

**OMAN WASTEWATER  
SERVICES COMPANY S.A.O.C**



**الشركة العمانية  
لخدمات الصرف الصحي ش.م.ع.م**

**OMAN WASTEWATER SERVICE COMPANY**

**ELECTRICAL STANDARD SPECIFICATION**

**SECTION 12**

**GENERAL ELECTRICAL INSTALLATION**

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## **1-0 GENERAL REQUIREMENTS**

- 1-1 This specification states the minimum requirements for general electrical installation work, methods and materials that shall be used for general installation and testing of electrical equipment to be installed within OWSC projects.
- 1-2 If any discrepancy is found between this specification and the related documents, regulations or standards, the Engineer shall be informed during the tender period.
- 1-3 Each installation shall comply with all relevant statutory instruments and regulations including the following:
- § Omani Electrical Standards
  - § Local Authority Regulations
  - § The Electricity Supply Regulations
  - § The Electricity at Work Regulations
  - § Health and Safety
  - § Fire Authority requirements
- 1-4 The complete installation shall comply with all relevant British Standards, British Standard Codes of Practice and, where indicated, with other Standards and Specifications, and all amendments thereto.

## **2-0 CONTRACTOR RESPONSABILITIES:**

- 2-1 The contractor shall only employ on his contract those personnel who are fully conversant with the installation and type of equipment to be installed.
- 2-2 The contractor shall include in his team an electrical Supervisor and sufficient suitable personnel for all the fields of work associated with the installation. The supervisor shall be capable of providing proper continuity of field supervision for installation, inspection and testing of equipment and systems to the satisfaction of the Project Engineer.
- 2-3 The contractor shall be responsible for ensuring that the installation complies with the requirements of the latest edition of applicable standards and regulations.
- 2-4 The contractor shall be held responsible for the quality and correctness of workmanship. He shall be expected to remake any section of work or replace any material of his supply which does not meet the satisfaction of the Project Engineer.

- 2-5 The electrical installation work shall be carried out to a high standard of workmanship using skilled labour of proven ability.
- 2-6 The installation shall be carried out in accordance with all manufacturers' recommendations and established methods and practices and to the entire satisfaction of the Project Engineer.
- 2-7 The Contractor shall be responsible for all site co-ordination with other trades, services and disciplines.

### **3-0 CONTAINMENT SYSTEMS**

#### **3-1 GENERAL CLAUSES**

- 3-1.1 All containment shall be installed neatly, unobtrusively and parallel to the general building line, and shall meet the aesthetic considerations of the building, as determined by the Project Engineer.
- 3-1.2 Where the Containment installation does not meet these criteria it shall be replaced.
- 3-1.3 Containment shall only be installed in horizontal or vertical runs.
- 3-1.4 Containment installed within ceilings, floors, ducts, risers etc shall be installed to the same standard as that of the surface installation.
- 3-1.5 All containment systems shall comply with the latest applicable Standard, and shall be installed in strict accordance with manufacturers' instructions.
- 3-1.6 As a guide where it is feasible all containment shall be over - sized by 25% to allow for future projects, after all allowances have been made for Space Factors.
- 3-1.7 All metallic containment systems shall be earth continuity tested and offered to the Project Engineer for Witness Testing before cabling and concealment of any containment commences.
- 3-1.8 In instances where containment has to pass across building expansion joints if the installation method is not detailed in the Particular Specification, the Contractor shall agree it on site with the Project Engineer and the Building Surveyor.

3-1.9 Where it is intended to use Adaptable boxes, they shall be of the same type and grade as then associated containment. They shall not be used as joint boxes unless it is a requirement of the Particular Specification.

3-1.10 If it is a requirement of the Particular Specification it shall be fitted with fixed connectors, a circuit designation, and a warning sign fitted to the lid.

3-1.11 The containment system selected shall be the same type, and grade throughout the entire installation.

3-1.12 Separate containment shall be installed for each category of the installation.

### 3-2 LADDER RACK

3-2.1 All Ladder Rack shall be Hot dipped Galvanised and the grade shall be General Purpose Heavy Duty.

3-2.2 All Bends and sets shall be factory formed and be of the same grade and size as the Ladder Rack.

3-2.3 At each joint an earth continuity strap shall be fitted so as to ensure earth continuity. All straps shall be fitted on the external edge of the Ladder Rack so they are clearly visible.

3-2.4 The Ladder Rack shall have all sharp edges removed and shall be painted with a zinc rich paint where cuts have been made.

3-2.5 The Ladder Rack shall be spaced from the building fabric by means of proprietary brand brackets, which shall be firmly fixed to the building structure. The brackets shall ensure the following minimum clearances:

- Ceilings - 300mm between the Ladder Rack and the building structure.
- Walls - 25mm between the Ladder Rack and the building structure.
- Floors - 25mm between the Ladder Rack and the building structure.

### 3-3 CABLE TRAY

3-3.1 Internal to a building Cable tray shall be Hot dip galvanised. External to a building Cable tray shall be either Hot dip galvanised or GRP.

3-3.2 Bends and sets shall be factory formed and of the same grade and thickness as the cable tray.

3-3.3 The cable tray shall have all sharp edges removed and shall be painted with a zinc rich paint where cuts have been made.

3-3.4 The tray shall be spaced from the building fabric by means of a proprietary brand cable tray bracket, which shall be firmly fixed to the building structure. The bracket shall ensure a minimum clearance of 50mm between the tray and the building structure.

3-3.5 The brackets shall be fixed:

§ At the end of each cable tray.

§ At not more than 100mm from each bend or set,

§ At not more than 1m intervals along straight runs.

3-3.6 The cables shall be fixed at equal intervals.

A maximum number of 3 cables deep are allowable where it is necessary to stack cables.

### 3-4 STEEL TRUNKING

3-4.1 Steel Trunking and fittings shall be Pre-galvanised steel.

3-4.2 Trunking dimensions shall not be less than 50mm x 50mm.

3-4.3 Trunking fittings shall be of the same finish and type as the associated trunking system.

3-4.4 Trunking shall be supplied and installed with close fitting lids which have a screw or catch type assembly.

3-4.5 Only standard manufactured bends, sets, etc shall be used on the trunking system.

- 3-4.6 Trunking shall have all sharp edges burrs and swarf removed internally and externally.
- 3-4.7 The trunking shall be butted solidly into all fittings so as to ensure a continuous mechanical installation.
- 3-4.8 At each joint a tinned copper link shall be fitted so as to ensure earth continuity. All links shall be fitted on the external edge of the trunking so they are visible.
- 3-4.9 Trunking shall be securely fixed to the fabric of the building at intervals not exceeding 1m.
- 3-4.10 In instances where trunking is to be suspended it shall be firmly fixed to the fabric of the building by means of proprietary brand hangers and/or brackets.
- 3-4.11 Where trunking passes through the general building structure, it shall be installed with a permanently fixed section of lid. Such fixed sections shall be restricted to the absolute minimum length necessary.
- 3-4.12 Where trunking pass through fire compartments (wall/floor etc) the trunking shall have fitted internally, a fire protective barrier equivalent to that of the (wall/floor). The method of achieving fire protection must be put forward for approval by the Project Engineer.
- 3-4.13 Multi compartment trunking shall be installed to ensure the integrity of all compartments.

**3-5 PVC TRUNKING**

- 3-5.1 The grade of PVC trunking and fittings shall be Heavy Duty, High Impact.
- 3-5.2 Trunking fittings shall be of the same grade, colour and finish as the associated trunking system.
- 3-5.3 Trunking dimensions shall not be less than 50mm x 50mm.
- 3-5.4 The trunking shall be supplied and installed with close fitting lids.
- 3-5.5 Multi compartment trunking shall have fitted separate lids to each compartment.

- 3-5.6 The trunking shall be installed complete with manufacturers bends, bridges etc.
- 3-5.7 Adhesive to be used shall be that recommended by the trunking manufacturer.
- 3-5.8 Trunking shall be installed in strict accordance with the manufacturers instructions.
- 3-5.9 The trunking shall be butted solidly and cemented (using the manufacturer's approved adhesive) into all fittings.
- 3-5.10 The trunking shall be securely fixed to the fabric of the building at intervals not exceeding 700mm.
- 3-5.11 In instances where trunking is to be suspended it shall be installed as follows:-
- a) A suitable sized metal tray or batten shall be firmly fixed to the fabric of the building by means of proprietary brand hangers and brackets.
  - b) The trunking shall be firmly fixed to the tray/batten using pan head screws, nuts and washers.
- 3-5.12 Where trunking passes through the building structure, it shall be installed with a fixed section of lid. Such fixed sections shall be restricted to the absolute minimum length necessary.
- 3-5.13 Where trunking pass through fire compartments (wall/floor etc) the trunking shall have fitted internally, a fire protective barrier equivalent to that of the (wall/floor). The method of achieving fire protection must be put forward for approval by the Project Engineer.
- 3-5.14 Insulated pin racks shall be installed in vertical runs of trunking exceeding 1m.
- 3-5.15 All cables installed within these sections shall be fixed within the pin rack.
- 3-5.16 Multi compartment trunking shall be installed in a manner, which ensures the integrity of all compartments.

### 3-6 STEEL CONDUIT

- 3-6.1 All conduits shall be Hot Dipped Galvanised.
- 3-6.2 Conduit shall have a minimum diameter of 20mm.
- 3-6.3 Conduit fittings shall be of the same type as the associated conduit.
- 3-6.4 Conduit boxes shall be of the screwed circular pattern for sizes 20mm and 25mm.
- 3-6.5 Conduit shall be cleaned of all lubricant and swarf internally and externally. Internal cleaning shall be achieved by use of a “draw-rag” pulled through its entire length.
- 3-6.6 Conduit shall be free from all score marks and shall have a continuous bore throughout its length.
- 3-6.7 Conduit shall be screwed and butted solidly into all fittings so as to ensure a continuous electrical and mechanical installation.
- 3-6.8 Conduit shall be installed with the minimum number of running couplings.
- 3-6.9 Conduit shall have runs of no more than 6m for straight lengths or 3m for runs containing a bend or bends without the provision of a draw-in box.
- 3-6.10 Conduit shall have no more than two right angle bends without the provision of a draw-in box.
- 3-6.11 All exposed threads shall be painted using a zinc rich paint.
- 3-6.12 Conduit shall be bent, set, cut and threaded using a proprietary brand bending machine and pipe vice.
- 3-6.13 Saddles shall be fixed at a maximum distance between saddles of 1.2m.
- 3-6.14 Where conduit is installed outside, connections to accessory boxes shall be made with flanged couplings and long reach bushes, and all conduit boxes shall be fitted with gaskets.

### 3-7 PVC CONDUIT

- 3-7.1 All PVC Conduit shall be Super High Impact, Heavy Gauge.
- 3-7.2 Shall be free from imperfections
- 3-7.3 Shall be suitable for jointing by adhesive solution and proprietary brand fittings
- 3-7.4 Shall have a minimum diameter of 20mm.
- 3-7.5 All fittings and boxes shall have brass inserts for the fixing of electrical accessories.

- 3-7.6 Where PVC Conduit terminates into a switchbox or accessory box of any kind, the termination shall be completed using a screwed bush and coupling.
- 3-7.7 Conduit shall be cut with proprietary brand cutting tool.
- 3-7.8 Conduits shall be cleaned of all debris and adhesive after fixing.
- 3-7.9 Conduit shall have no more than 2 right angle bends without the provision of a draw-in box.
- 3-7.10 Conduit shall have runs of no more than 6m for straight lengths or 3m for runs containing a bend or bends without the provision of a draw-in box.
- 3-7.11 Conduit shall be bent and set with the use of a bending spring. The bending spring shall be of the same manufacturer as the conduit.

### 3-8 FLEXIBLE CONDUIT

- 3-8.1 All flexible conduit shall be PVC covered flexible steel.
- 3-8.2 The minimum size of flexible conduit shall be 20mm, and all fittings shall have a metric thread.
- 3-8.3 The contractor shall install the correct type of flexible conduit for the application.
- 3-8.4 Flexible conduit shall be cut using the manufacturers approved cutting tool.
- 3-8.5 The maximum distance between supports shall be 0.5m
- 3-8.6 The maximum length of Flexible Conduit shall not exceed 3m.
- 3-8.7 Flexible conduit shall be installed neat and unobtrusively.

### 3-9 BUSBAR TRUNKING

- 3-9.1 All Busbar trunking shall have equal sized phase neutral and earth conductors.
- 3-9.2 All Busbar trunking shall have copper conductors.
- 3-9.3 All Tap-In boxes shall be both switched and fused.
- 3-9.4 All Busbar trunking systems shall be fixed in strict accordance with manufacturers instructions.
- 3-9.5 Where tap off Units are used to supply distribution equipment connections shall be made by either flexible conduit or Armoured cable.

## 4-0 CABLING SYSTEMS

### 4-1 GENERAL CLAUSES

- 4-1.1 It shall be the Contractor's responsibility to check the correct size of all cables, so as to comply with either the current edition of the Standards and Regulations or the minimum cross sectional area of the cables as detailed in the relevant parts of the Particular Specification, whichever is the greater.
- 4-1.2 All cables shall be installed in strict accordance with the manufacturer's instructions and recommendations.
- 4-1.3 All surface run cables shall be installed neatly, unobtrusively, and parallel to the general building line, and shall meet the aesthetic considerations of the building. Cable runs that do not meet these criteria shall be replaced.
- 4-1.4 All surface run cable shall only be installed in horizontal or vertical runs.
- 4-1.5 All cables installed within ceilings, floors, ducts, risers etc, shall be installed to the same standard as that of the surface installation.
- 4-1.6 When installed all cables shall be free from all imperfections throughout their entire length.
- 4-1.7 The final layout of the installation (spacing of clips saddles etc) shall take into account the aesthetics of the building and the installation as a whole.
- 4-1.8 The minimum cable size on a general electrical installation shall be 1.5 mm<sup>2</sup>.
- 4-1.9 Where cable is to be installed on cable or basket tray it shall be fixed using a proprietary brand plastic cable tie, cut to length. The Maximum distance between cable ties is 300mm.
- 4-1.10 If the tray is run inverted / vertical / horizontal the cable tie is to be supplemented with saddles or band fixed securely every 2m.
- 4-1.11 Non Armoured Cables:
- 4-1.12 Cables shall be installed without joints, with all intermediate connections on the circuit to be made within the manufactured terminals, at luminaries, switches or other outlets etc.
- 4-1.13 Cables shall be laid into the trunking after the removal of all lids, and shall be held in place in the trunking by the trunking manufacturer's retaining clips, fitted at intervals as recommended by the manufacturer.
- 4-1.14 Where trunking passes through walls with short sections of permanently fixed lid the Contractor shall ensure that the cable is installed in a neat manner and free from damage to both new and existing cable.

4-1.15 Conductors shall be the correct colour for their purpose, in accordance with the Oman Electrical Standards.

4-1.16 Where applicable all earth wires shall be sleeved.

4-1.17 Where the installation involves modifying any existing circuit, the cable colours shall be the same throughout the circuit.

4-1.18 Where a Distribution Board is supplying circuits with different coloured cables, it shall be fitted with a Warning Sign detailing the danger.

#### 4-2 FIRE RESISTING CABLES

4-2.1 Single run cable shall be clipped using a proprietary brand two hole clip.

4-2.2 Where two cables run together they shall be clipped using a proprietary brand saddle. All clips and saddles shall be fixed using brass round head screws.

4-2.3 Where more than two cables run together they shall be installed on or in containment. I.e. Cable Tray, Cable Basket, or Trunking.

4-2.4 Where cable passes through walls, it shall be protected by a high impact heavy duty PVC sleeve. The sleeve shall be finished to give a neat appearance.

4-2.5 Where cable passes through floors it shall be protected by a metallic, or a high impact PVC covering to a height of 600mm above finished floor level.

4-2.6 Cable shall be fixed at 110mm from each bend and or termination point.

4-2.7 The cable shall be further fixed at intervals not exceeding 300mm.

4-2.8 Cable shall be securely fixed to the fabric of the building or to cable tray.

4-2.9 Cable shall have sufficient length to enable direct termination to the equipment to be made.

4-2.10 Where cables terminate into Conduit or adaptable boxes, all boxes shall be Galvanised.

4-2.11 All cables shall be identified throughout the installation by use of either cable markers and/or coloured sleeving, as directed by the Project Engineer.

#### 4-3 ARMOURED CABLES

- 4-3.1 All armoured cables shall have copper conductors.
- 4-3.2 All armoured cables are to have XLPE insulation with an LSF oversheath.
- 4-3.3 Where Armoured cables are used for either Main or Sub-Main distribution they shall be installed with an additional CPC a minimum of half the size of the cable carrying the phase conductors.
- 4-3.4 Where this CPC is an additional single core cable it shall run parallel and adjacent to its associated mains cable.
- 4-3.5 The additional conductor and the steel wire armouring shall be used together to form the circuit protective conductor (CPC).
- 4-3.6 Both cables shall be identified at points of termination and labelled as to their usage.
- 4-3.7 All Armoured cables used in a distribution system shall be fitted with a Cable Tag reference number, using slide type identification numbers at each end of the cable. The Reference numbers shall be agreed by the Project Engineer.
- 4-3.8 All glands and spreader boxes shall be installed in a manner, which ensures both mechanical and electrical continuity.
- 4-3.9 Cable shall be installed with no joints unless detailed as a specific requirement of the Particular Specification.
- 4-3.10 Where joints are specified they shall be a proprietary brand cable joint.
- 4-3.11 The continuity of the steel wire armouring shall be tested by the Contractor and offered for witness testing to the University prior to the separate CPC being connected.
- 4-3.12 Where cables are buried they shall meet the following criteria: (a) Soft Dig – Cable shall be installed to a minimum depth of 600mm. Cable shall be laid and covered in soft sand. Cable tiles to be installed at a depth of 400mm. Warning tape shall be installed at a depth of 150mm. Marker Posts shall be installed at strategic locations
- 4-3.13 (b) Pathways / Roads - Cable shall be installed to a minimum depth of 600mm. Cable shall be installed in a duct. Warning tape shall be installed at a depth of 150mm. Marker Posts shall be installed at strategic locations
- 4-3.14 In both instances the excavation / proprietary work shall be offered to the Project Engineer for inspection before cables are installed.
- 4-3.15 Where cable enters a building it shall be installed within a suitably sized duct.
- 4-3.16 The duct shall be sealed so as to prevent the ingress of gas, flame, moisture and vermin.

4-3.17 Where the cable is running alone it may be fixed to the fabric of the building using a proprietary brand cleat. The cleat shall be of the correct size and specification for the cable, and shall be installed in the same orientation throughout its length.

#### 4-4 FLEXIBLE CABLES

4-4.1 All flexible cables shall have stranded copper conductors with insulation rated at 600/1000 Volt grade.

4-4.2 Where a flexible cable is used to make a connection to electrical equipment without a specific flexible cable entry, the termination shall be made using a proprietary brand-stuffing gland.

4-4.3 All flexible cables shall be terminated in a manner which ensures no undue stress is placed on any conductor.

#### 4-5 EXTRA LOW VOLTAGE CABLES

4-5.1 Extra low voltage cables shall include Telecommunication, Data, BMS and Security systems cabling.

4-5.2 Cables shall be installed utilising Conduit, Trunking, Basket Tray and/or Cable tray.

4-5.3 The method of installation shall be detailed in the Particular Specification.

4-5.4 The cables shall be fixed to the cable tray at intervals not exceeding 225mm.

### 5-0 SWITCHGEAR AND ACCESSORIES

#### 5-1 GENERAL CLAUSES

5-1.1 All switchgear and accessories shall be installed in strict accordance with the manufacturer's instructions and recommendations.

5-1.2 When installed all accessories and switchgear shall be free from all imperfections

5-1.3 The final layout of the installation (mounting of switches etc) shall take into account the aesthetics of the building and the installation as a whole.

5-1.4 All Switchgear and Distribution Boards shall be installed so they are easily accessible.

## 5-2 Accessories

- 5-2.1 Accessories shall generally be as detailed in the Particular Specification.
- 5-2.2 Accessories shall be mounted only on the correct mounting boxes as recommended by the accessory manufacturer.
- 5-2.3 Socket outlets and Fused connection Units are to be double pole switched.
- 5-2.4 No accessory shall be used as a 'Through Box'.
- 5-2.5 At each accessory the contractor shall fit a thermally printed label, which details a distribution board and circuit reference number.

## 5-3 Luminaires

- 5-3.1 Approved methods of fixing luminaires are as follows:
  - By means of conduit boxes.
  - Modular fittings laid into false ceiling
  - Surface fittings on false ceilings supplemented by plywood pattress of the same dimensions as the ceiling tile.
  - Suspended by small link chrome chain / Piano Wire
  - Direct onto Trunking
  - Direct to ceiling / wall
  - As dictated by the ceiling / luminaire design.
- 5-3.2 Approved methods of connecting light fittings are as follows:-
  - Terminated direct to luminaire.
  - Final connection via heat resistant flex and 'plug – in' ceiling rose Flex to any one luminaire shall not exceed 2m in length.
- 5-3.3 Under no circumstances shall any cable or flex be allowed to pass or come into contact with the luminaire's choke and/or control gear.
- 5-3.4 Under no circumstances shall any luminaire be used as a Through box.
- 5-3.5 Final connection to External luminaries shall be made using an IP56 Plug and Socket arrangement. The socket is to be fitted adjacent to the light fitting, unless otherwise specified in the Particular Specification.
- 5-3.6 All fluorescent luminaires are to be high frequency.

## 6-0 SWITCHGEAR AND DISTRIBUTION BOARDS

- 6-1 Switchgear shall be a minimum standard of Form 4, Type 7 preferably with external cable boxes.
- 6-2 The cable box shall comprise a 2 part lid, the first part shall be an easily removable metal lid, and the second shall be a ventilated Perspex cover. This is to enable effective thermographic inspection.
- 6-3 Switchgear and distribution boards shall generally be as detailed in the Particular specification.
- 6-4 When Main Switchgear is being installed it is an absolute requirement of this specification that all connections are made using a Torque Wrench to ensure they are correctly tightened, in accordance with the manufacturers recommendations.
- 6-5 Distribution boards shall be fitted with integral isolators.
- 6-6 All Power circuits shall be protected by an RCD unless otherwise detailed in the particular specification.
- 6-7 Semi-Enclosed (Rewirable) fuses shall not be used under any circumstances.
- 6-8 Switchgear and distribution boards shall have fitted a locking facility.
- 6-9 The fixing method for individual items of equipment shall be determined on site between the Contractor and the Project Engineer.
- 6-10 The Contractor shall ensure that all cables are clearly identified within each distribution board by means of Cable Markers.
- 6-11 Furthermore the Contractor shall ensure that the identified phase, neutral and circuit protective conductor are connected in the same sequence within their respective protective device and terminal blocks.
- 6-12 A label, of acrylic engraving laminate (Traffolite) shall be fixed using either bolts, or rivets to the outside of all distribution equipment. The label shall have a minimum of 6mm black characters on white background. The label shall contain the following information if applicable:
- - Reference number of Distribution board / Switchgear
  - - Where the supply is fed from and/or where it goes to
  - - Cable Size
  - - Switch Size & Fuse Size
- 6-13 A circuit schedule shall be included within each distribution board. The schedule shall be typed and shall clearly indicate the following minimum information:
- Specific circuit designation
  - Cable description.
  - Cable size.
  - Protective device rating and type.
  - No. of points served by the circuit

- 6-14 Adjacent to each Distribution Board a single socket shall be installed. The socket shall be on a 20A radial circuit without RCD protection, and marked 'Test Socket'.
- 6-15 All control gear associated with plant and equipment shall be mounted adjacent to the equipment and plant it serves. This control equipment shall incorporate full electrical isolation for maintenance purposes..

## **7-0 EARTHING ARRANGEMENTS AND PROTECTIVE CONDUCTORS**

- 7-1 For all conduit and trunking systems (Metal and Plastic), a separate circuit protective conductor shall be installed to each point of termination.
- 7-2 The cable shall have the same cross sectional area (CSA) as that of its associated circuit phase conductor, unless detailed otherwise in the particular Specification.
- 7-3 The Contractor shall ensure that the whole area is bonded so as to create an equipotential zone.
- 7-4 All Main and Supplementary bonding conductors shall be LSF single cables coloured green / yellow .
- 7-5 This Main bonding conductor shall have a minimum CSA of 10.0mm<sup>2</sup>, and shall be fitted with a Cable Tag reference number, using slide type identification numbers, as agreed with the Project Engineer.
- 7-6 All extraneous metalwork (gas, water, steam, condensate, heating systems, ventilation systems, compressed air, ceiling grids and exposed metallic parts) shall be supplementary bonded to the electrical earth.
- 7-7 This Supplementary bonding conductor shall have a minimum CSA of 4.0mm<sup>2</sup>.
- 7-8 At each point where the metalwork, pipes etc, are bonded to the electrical earth, a proprietary brand earth termination clamp complete with earth warning tag shall be fitted.
- 7-9 All power circuits shall be protected for earth leakage by means of an RCD, unless detailed otherwise in the particular specification.
- 7-10 All socket outlet circuits shall be wired in a form, which complies with the requirements of High Integrity Earthing, unless otherwise detailed in the particular specification.

## **8-0 INSPECTION AND TESTING**

### 8-1 Initial Testing Requirements

8-2 It is the Contractor's responsibility to ensure that the work is continuously checked throughout the whole of the installation period and that all requirements of both this and the particular Specification are strictly adhered to.

8-3 The Contractor shall on completion of the installation carry out a full inspection and test in strict accordance with the current edition of the Regulations.

8-4 If it is found necessary to carry out remedial work following the initial inspection and testing procedure, it is essential it is completed before final inspection and testing commences.

8-5 Once satisfied with the test results, the quality of the installation, and assured it is in accordance with the requirements of this specification, and the Particular Specification, the Contractor shall formally offer the installation for Witness Testing.

### 8-6 Final Testing Requirements

8-7 The contractor shall carry out full 100% witness testing of the electrical installation.

8-8 The actual testing is carried out by the Contractor's personnel and witnessed by the Engineering Consultant.

8-9 The Contractor shall prove the instruments are within calibration to the Engineering Consultant prior to any testing being carried out.

8-10 If it becomes necessary for any remedial work to be completed during this inspection and testing procedure, the whole of the installation shall be re-tested.

8-11 The Contractor shall then provide a written explanation as to why the remedial work was necessary at this juncture, and was not carried out following the initial inspection.