are to consistof a 5A socket outlet with an extended cord set to allow the 5A socket connection tobe accessed from below through the cut-out for the LED fitting.
- Where LED lighting is installed in accessible ceilings, the outlets are to be provided

as 5A socket outlets fixed to the soffit.

- ❖ Only approved type or specified type LED drivers are to be used.
- ❖ All LED fittings and drivers must have a minimum 3-year unconditional warranty.
- ❖ Low voltage connections to light fittings are to be ferreld, and crimped joints are to be covered with heat-resistant heat shrink or tape. “Chocolate” type plastic block connectors are notallowed.
- ❖ Unless otherwise specified all LED downlighter lamps will be of the GU10 230V type. No 12V lamps will be accepted.

D. Outside pole light installations

- ❖ Each pole will be provided with a weatherproof, accessible hatch. Inside the hatch, provision shall be made for the termination of cables, earthing fitting of the isolator, and control gear, if specified.
- ❖ Each pole shall be provided with a L+N type 10A 2-pole circuit breaker, unless otherwise specified.
- ❖ In 3-phase installations, the main neutral wiring shall be permanently ferreld, crimped and taped with only one wire connection at the top of the isolator terminal.The same applies to the phase conductors.

19. LIGHT SWITCHES

- ❖ The electrical contractor shall supply, install, and connect light switches in the positions indicated on the drawings. These switches shall be rated for 15A, 250V and comply with the latest SABS Specification. They shall be mounted 1,000 mm above the finished floor level, measured to the centre.
- ❖ Where flush-mounted, the switches shall be installed in 100 x 50 x 50 mm pressed steel, galvanised boxes with oversized cover plates, the colour of which shall be specified in the Detailed Specification. Where located in walls with dual finishes, e.g. tiled, the Electrical Contractor shall be responsible for ensuring that cover plates fall entirely withinone or the other finish, but not on the junction line. Special narrow units shall be providedwhere switches are mounted directly into partition mullions. Surface-mounted switches shall be of the metal-clad type.
- ❖ Where switches are exposed to the atmosphere or situated in damp, moist conditions, then watertight switches shall be used.
- ❖ A maximum of 3 switches shall be allowed in a 100 x 50 x 50 mm switch box.

20. OCCUPANCY / MOTION SENSORS

- ❖ The electrical contractor shall supply, install, and connect motion sensors in the positions indicated on the drawings. These switches shall be rated for 15A, 240V and comply with the latest SANS Specifications.
- ❖ Motion sensors shall employ dual technology, have a built-in microphone for occupancy detection, and operate in a 360 ° radius.

- All motion sensors shall feature adjustable time settings from 10 minutes to 40 minutes and typically be set to operate at 30 minutes.
- A single motion sensor will control a maximum of 10 light fittings.
- Motion sensors are to be supplied with dual outputs to control both lighting and air-conditioning installations, where required.

21. BELL PUSHES

These shall be rated for 5A 250V, even where used for low-voltage bell installations. Theinstallation of bell push can be treated as for lighting switches above.

22. SWITCHED SOCKET OUTLETS (SSO's)

- All SSOs shall be supplied and installed by the Electrical Contractor in the positions and heights as indicated on the drawings and specified in the Detailed Specification.
- Unless otherwise specified, all single-phase SSOs shall consist of 15A, 250V, 3-pin shuttered sockets together with the new ZA standard 3-pin socket to the latest SANS 164-2 specification.
- Where flush-mounted, the switch sockets shall be installed in 100 x 100 x 50 mm pressed steel, galvanised boxes with oversized cover plates, the colour of which will be specified in the Detailed Specification.
- All surface-mounted SSOs shall be of the metal-clad type.
- Where SSOs are exposed to the atmosphere or situated in damp, moist conditions, weather-proof sockets, e.g., the "York" type or equivalent, shall be used and approved.
- Where not specified or indicated on the drawings, SSO's shall be mounted at 300 mm above the finished floor level in offices, shops and bedrooms, at 1, 400 mm in factories, workshops and garages and at 1,200 mm in kitchens and laundries, all measured from finished floor level, to centre of outlet.

23. AIR-CONDITIONING UNITS

- Unless otherwise specified to the contrary, these units will be supplied and installed by others,and the Electrical Contractor will be responsible for electrical outlets and final connections only.
- One of two types of outlets will generally apply:

  - ***Isolator***
    Each outlet point shall have a separate 20 or 30A double-pole isolator.

  - ***Socket outlet***
    Each outlet shall be equipped with a dedicated “black” socket outlet to ensure that the socket employed is non-standard and prevent the user from inserting standard 16A plug tops since air-conditioning circuits will generally not be protected against earth leakage. The Electrical Contractor shall supply and install the plug top.

- 4 mm^2 wiring shall be used for 20A supplies and 6mm^2 wiring shall be used for 30A supplies.

- "Split" air-conditioning units
  Unless specified to the contrary, the Electrical Contractor shall be responsible for providing power at one or the other component, i.e., evaporator (fan air terminal) or condenser. The Electrical Contractor shall establish the exact supply point before starting work.
- All outlets for air-conditioning units shall be permanently labelled.

24. GEYSERS

- Others will supply and install the geysers, mount them, and connect the water supplies.
- The electrical contractor shall make the final electrical connection. The wire will be from the board with 2 x 4 mm^2 PVC conductors and 2.5 mm^2 BC earth wire in a 25 mm conduit. A local 30A DP isolation shall be provided adjacent to each geyser.
- Care shall be taken to ensure that the geysers are filled with water before the power is switched on. The Electrical Contractor shall confirm the nature and positions of all geysers with the plumber before installation.

25. KITCHEN EQUIPMENT

- Unless otherwise specified, appliances will be supplied and installed by others but shall be connected by the Electrical Contractor.
- All outlets, unless otherwise specified, shall be tubed in 25 mm conduit to a local flush isolator at + 1,400 mm above the finished floor level with a flush round conduit outlet boxbelow at 300 mm.
- The connection from the outlet box to the stove shall be with a dome lid and PVC SWA cable or heat-resistant insulated wire in flexible tubing.
- Enough slack shall be allowed to permit moving of the appliance at least 500 mm for cleaningpurposes.
- The Electrical Contractor shall supply and install engraved labels on each isolator with the appropriate designation, e.g., "FISH FRYER."

26. SUMP PUMPS

- Sump pumps, where specified, shall be connected, including all controls, by the Electrical Contractor, and, where supplied by the electrical contractor, shall be ordered with entries to suit the Plumber, to whom they shall be handed for fixing in position.
- The electrical Contractor shall install control equipment so that it operates most effectively. For example, float switches shall not be prone to tangling, electrode assemblies shall be clear of water splash, etc.

27. SMALL EXTRACTION FANS

- Where small extract fans are specified, they shall, unless otherwise specified, be

supplied and installed by the Electrical Contractor.

- Outlets shall consist of 5A un-switched socket outlets located in the ceiling and connected to, and accordingly switched with, the local lighting circuit.

28. MOTORS

- Unless otherwise specified, all electric motors will be supplied and installed by others, but shall be connected by the Electrical Contractor.
- Wiring to the motors shall be as specified in the Detailed Specification, and local isolators shall also be provided. The connection from theisolators to the motors shall be made using a PVC SWA cable.
- Motor starters will generally, unless otherwise specified, be supplied by others but installed by the Electrical Contractor in the positions detailed.
- All starter overloads shall be finally set by the Electrical Contractor to suit current ratings of the equipment installed.
- The Electrical Contractor shall also check the correct rotation of the motor.

29. PROVISIONS FOR TELEPHONE, INTERCOM, TELEVISION & OTHER SERVICES

- The Electrical Contractor shall supply and install all the necessary conduit, sleeves, wiring channels, distribution boards, etc., as specified and indicated on the drawings, for the above services.
- Telephone service conduits shall be at least 25 mm and fitted with draw wires. Outletsfor telephone services shall consist of 100 x 100 x 50 mm galvanized pressed steel boxes with cover plates to match those for switch sockets.
- Conduits and outlets for all other services shall be sized as detailed and fitted with draw wire.
- The Electrical Contractor shall co-operate with the installers of telephone equipment and other services as best as possible and shall provide whatever information these installers require regarding the provisions made for them.

30. CIRCUIT, OUTLET AND LUMINAIRE REFERENCE

- The circuit/outlet references used in the drawings and specification shall have the following meaning: the prefix letter/s of any outlet shall refer to the distribution board from which it is fed; the number immediately thereafter shall refer to the circuit; the number after the dash shall refer to the outlet number e.g. B3.6 = Outlet no. 6 on circuit no. 3 fed from distribution board B.
- The alpha character used in the specification to indicate luminaire type shall refer to fittings as described in the Schedule of Luminaires.
- All mounting heights and dimensions to outlets shall, unless otherwise specified, be measured to centre of outlet boxes. Mounting heights preceded by a plus sign (+) shall represent height above finished floor level.
- Where exact positions of outlets are to be confirmed, this shall be established before installation.