



# ENGINEERING STANDARD

## Light and Power Distribution Boards

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**GRC-ES005**

Revision:

**2**

### REVISION HISTORY

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**1 PURPOSE**

The purpose of this Engineering Standard is to describe the requirements for the design, manufacture, supply, testing and delivery to site of 415V lighting and power distribution boards for Gladstone Regional Council. This Engineering Standard shall be read in conjunction with the attached Distribution Board data sheet.

**2 SCOPE**

This Engineering Standard is applicable to all lighting and power distribution boards, for indoor and outdoor areas supplied for use at Gladstone Regional Council sites, where the primary supply is 415V three phase or 240V single phase.

**3 RESPONSIBILITIES**

All persons involved in the purchasing, design, fabrication and supply of lighting and power distribution boards for use on any GRC site shall comply with this Engineering Standard.

Any variations proposed that are contrary to the requirements of this Engineering Standard shall be specifically identified and referred to GRC, in writing, for approval.

The Purchaser shall complete the attached Distribution Board data sheet for each distribution board required.

**4 DEFINITIONS**

<i>Term</i>	<i>Definition</i>
<b>Council</b>	Gladstone Regional Council or its nominated representative or agent.
<b>DB</b>	Distribution Board
<b>GRC</b>	Gladstone Regional Council or its nominated representative or agent.
<b>Hz</b>	Hertz
<b>LV</b>	Low Voltage, Exceeding 32VAC or 115VDC but not exceeding 1000VAC or 1500VDC.
<b>Manufacturer</b>	The corporation or business that manufactures and/or assembles the equipment described by this Engineering Standard.
<b>MCB</b>	Miniature Circuit Breaker
<b>MCCB</b>	Moulded Case Circuit Breaker
<b>MEN System</b>	Multiple Earthed Neutral. A system of earthing in which the parts of an electrical installation required to be earthed in accordance with AS/NZS 3000 are connected to the general mass of earth and, in addition are connected within the electrical installation to the neutral conductor of the supply system.
<b>Purchaser</b>	The individual or corporation responsible for purchasing the equipment described by this Engineering Standard on behalf of GRC.
<b>RCBO</b>	Residual current Circuit Breaker with Overload protection.
<b>RCD</b>	Residual Current Device
<b>Specifier</b>	Any individual specifying equipment for use in electrical installations on a GRC site.
<b>Superintendent</b>	Person authorised to act on behalf of GRC with respect to the Contract works.
<b>Supplier</b>	The individual or corporation with whom GRC enters an agreement to purchase the equipment described by this Engineering Standard. Note that in some instances, the Supplier may also be the Manufacturer.

## 5 REFERENCE DOCUMENTS

All equipment shall be designed, manufactured and tested in accordance with the latest edition of the following GRC Engineering Standards, Australian Standards, Acts and Regulations.

GRC requirements shall prevail where they exceed but do not compromise the requirements of the applicable Australian Standards, Acts and Regulations as listed below.

### 5.1 GRC Engineering Standards

<i>Standard</i>	<i>Title</i>
GRC-ES001	Electrical Work
GRC-ES002	Preferred Electrical Components
GRC-ES008	Equipment Identification

### 5.2 GRC Standard Drawings

<i>Drawing</i>	<i>Title</i>
GRC-ED-001	Typical Light and Power Distribution Board
GRC-ED-002	Typical DB Schematic – Power Section – RCD with Test
GRC-ED-003	Typical DB Schematic – Lighting Section – RCD with Test
GRC-ED-004	Typical DB with RCD – Internal Arrangement
GRC-ED-005	Typical DB with RCD – Labels

### 5.3 Australian Standards

<i>Standard</i>	<i>Title</i>
AS 2293	Emergency Escape Lighting and Exist Signs for Buildings
AS 2700	Colour Standards for General Purposes
AS/NZS 3000	Electrical Installations (Australian/New Zealand Wiring Rules)
AS/NZS 3008.1	Electrical Installation – Selection of Cables
AS/NZS 3111	Approval and Test Specification – Miniature Over current Circuit-Breakers
AS/NZS 3190	Approval and Test Specification – Residual Current Devices (Current - Operated Earth - Leakage Devices)
AS/NZS 61439	Low Voltage Switchgear and Controlgear Assemblies
AS 60529	Degrees of protection provided by enclosures (IP Code)
AS/NZS 60947	Low Voltage Switchgear and Controlgear
AS/NZS 60898.1	Electrical accessories -Circuit-breakers for overcurrent protection for household and similar installations -Circuit-breakers for a.c. operation (based on IEC 60898-1 Ed. 1.2 (2003) MOD)
AS/NZS 60898.2	Circuit-breakers for overcurrent protection for household and similar installations - Circuit-breakers for a.c. and d.c. operation (IEC 60898-2 Ed. 1.1 (2003) MOD)
AS/NZS 61009.1	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) -General rules (based on IEC 61009-1 Ed. 2.1 (2003) MOD)

## 5.4 Acts and Regulations

<i>Title</i>
Electrical Safety Act 2002
Electrical Safety Regulation 2002
Work Health and Safety Act 2001
Work Health and Safety Regulation 2011

## 6 TECHNICAL REQUIREMENTS

### 6.1 General

#### 6.1.1 Prohibited Materials

Components that contain asbestos, mercury, cadmium, PCB's, silica gel containing the indicating agent cobalt chloride or any other products either known to or suspected of having carcinogenic or other detrimental long or short term effects on the health of personnel if they are inhaled, ingested or otherwise contacted shall not be used in electrical equipment to be supplied for use on any GRC site.

This requirement shall apply to all fabrication tools and equipment used in the construction of the distribution board that could leave harmful residues inside the distribution board and associated components covered by this Engineering Standard.

#### 6.1.2 Service Conditions

All components and equipment within the Distribution Board shall have an ambient temperature rating of not less than 55°C. The thermal design shall be such that the maximum temperature within the Panel when operating under an ambient temperature of 45°C shall not exceed 55°C. The thermal design shall be based on natural heat dissipation. Ventilation openings shall not be used unless specified.

#### 6.1.3 Safety Requirements

The design, construction and wiring methods employed for all distribution boards supplied in accordance with this Engineering Standard shall minimise the risk of personnel contacting exposed live wiring or terminals when the escutcheon is opened.

Terminals, busbars and any components carrying voltages greater than extra low voltage shall be protected against accidental contact by personnel to an IP rating of IP2X to AS 60529.

- a) All wires, lugs and busbar take-offs shall be connected to their terminals so that they are fully inserted up to the insulation and no bare conductors are exposed.
- b) Crimp lugs and pins shall have insulated barrels.
- c) Components shall not be mounted on the hinged escutcheon. Components shall be base mounted with flush fitting cut-outs provided in the hinged escutcheon to allow operation of components where necessary or to view indication lights.
- d) Unused bus system circuit breaker connection tabs shall either be left coated with the bus system polythene insulation or, where this has been removed, the exposed section shall be covered with a slip-on insulated cover that is prevented from coming off if inadvertently touched.

- e) Unused circuit breaker pole spaces on the escutcheon shall be filled with securely fixed insulated pole covers.
- f) Neutral bars shall have standard stand-off feet attached.

#### **6.1.4 Supply Voltage**

Equipment shall be designed and constructed for operation on a power system with the following characteristics:

- System voltage: 415V AC
- Phases: 3
- Frequency: 50 Hz
- Neutral: Solidly earthed with nominal 240 Volts between line and neutral

### **6.2 Construction**

Distribution Boards shall be to the Manufacturer's standard design with modifications only as required to meet the requirements of this document, using standard components.

All panels shall have at least Form 2 segregation to AS/NZS 61439.2 and be rated for continuous operation at full load. Form 3bih is preferred.

### **6.3 Enclosures**

- a) Panels designated on the Data Sheet as indoor service shall be 1.6mm painted zinc annealed steel, fully welded construction. Panels for internal use shall have a minimum degree of protection of IP42.
- b) Panels designated on the Data Sheet as outdoor service shall be 1.6mm grade 316 stainless steel, fully welded construction, complete with full width weatherproof rain hood of the same material. Panels for external use shall have a minimum degree of protection of IP66.
- c) Enclosures shall be provided with a minimum of four 6mm thick mounting pads 50 x 50mm welded inside the enclosure and drilled for 10mm bolts. Pads shall be made of the same material as the enclosures. The location of the pads shall permit the installation of the mounting bolts without having to remove the busbar chassis assembly or any other component.
- d) Enclosure height shall include an allowance of 200mm at both the top and bottom of the board to facilitate the connection of external cables.
- e) Minimum enclosure dimensions shall be 800mm height, 640mm width, 240mm depth.
- f) Enclosure height shall not exceed 2000mm.

### **6.4 Doors**

- a) The Distribution Boards shall be provided with hinged doors having lift off, chromium plated, brass block hinges with stainless steel hinge pins. Concealed stainless steel hinges may be offered with stainless steel enclosures. Hinges shall permit the door to move through an arc of at least 120°.
- b) Doors shall be lockable, with a Fletcher and Lowe type L1602 L Handle or equivalent with lock No. 92268. Two keys shall be provided, attached to the handle.
- c) Doors 900mm high or less shall have single point locking. Doors greater than 900mm high shall have multiple point locking.
- d) Doors on panels between 1000mm and 1600mm in height shall be provided with two handles and two-point locking. Doors on panels greater than 1600mm in height shall be provided with three handles and three-point locking.

- e) The doors shall be of fully folded construction with sealing by a neoprene gasket in a metal channel. All seams shall be welded.
- f) A top hat bracing section shall be fitted on the inside of each door to provide stiffening. Doors on panels greater than 1800mm in height shall be provided with three hinges.
- g) A circuit cardholder complete with removable blank card and clear plastic cover sheet shall be provided and fixed to the inside of the door on the door stiffener.

## **6.5 Escutcheons**

- a) A dished escutcheon and supporting frame manufactured from the same material used for the main enclosure shall be provided to cover wiring and prevent access to internally mounted components by non-electrical personnel.
- b) The escutcheon shall be hinged with a minimum of two pintle-type hinges mounted on the same side of the enclosure as the door hinges, and shall be removable without requiring removal of the door.
- c) The escutcheon shall be secured in the closed position with a minimum of three 6mm chrome plated acorn nuts and washers.
- d) The escutcheon must be deep enough to allow for padlocks to be installed on the circuit breakers with the door closed.
- e) Cut-outs shall be made in the escutcheon for all poles available on the busbar assembly. All unused pole spaces shall be filled with firmly retained non-metallic pole fillers.
- f) Additional cut-outs shall also be provided for indicating lights, pushbuttons, test outlets, switches and timers etc. as required, or as indicated elsewhere in this Engineering Standard.
- g) A top hat bracing section shall be fitted to the inside of the escutcheon to prevent deflection when the escutcheon is securely closed.

## **6.6 Fault Rating**

The Distribution Board shall have a fault current rating as specified on the attached Data Sheet. Where no fault current rating is specified, the Distribution Board shall have a minimum fault current rating of 10kA.

## **6.7 Busbar System**

- a) The Distribution Board shall consist of a three phase, fully insulated busbar assembly with test verification in accordance with AS/NZS 61439.
- b) The assembly shall be mounted with the main busbars vertical and with horizontal take-off tabs for connection of outgoing breakers, and shall permit the mounting of two vertical rows of circuit breakers with their toggles operating in the horizontal plane.
- c) Busbar connections shall be provided for all circuit breaker pole positions whether they are filled or not. Busbars shall be fully insulated, with unused poles capped with insulating material.
- d) The busbar rating shall be as specified on the attached Data Sheet and not less than 250A.
- e) The assembly shall be double dipped polyethylene insulated in phase colours with the phases arranged red-white-blue from left to right as viewed from the front of the distribution board.
- f) Where the Data Sheet specifies that an Isolating Chassis is required, the busbar system shall incorporate a facility to allow individual circuit breakers to be isolated from the chassis so that circuit breakers can be mounted or removed without the need to isolate supply to the busbar assembly.

## 6.8 Neutral and Earth Bars

Tunnel type neutral and earth terminal bars shall be provided in addition to the phase bus bars.

- a) The number of neutral and earth terminals in each distribution board shall be not less than the number of circuit breaker chassis poles specified for that panel.
- b) Neutral bars shall be insulated from earth and rated for 100% or the phase busbar rating.
- c) Tunnels shall be numbered and able to accommodate 16mm<sup>2</sup> cables.
- d) Neutral and earth bars shall each be provided with two 10mm hexagon head studs and spring washers to permit connection of the supply neutral and earth cables.
- e) Distribution boards with 48 poles and greater shall be provided with dual neutral and earth bars (one set per side) with suitably rated insulated cables interconnecting each set.
- f) Tunnels shall use two-screw fixing for each tunnel, or one screw fixing where the screw outside diameter is not less than 80% of the tunnel diameter.
- g) All wires and pins inserted into tunnels with two screw fixing shall be long enough to ensure that both screws secure the conductor.

## 6.9 Main Circuit Breaker

The distribution board shall be provided with a main circuit breaker to isolate the incoming supply as specified in the attached Data Sheet.

- a) The circuit breaker shall be a moulded case type (MCCB) with a fixed padlock off facility.
- b) The circuit breakers shall be centrally mounted above the busbar assembly and shall not consume any of the available poles on the bus system.
- c) A minimum space of 200mm between the incoming terminals of the circuit breaker and the top of the enclosure shall be provided.
- d) The door shall be capable of being closed with a lock applied to the main circuit breaker.

## 6.10 Miniature Circuit Breakers

- a) Circuit breakers shall be C curve type, 10 kA fault rating unless otherwise specified on the Data Sheet.
- b) Miniature Circuit Breakers shall comply with AS 3111 and AS 60947.2 as applied by the definition given in AS 3111, Appendix A, Type Tested in accordance with Schedule B.
- c) Circuit breakers shall provide full Selectivity with the upstream circuit breaker or fuse, up to the fault rating of the distribution board as specified on the Data Sheet.
- d) All distribution boards shall be fully fitted out with suitably rated MCBs on all chassis poles as per the Drawings.
- e) Circuit breakers from more than one manufacturer shall not be mixed within the same distribution board.

## 6.11 Circuit Breaker Lock-out Devices

- a) Each miniature circuit breaker shall be fitted with a means of padlocking it in the off position. The lock-out device and padlocking shall prevent the movement of the operating toggle from the off to the on position.
- b) The means of padlocking shall be achieved by the operation of a captive device fixed to the circuit breaker or escutcheon that is not supplied loose and does not require the use of a tool to attach it.

- c) Sufficient space shall be provided so that when a six-way padlocking scissor and three padlocks are attached to a lock-out device, it will still be possible to completely close and lock the enclosure outer door without contact being made with the locks and the door.
- d) This may be achieved either by making the panel door deep enough to provide the necessary clearance or by recessing the breaker assembly and the escutcheon.
- e) A separate lock-out device that allows the attachment of a six-way padlocking scissor and prevents the opening of the escutcheon when in the locked out position shall also be provided.
- f) This assembly shall be located clear of the circuit breakers so that lock-out scissors and padlocks when attached to the devices at the same time do not interfere with each other.
- g) It shall still be possible to completely close and lock the enclosure door without contact being made with the attached scissors and locks and the door.

### **6.12 Earth Leakage Circuit Breakers**

- a) Circuit breakers for all lighting and power outlets, or other circuits requiring RCD protection shall be the RCBO type providing overload, short circuit and earth leakage protection, with a rated residual operating current of 30mA.
- b) RCBO's for single phase applications shall be single pole width.
- c) RCD protected zones, where a whole section of the bus system or a number of individual circuits are protected by an upstream single or multi-phase RCD shall NOT be used on any distribution board.
- d) Distribution boards fitted with RCD protected circuits shall be provided with a means of testing each circuit to satisfy statutory requirements at the switchboard without having to open the escutcheon.
  - This shall be achieved by providing a 3 flat pin outlet for each group of 6 RCD MCB's to connect the RCD tester.
  - Each RCBO shall be individually connected to its test outlet via a 7-position circuit selector switch and protective 2 Amp rated MCB arranged and wired as shown on GRC Drawings GRC-ED-002/3.
  - If more than six circuits on a distribution board require testing multiple test outlets and selector switches as shown on the above drawing shall be provided.
  - The above arrangement shall be mounted within the board behind the escutcheon and towards the bottom of the board unless otherwise specified.
  - Labels shall be provided to identify which circuits the selector switch(es) are associated with and their associated test outlet.

### **6.13 Surge Diverters**

Surge diverters where specified shall be three phase and neutral, plug in type Shunt Surge diverter with a minimum protection level of 1200V with a short time withstand capacity (8/20 us) of 40 kA.

Surge diverters are only required on certain distribution boards as specified on the Data Sheet.

### **6.14 Contactors**

Contactors shall be suitable for AC-3 utilisation category in accordance with AS 60947, Part 4.1 with the rating as specified in the Drawings. The contactors shall be completely protected against short circuit by a suitably rated and coordinated back-up protection circuit breaker as recommended by the contactor manufacturer.

## 6.15 Lighting Control Circuits

A lighting control circuit is required for Distribution Boards where a proportion of lighting is only required at low levels of natural light.

- a) Where specified, a designated section of the bus shall be switched by a three-pole contactor in response to the operation of a photo-electric (PE) switch, which operates a changeover contactor when the outside light level falls below a threshold.
- b) A three-way selector switch shall enable the PE cell controlled contactor to be BYPASSED (always on), AUTOMATIC (PE cell controlled) or OFF (contactor de-energised).
- c) The minimum contactor size shall be 100A.
- d) The contactor shall be mounted behind the escutcheon.
- e) The externally mounted PE cell shall be terminated to DIN rail mounted terminals mounted behind the escutcheon.
- f) The lighting control circuit shall be supplied from circuit breaker No. 1 and shall be rated at 6A.

## 6.16 Earthing

All metallic non-current carrying parts of the Distribution Board shall be bonded together and connected to the earth busbar. Earth straps on the front door shall be secured using a method which allows the removal of the earth from the door without using a tool.

## 6.17 Cable Entries

Sufficient space shall be provided for the glanding, spreading, routing and termination of the number of field cables to be terminated in the Distribution Board, based on the number of circuit breakers specified in the Drawings.

Gland plates shall be provided for all cable entries. Gland plates shall be 5mm thick plated brass and shall be fixed to the enclosure with a minimum of 10 external equi-spaced M6 stainless bolts and washers into threaded inserts, welded nuts or captive nuts.

## 6.18 Internal Wiring

Wiring shall be in accordance with AS 3000 and the following requirements:

- a) Different wiring systems, e.g. control, transducer output, CT, VT, 110V AC, 240/415 V AC, shall be segregated and separated in accordance with the requirements of AS 3000.
- b) All internal wiring shall be carried out in flexible copper cables, 0.6/1 kV, V75 grade PVC and terminated with insulated compression type lugs or connectors.
- c) The minimum size of flexible cable shall be as follows:
  - Control wiring 1.5 mm<sup>2</sup>
  - Protection 4.0 mm<sup>2</sup>
  - Metering 2.5 mm<sup>2</sup>
- d) Different wiring systems, e.g. control, transducer output, CT, VT, 110V AC, 240/415 V AC, shall be segregated and separated in accordance with the requirements of AS 3000.
- e) All internal wiring shall be neatly arranged and wherever practicable, shall be contained in capped plastic ducting. Elsewhere, groups of wires shall be strapped together with nylon or other strong plastic ties or spiral binding to form neat wire bundles.

- f) Wiring identification shall be by numbered and/or lettered ferrules, of insulating material adjacent to the terminals. Wires shall be identified in accordance with IEC 60445. The ferrules shall be indelibly marked and removal without disconnecting the wire from its terminal shall not be possible.
- g) All wiring for external connections shall be brought out to individual terminals on a readily accessible terminal block.
- h) All busbar and wiring colours shall be as follows:

<i>Voltage</i>	<i>Active Conductor</i>	<i>Common Conductor</i>	<i>Earth Conductor</i>
415V/240V AC	Red/White/Blue	Black	Green/Yellow
110V AC	Gray	Orange	Green/Yellow
CT Wiring	Red/White/Blue	Black	Green/Yellow

**6.19 Terminations**

- a) Cable terminating facilities and terminals shall be suitable for the cable type, gland and conductor size.
- b) DIN rail mounting moulded polyamide terminal blocks shall be provided for termination of all control wiring external to switchboards. Terminals shall carry numeric designation in accordance with the Drawings and shall be segregated according to function and voltage.
- c) Terminal groups shall be arranged and spaced to facilitate easy connection of wiring and cables. Spare space shall be available on each terminal rail to accommodate additional terminals.
- d) A separate terminal shall be provided for the connection of each individual wire. Bridging links as supplied by the terminal manufacturer shall be used to interconnect ‘common’ terminals.
- e) Terminal blocks shall avoid obstruction of other cable terminations, removable covers, etc. and positioned to afford easy access for carrying out external cable termination, testing, inspection and maintenance. There shall be clear space allowed between the terminals and the gland plate for the spreading and termination of external conductors.
- f) Terminal blocks shall be mounted in a single deck arrangement.
- g) The panel wiring shall be connected to one side of the terminal block only.
- h) Terminals serving voltage circuits exceeding “Extra Low voltage”, as defined in AS 3000, shall be segregated from other terminals, shrouded, voltage identified and Danger labelled. All other differing voltages shall be separated by partitions.
- i) Cable supports shall be provided (where practicable) by the Seller to avoid undue strain on the cable termination.
- j) Separate terminal arrangements shall be provided for power and control cables.
- k) All access to wiring shall be from ground level. Terminals shall not be located on top of equipment.

**6.20 Identification Labels**

Identification labels shall be provided in accordance with the requirements of Engineering Standard GRC-ES008 – Equipment Identification.

- a) All labels shall be engraved traffolyte using black upper case characters on a white background unless otherwise indicated.

- b) Labels for emergency equipment (e.g. fire alarms, emergency lighting etc.) shall be engraved traffolyte using white upper case characters on a red background.
- c) All labels shall be fastened to the metalwork with stainless steel M3 metal threads and nuts or stainless steel self-tapping screws.
- d) Adhesive or double-sided adhesive tape shall not be used as a means of fixing labels.
- e) Each distribution board shall have a 220 x 40mm label mounted externally and centrally on the door 300mm from the top edge of the door.
- f) Each earth and neutral bar shall have a 40 x 10mm label mounted adjacent to it indicating 'EARTH' and 'NEUTRAL' as appropriate.
- g) A number shall identify every circuit breaker. This shall be achieved by vertically mounting two long strips of traffolyte 20mm wide on the escutcheon plate adjacent to the two rows of circuit breakers and engraving the breaker number opposite the appropriate circuit breaker in 6mm high characters.
- h) All pole positions shall be numbered. This means that two and three-pole circuit breakers shall have a number opposite each pole.
- i) The numbering shall match the numbering shown on the Drawings.
- j) The traffolyte shall be screw fixed in several positions along its length to prevent it from buckling.
- k) Each RCD test outlet, its protection circuit breaker and each RCD test selector switch shall be provided with labels as detailed on drawing GRC-ED-005.
- l) All other electrical control components such as the incoming main circuit breaker/s, contactors, timers, relays, etc. contained within the enclosure shall be provided with an identifying traffolyte label with 6mm high characters.

## 6.21 Fastenings

Nuts, bolts and other fastenings for panels designated on the Data Sheet as indoor service shall be cadmium plated. Nuts, bolts and other fastenings for panels designated on the Data Sheet as outdoor service shall be stainless steel. All nuts, bolts, screws and studs shall have ISO metric threads. Washers shall be fitted under bolt heads and nuts to prevent damage to the surface in contact with the bolt head or nut. The threads of all bolts shall project beyond the nut by at least one full thread.

## 6.22 PVC Cable Ducts

Grey slotted PVC cable duct such as the Iboco T1 series complete with covers shall be installed internally down both sides of each distribution board and elsewhere as required to contain internal control, test circuit wiring and cables to be connected by others to the outgoing circuit breakers.

- a) Distribution boards with up to 18 poles per side shall be fitted with minimum 80mm wide grey slotted PVC wiring ducts complete with covers on the left and right hand side of the distribution board to accommodate outgoing cables and internal wiring.
- b) Distribution boards with greater than 18 poles per side shall be fitted with minimum 100mm wide grey slotted PVC wiring ducts complete with covers on the left and right hand side of the distribution board to accommodate outgoing cables and internal wiring.
- c) Each duct shall stop 200mm short of the top and bottom of the enclosure to permit entry of cables to the board. The ducts shall be positioned sufficiently clear of the side walls for easy removal and replacement of covers.

## **7 INSPECTION AND TESTING**

The Seller shall perform routine testing of each distribution board to confirm the electrical safety, correct operational functionality and selection of components are in accordance with this Engineering Standard, the drawings and data sheets supplied. Test sheets indicating the test results shall be provided with each distribution board supplied.

The Seller shall supply copies of type test certificates confirming that the various component parts of the distribution board have been tested in accordance with the requirements of AS/NZS 61439.

## **8 TRANSPORTATION AND STORAGE**

- a) Preparation for shipment shall protect the Distribution Boards against corrosion, dampness, breakage or vibration injury during transportation and handling.
- b) Each Distribution Board shall be wrapped in heavy duty clear plastic and weatherproofed and then contained in a wooden framed crate and shall be securely bolted to the floor of the crate.
- c) Packing shall include a suitable desiccant to prevent corrosion of equipment during shipment and storage.
- d) The base of the crate shall be suitable for forklift handling.
- e) Each shipping package shall be clearly and indelibly identified with the contents, purchase order number and item number.

## **9 PAINTING AND SURFACE PROTECTION**

Steelwork surface preparation, anti-corrosion protection and the surface coating system shall be to Australian Standards. Evidence shall be provided that these items meet Australian Standards.

The painting system used for the Distribution Board shall be powder coated to a total thickness of 70 microns. The standard painting system of the switchboard supplier may be used provided details of the system are submitted and approval for use is received from the Purchaser.

- a) The colour and finish of Distribution Boards for indoor service shall be X15 Gloss Orange.
- b) The colour and finish of Distribution Boards for outdoor service shall be X15 Gloss Orange.
- c) Escutcheon panels shall be Gloss White.

## **10 DOCUMENTATION AND DRAWINGS**

The Supplier shall provide drawings and documentation for the Distribution Board as listed below:

- a) Single line diagram.
- b) Schematic diagrams for all control circuits.
- c) Equipment list inclusive of part numbers for all items.
- d) Internal and External label drawings.
- e) Copies of all QA check sheets and test reports.

All drawings shall be provided in AutoCAD electronic file format (.dwg) and in PDF format.

## **11 DATA SHEET**

This Engineering Standard shall be read in conjunction with the attached Distribution Board data sheet. The Purchaser shall complete an individual data sheet for each Distribution Board. Each Distribution Board data sheet shall be provided to the Manufacturer in Microsoft .xls format for completion.