

Main Roads Technical Standard

MRTS226

Telecommunication Field Cabinets

October 10

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Telecommunications Field Cabinets

1 INTRODUCTION

This Standard applies to the supply, manufacture and installation of field cabinets for housing roadside Telecommunications field equipment as an integral part of Main Roads' wider requirement for telecommunications systems.

The scope of this Standard includes the following:

- Supply and installation of field cabinet to house roadside Telecommunications field equipment
- Supply and installation of plinths
- Electrical switchboard and associated internal wiring
- Cabinet ventilation / cooling system
- Cabinet lighting
- Provision and connection of mains power and telecommunications services to the cabinet.

The following items are excluded from the scope of this Standard:

- Wiring connections to field equipment housed within the cabinet
- Connection to the Main Roads telecommunications network

This Technical Standard shall be read in conjunction with MRTS01 *Introduction to Technical Standards*, MRTS50 *Specific Quality System Requirements* and other Technical Standards as appropriate.

This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

All equipment and material, where not otherwise specified in this document, shall be in accordance with the appropriate Australian Standard Specifications, where such exist; and in their absence, with appropriate British Standard Specifications.

Where standard specifications are quoted or implied, the latest version shall be applicable, including its amendments to date.

All electrical wiring and associated equipment shall comply with the requirements of AS/NZS 3000, 'Wiring Rules'.

The telecommunications equipment and cabling shall comply with relevant Australian Communications and Media Authority technical standards and requirements.

2 DEFINITION OF TERMS

For the purpose of this Standard, in addition to those defined in MRTS201 *General Equipment Requirements* and Clause 3 of MRTS01 *Introduction to Technical Standard*, the definitions in Table 2 apply.

Table 2 – Definitions

Term	Definition
Conduit	Refer to Main Roads Standard MRTS91 <i>Conduits and Pits</i>
Electrical Supervisor	An Electrical Contractor authorised under the Electricity Act to carry out electrical installation works.
Electricity Act	Queensland Electricity Act and Regulations
Extra Low Voltage	Not exceeding 50 V a.c., or 120 V, ripple free d.c.
Low Voltage	Exceeding Extra Low Voltage but not exceeding 1000 V a.c. or 1500 V d.c
MOV	Metal Oxide Varistor
Pit	Refer to Main Roads Standard MRTS91 <i>Conduits and Pits</i>

Term	Definition
PU	Polyurethane
RCBO	Residual Circuit Breaker with over-voltage protection
Telecommunications Supervisor	A registered cable provider under the provisions of the Telecommunications Act authorised to perform cabling work for telecommunications.

3 REFERENCE DOCUMENTS

The requirements of the referenced documents listed in Table 3 of MRTS201 *General Equipment Requirements* and Table 3 below apply to this standard. Where there are inconsistencies between this standard and the referenced documents, the requirements specified in this standard takes precedence.

Table 3 – References summary

Document	Description
AS/NZS 1044	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus
AS/NZS 1170.1:2002	Structural design actions - Permanent, imposed and other actions
AS/NZS 1170.2:2002	Structural design actions - Wind actions
AS 1319	Safety signs for the occupational environment
AS 1324.1	Air filters for use in general ventilation and air-conditioning – Application performance and construction
AS 1324.2	Air filters for use in general ventilation and air-conditioning – Methods of test
AS/NZS 1580.457.1	Paints and related materials - Methods of test - Resistance to natural weathering
AS 1627.0	Metal finishing - Preparation and pre-treatment of surfaces - Method selection guide
AS/NZS 1664.1	Aluminium structures - Limit state design
AS/NZS 1664.2	Aluminium structures - Allowable stress design
AS 1768	Lightning protection
AS 1789	Electroplated zinc (electrogalvanized) coatings on ferrous articles (batch process)
AS 2317-1998	Collared eyebolts
AS 2578—2009	Traffic signal controllers
AS 2700S (T33)	Colour Standards for general purposes – Smoke Blue
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3100	Approval and test specification - General requirements for electrical equipment
AS/NZS 3085.1	Telecommunications installations - Administration of communications cabling systems - Basic requirements
AS/NZS 3750.16	Paints for steel structures - Waterborne primer and paint for galvanized, zinc/aluminium alloy-coated and zinc-primed steel
AS 4070	Recommended practices for protection of low-voltage electrical installations and equipment in MEN systems from transient overvoltages
AS/NZS 4506	Metal finishing - Thermoset powder coatings

Document	Description
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 60529	Degrees of protection provided by enclosures (IP Code)
AS 62208-2006	Empty enclosures for low-voltage switchgear and controlgear assemblies - General requirements
AS/NZS ISO 9001	Quality management systems - Requirements
AS/ACIF S008	Australian Communications Industry Forum - Requirements for authorised cabling products
AS/ACIF S009	Australian Communications Industry Forum - Installation requirements for customer cabling
MRTS Drawing No. 1423	Controller Base Installation Details
MRTS01	Introduction to Technical Standard
MRTS50	Specific Quality System Requirements
MRTS91	Conduits and Pits
MRTS92	Traffic Signal and Road Lighting Footings
MRTS201	General Equipment Requirements
MRTS210	Mains Power Supply
DIN 18255/EN1303	Building Hardware-Cylinders for locks – Requirements and test methods

4 QUALITY SYSTEM REQUIREMENTS

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5 of MRTS01.

The Hold Points, Witness Points and Milestones applicable for this Standard are summarised in Table 4.1.

Quality system requirements for this contract shall be in accordance with this Standard, MRTS01, MRTS50 and MRTS201.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Points	Witness Points	Milestones
6.2.3	1. A prototype of cabinet and cooling system to be provided subject to Factory Acceptance Testing (FAT) to the satisfaction of the Superintendent		
6.9	2. The quality and Factory Acceptance Testing (FAT) procedures on surface preparation, primer/ undercoat application and final finish application shall be submitted for approval prior to fabrication		
7	3. The contractor shall allow access for inspection of all mounting surfaces by the Administrator prior to installation of cabinets.	Conduits shall be sealed to prevent vermin entry	

Clause	Hold Points	Witness Points	Milestones
11	<p>4. The Contractor shall submit detailed design drawings and calculations to the Administrator for acceptance prior to manufacturing of the cabinets.</p> <p>5. The Contractor shall submit all documentation relating to warranty provisions, test results and compliance statements and reports to the Administrator for acceptance prior to the delivery of the cabinets to site.</p> <p>6. The Contractor shall submit all "As Constructed" documentation to the Administrator for acceptance prior to practical completion.</p>		
17	<p>7. Contractor shall submit test results demonstrating compliance with the technical requirements of this Standard prior to the delivery of the equipment to sited</p>		
18			<p>1. Contractor shall submit and maintain, a program schedule</p>

The Principal reserves the right to evaluate the subcontractor's quality system throughout the contract. Arrangements for conducting evaluations shall be at a time, convenient to both parties and shall be confirmed in writing.

In contracts where a subcontractor becomes the major supplier, the subcontractor shall meet the requirements of AS/NZS ISO 9001 and this Standard.

5 ENVIRONMENTAL CONDITIONS

The environmental requirements defined in MRT201 *General Equipment Requirements* apply to this standard. Additional environmental requirements relevant to this standard are defined below:

The equipment shall be capable of operating continuously under the following roadside conditions:

- A range of temperature and humidity prescribed in Clause 1.4.1 of AS 2578—2009
- Queensland coastal environment with salt deposit densities in the range of 2.0 to 3.0 g/m²

The cabinet shall be suited to installation in the following roadside conditions:

- Full exposure to summer solar radiation experienced throughout Queensland
- Installations where exposed to vandalism
- Exposed to infestation by vermin

6 DESIGN AND MANUFACTURE

6.1 *Materials*

The cabinet materials and methods of construction shall be such that it has the strength and durability to withstand normal conditions of transportation, installation and operation for a lifespan of 20 years when installed in a roadside environment described in Clause 5.

The cabinet design and installation shall provide a protection rating of IP55 in accordance with AS 60529. The cabinet shall be designed to minimise its susceptibility to vandalism. It shall be installed so as to prevent infestation by vermin.

The cabinet shall be of either single or twin wall construction. Solar shields may be installed on external surfaces to assist in controlling internal temperature.

The external cabinet wall shall be manufactured of sufficient thickness to provide adequate strength against vandalism, but in any case, not less than:

- 1.5 mm stainless steel (Grade 316)
- 2 mm marine grade aluminium

The cabinet interior and exterior shall be free from sharp corners and projections that may cause injury.

Contact between dissimilar metals shall comply with the requirements of AS 1664. Suitable fixings shall be used to prevent damage and corrosion to all surfaces and surface treatments applied to the cabinet or the mounting structure.

Design loads shall be in accordance with AS 1170.1 and AS 1170.2.

6.2 *Ventilation and Cooling System*

6.2.1 **General**

The cabinet shall control the internal operating environment so as to meet the requirements of Clause 5 with an internal 500 W thermal loading, a maximum ambient temperature of 40 degrees Celsius, and full summer solar radiation on the cabinet for all daylight hours. For testing purposes, the 500 W thermal loading shall be distributed such that the switchboard compartment and the location of the Power Distribution Units (PDU) are jointly allocated 60% of the thermal load.

The cabinet cooling system shall have redundant positive pressure, fan forced ventilation or heat exchanger systems under thermostat control. The cabinet cooling system shall have redundant positive pressure, fan forced ventilation or heat exchanger systems under thermostat control. The difference between ambient and internal air temperatures shall not exceed:

- 12 degrees Celsius for standard cabinets.
- 6 degrees Celsius for extended cabinets.

when the cooling system is operating.

At least one filtered inlet vent shall be provided on both sides of the cabinet at a minimum of 300 mm above ground level. At least one filtered outlet vent shall be provided on both sides of the cabinet at a maximum of 150 mm from the top of the cabinet. Where fans are provided, they shall be installed adjacent the inlet vent.

Fans and filters shall be easily accessed and replaced without disturbing other equipment.

6.2.2 **Equipment**

Thermostats shall be of bi-metal sensor type with contact closures suitable for the electrical loads of the supplied cooling system. Each thermostat shall have a minimum set point range of 10 degrees to 30 degrees Celsius.

Filter performance rating shall be classified G4 in accordance with AS 1324.1, and meet the following requirements:

- Filter Material Density: 350 g/m²
- Filtration average arrestance greater or equal to 90%

Inlet and outlet vents shall be sized to allow filters to have a minimum time between replacements of 12 months when operating in a roadside environment.

Filters shall be installed such that their replacement is done without opening the cabinet.

Fan motors shall be of a construction that exhibits minimal amount of electrical noise output, and shall be EMC shielded to prevent interference with electronic component within the cabinet. The fan motor and bearings shall be suitable for 100% operating duty in the intended operating environment. The fan motor and bearings shall have a MTBF of 40 000 hours based on intended use, at a 90% running duty cycle.

6.2.3 Operation and Performance

Each thermostat shall operate the connected cooling device(s) once the internal ambient temperature (measured at the top of the cabinet) reaches the set point.

Prior to approval of the cabinet and cooling system design, a prototype of the cabinet and cooling system to be provided under this contract shall be subject to Factory Acceptance Testing (FAT) to the satisfaction of the Administrator. **Hold Point 1**

6.3 Dimensions

The cabinet shall house an adjustable full height internal racking system described in Clause 6.6. In addition, 50 mm clear space free of all cables and equipment shall be provided at the front and rear of the cabinet when the cabinet doors are closed. A minimum of 100 mm clear space shall be provided on both sides of the rack framework.

Internal frame heights may be expressed in terms of Rack Units (RU) based on 1 Rack Unit (RU) \cong 44.45 mm.

The functional internal height of the cabinet shall be a minimum of that stated in Table 8.4.1. The functional internal height shall be taken as the rackable space between the top and bottom bracing of the rack.

6.4 Access Doors

6.4.1 General

Access doors shall be incorporated at the front and rear of the cabinet to provide access to all internal equipment and cables. Each door shall be held open at 110 degrees from the closed position by a mechanism that operates in a constrained manner (for example sliding metal door stay).

The size of the door openings shall be as close as practicable to the external dimensions of the cabinet (excepting internal luminaires) to maintain ease of access to equipment and the racking system. Doors and fixings shall be consistent with the material and construction requirements of the cabinet.

Table 8.4.1 – Cabinet Dimensions

Description	Size
Rackable height (Min)	1333.5 mm (30 RU)
Internal height of cabinet (Min)	1550 mm
External height of cabinet (Max)	1850 mm
Racking width	482.6 mm (19")
Internal width of cabinet (Min)	890 mm
External width of cabinet, including cowlings (Max)	912 mm
Racking depth	480 mm
Internal depth of cabinet with doors closed (Min)	580 mm
External depth of cabinet with doors closed, including roof overhangs (Max)	717 mm
Cabinet base/ Cable zone (Min)	100 mm
Gland plates aperture (Min)	2 of 250 mm x 400 mm

6.4.2 Gland Plates

The gland plates shall be held in place by mechanisms that can be operated without use of tools. The mechanism shall be designed to:

- i. Provide sufficient pressure around the perimeter seal of the gland plate to prevent water ingress.
- ii. Avoid creating catch points for cables personnel and clothing.

6.4.3 Drain Holes

Drain holes shall be provided in the bottom corners of all Enclosures or any place where water could be dammed by framing members. Drain holes shall not compromise the "IP55" rating of any enclosure and shall prevent entry of vermin.

6.4.4 Gaskets

A door compression gasket shall provide a durable and resilient waterproof seal against a flat surface to IP66 when closed. The seal shall be UV stabilised and manufactured of either polyurethane foam or silicon-based rubber equivalent. The gasket material shall maintain its elasticity and memory over the life of the cabinet in its normal operating environment.

6.4.5 Door Hinges and Locks

Unless otherwise specified, doors shall be hinged on the left hand side and the hinges shall not protrude from the housing. Hinges shall be of a design such that the hinge pins cannot be removed. Preference shall be given to concealed hinges.

Locking/unlocking of each door shall be effected by single key operation. The lock shall operate a three point latching mechanism with pins extending from the top, centre and bottom of the non-hinged side of the door. The door shall house a flush mounting metal ergonomic handle capable of accepting a Euro Profile locking cylinder (DIN 18255/EN1303) with restricted keying or Dirak 3-151 (part number 107-9209) Swinghandles with Dirak 2-140 Profile Cylinder (part number 211-9101), or equivalent.

Two keys shall be supplied with each cabinet, keyed to the Principal's requirements.

6.4.6 Document Storage Pocket

A pocket shall be provided on the inside lower half of each access door to provide space for the storage of site documentation. The pocket shall be sized to completely shroud unfolded, laminated A3 sized drawings with long edge in the horizontal plane. The pocket shall be minimum 20 mm in depth, 430 mm in width and 220 mm in height. The pocket shall include at least two equi-spaced finger slots extending at least 100 mm from the base of the pocket to assist in the removal of plans.

6.5 *Equipment*

Where an item of equipment is required more than once, the same make and model of that equipment shall be used in each instance.

Fans shall be of ball-bearing type.

6.6 *Equipment Racks*

The cabinet shall be supplied with an adjustable internal racking system of punched rails in each corner to the full height of the cabinet. The rack shall be capable of adjustment to accept 19 inch (482.6 mm) and Euro metric (535 mm) equipment and initially set to 19 inch sizing. A minimum equipment mounting depth of 480 mm shall be provided between the front and back of the rack.

All fixings (nuts, bolts and screws and the like) shall be metric threads.

The racking system shall be supplied with a proprietary relocatable, fixed shelf and a relocatable, sliding shelf. The fixed shelf shall be positioned to provide 5RU spare space above the shelf. The shelves shall be manufactured from perforated 1.5 mm steel sheet with a corrosion-proof coating (or annealed zinc). The shelves shall be capable of supporting a 50 kg static surface load without deformation.

6.7 Cable Management

Cable management shall be in the form of slotted duct with covers, cable shunting rings or similar rigid formed systems. These products shall be manufactured from a non-conductive material, and be of a design that shall not damage the cables being secured.

The field cabinets shall have a cable trunking/management system down the full height of both sides of the cabinet. The cable trunking/ management system shall be capable of holding a 50 mm diameter cable loom. It shall be installed such that it does not interfere with the internal racking system, while allowing easy maintenance access to cables within the trunking system. Horizontal cable management shall be provided where appropriate. At least 50% spare capacity shall be provided in each cable management systems.

Labels shall not be affixed to duct covers.

6.8 Danger Sign

A danger sign shall be fixed to the inside of the access door and shall comply with the relevant requirements of AS 1319.

6.9 Surface Finish

All cabinet surfaces shall have a durable gloss finish that may be either integral with the cabinet material or applied to its surfaces. The finish chosen shall comply with AS/NZS 1580.457.1 for resistance to natural weathering.

Where an integral finish is used, the material shall be such as to allow an alternative finish to be applied to the surface in the field without special preparation.

A suitable finish shall be applied to the cabinet depending on the material of manufacture, for an expected life span of 20 years when installed in a roadside environment in Queensland as specified in Clause 5 "Environmental Conditions" on this Standard. This finish shall be applied irrespective of the cabinet's intended location.

The cabinet shall be treated with the required surface or primer preparation for the material of construction. The primer/ undercoat shall be of powder-coat type and applied to the surface in accordance with the manufacturer's specifications. Provide at least 1 full coat of primer for stainless steel (Grade 316) and marine grade aluminium

Paintwork shall be a ripple-free finish of minimum 60 micron thickness (not including surface preparations or primers) of either a powder coat or wet paint type.

The surface colour shall be Smoke Blue (AS 2700S: Colour No. T33).

The quality and Factory Acceptance Testing (FAT) procedures on surface preparation, primer/ undercoat application and final finish application shall be submitted for approval prior to fabrication. **Hold Point 2**

6.10 Mounting Surface, Facilities and Structural integrity

Unless otherwise specified, the cabinet shall be mounted onto a plinth having four mounting studs arranged in accordance with MRS Drawing No 1423. Electrical and telecommunication conduits shall be installed between the cabinet and pits as shown on the drawings in accordance with MRTS91 *Conduits and Pits*.

To ensure stability of the enclosure, the concrete plinth design shall be flat and a slurry of cement shall be installed between the plinth and the enclosure base such that the cabinet does not move due any unevenness of the plinth. The gap between the plinth and enclosure shall be vermin proof and prevent corrosion of the enclosure or its fixings.

6.10.1 Lifting and Transportation Points

Where the fitted-out enclosure (including all operational equipment other than batteries) cannot be manually lifted and held by a single person (within workplace health and safety limits) during installation, lifting anchors shall be provided. The lifting anchor(s) shall be integral with the enclosure and prevent moisture ingress to the enclosure. Seals around the lifting anchor(s) are not permitted.

Anchors shall be capable of supporting the fitted-out enclosure complete with all operational equipment such, racks, fans, filters and switchboards. The integrity of the enclosure when being lifted shall be in

accordance with AS 62208-2006 Clause 9.4, with a test load of at least 250 kg in addition to the fully-fitted enclosure weight (excluding batteries).

If eyebolts are used as lifting anchors, the axial strength of the eyebolts shall be in accordance with AS 2317-1998 Clause 6.1 Table 2.

7 INSTALLATION

The cabinet shall be installed on a mounting surface in accordance with Section 6.10. The contractor shall allow access for inspection of all mounting surfaces by the Administrator prior to installation of cabinets.

Hold Point 3

After installation of the cables, the conduits shall be sealed to prevent vermin entry. **Witness Point**

8 STORAGE

The contractor shall take all reasonable care when storing field cabinets prior to installation. They shall be stored in a safe, dry and secure location until required. They shall not be stored directly on the ground.

9 ELECTRICAL REQUIREMENTS

9.1 *Electrical Safety*

The electrical equipment and associated wiring within the cabinet shall comply with the relevant requirements of AS/NZS 3100.

The switchboard and all electrical cabling within the cabinet shall comply with the relevant requirements of AS/NZS 3000, and MRTS91 *Conduits and Pits*.

The cabinet site works incorporating conduits for power and telecommunications cables shall comply with the requirements of the Electricity Act and AS/NZS 3000.

The switchboard shall provide a degree of protection from live parts to meet the classification of IP56 in accordance with AS 60529.

9.2 *Power Supply*

The Contractor shall arrange for mains power to be connected to the switchboard in accordance with the requirements of MRTS210 *Mains Power Supply*.

9.3 *Switchboard*

Each cabinet shall be supplied with a 19 inch rack mountable modular switchboard. The switchboard shall be mounted in the upper quarter of the rack, and shall have a depth not greater than half that of the cabinet. No part of the switchboard shall be above the level of the door opening, and in any case, 300 mm below cabinet roof level. They shall have a height of no greater than 8RU (356 mm approx).

All electrical components shall be suitable for operation on a 240 volt +5% / -10%, 50Hz \pm 0.1Hz system. The switchboard shall be capable of accepting all of the equipment listed below. The DIN rail shall be TH35 7.5 and minimum 400 mm length.

All power supply wiring within the switchboard shall be a minimum of 2.5 mm² (7/0.67) PVC. A minimum of 1.5 mm² (7/0.50) PVC is acceptable for lighting and fan circuits. All cabinets and switchboards shall be bonded to the MEN system by a suitable cabling and earth stake as per AS/NZS 3000. Only one wire shall be connected to each terminal. Bridging terminals shall be used for parallel connections.

All electrical design, wiring and associated equipment shall comply with the requirements of AS/NZS 3000 and as per the circuit diagram in Figure 1.

The switchboard shall incorporate the following items rated to the calculated prospective fault current:

- 1 x Single pole, DIN rail mount, miniature 250 V, 32 A, fused mains isolating switch
- 1 x Single pole, DIN rail mount, 250 V, suitably sized, miniature circuit breaker for the surge diverter
- Surge diverter and surge filter as per Clause 9.8.2 and 9.8.3

- 1 x 250 V, 10 A feeding remainder of the switchboard
- 2 x 250 V, 6 A miniature earth leakage circuit breaker protection for separate cabinet lighting and fan circuits
- 2 x 250 V, 6 A miniature earth leakage circuit breaker protection (1 per socket outlet strip with a maximum of 10 socket outlets each)
- Neutral bar and cover (with a capacity suitable for the circuit requirements of the cabinet)
- Earth bar (with a capacity suitable for the circuit requirements of the cabinet)
- Earth – Neutral link

9.4 Arrangement of Terminals

Each terminal shall be clearly and indelibly identified. The terminal assembly shall be arranged so that:

- a) The connecting cables can be formed in a neat manner
- b) The individual conductors can be connected or disconnected without disturbing other connections

9.5 Power Outlet Panels

Two proprietary power outlet panels shall be installed to supply power to equipment mounted in the cabinet. Each power outlet panel shall:

- be wired to an individual subcircuit
- between 5 and 10 socket outlets, arranged to allow plug-pack type transformers to be installed in all outlets concurrently
- be mounted vertically on the rear side of the rack frame so as not interfere with equipment racking and cabling
- be easily accessible from both the front and rear of the cabinet
- allow any equipment installed within the cabinet to be connected via a power cord with maximum of 500 mm length.
- have plug/power supply retention capability for each product supplied as part of the contracts.

9.6 Cabinet Lighting

Each cabinet shall have two miniature fluorescent luminaires with diffusers that are:

- rated between 8 watt and 15 watt
- mounted within 150 mm of the top of the cabinet (one each at front and rear)
- rack mounted or directly mounted inside the cabinet above each door.
- hard wired to the lighting subcircuit

The fluorescent luminaires shall be mounted in a manner such that they do not interfere with equipment racking and cabling and do not shine directly into eyes of maintenance personnel.

The micro switches shall be of a weatherproof construction with a minimum rating of IP56 and wired such that the relevant luminaire is switched on upon opening an access door. Each micro switch shall have two sets of contacts and a minimum MTBF of 10 000 switching operations.

9.7 Radio Frequency Interference

The electrical interference produced by the equipment supplied and installed in the field cabinet by the Contractor shall not exceed the limits prescribed in AS 1044.

All equipment supplied by the Contractor shall include documentation detailing the equipment conformance to Radio Frequency Interference, Electromagnetic Compatibility and other relevant Authority compliance. This documentation shall be submitted to the Administrator on delivery of the cabinet.

9.8 Protection Against Electrical Transients And Over-Voltage

9.8.1 General

The cabinet shall incorporate protection against electrical transients and over-voltage. The installation shall follow the recommended practices for MEN systems, specified in AS 4070 for protection of low-voltage electrical installations and equipment from transient over-voltages.

The cabinet installation shall follow the general guidelines for the protection of persons and property from hazards arising from exposure to lightning in accordance with AS 1768.

The switchboard shall also include the necessary devices to protect all equipment being housed in the cabinet from electrical transients and over-voltage.

9.8.2 Surge Diverter

A surge diverter shall be supplied and installed in the cabinet switchboard. The surge diverter shall provide protection against multiple impulses caused by lightning or other transient disturbances. The surge diverter shall be in accordance with Australian standard AS 4070 and connected between the following terminals:

- phase and neutral,
- phase and earth.

The surge diverter shall have a phase-to-neutral single shot 8/20 μ s rating of 80 kA and shall be suitably rated to withstand multiple impulses as defined by location category C in AS 1768.

The surge diverter shall be based upon Metal Oxide Varistor (MOV) technology, with each MOV rated at no less than 40 kA for an 8/20 μ s pulse. The MOVs shall be internally fused such that they are disconnected if the unit experiences a surge that exceeds its rating.

The surge diverter shall have visual indication of MOV fuse operation, loss of power, or thermal overload. In the event of a thermal overload the protection shall remain in circuit.

A voltage free changeover contact (Alarm output) shall be incorporated in the surge diverter. This shall activate upon any MOV failure, power failure or thermal overload condition. The contact shall be isolated to 4 kV to all active circuitry.

The surge diverter shall be rated for a nominal operating voltage of 240 V and a maximum operating voltage of 275V rms. Let through voltage (Residual Voltage) for a 6 kV 1.2/50 μ s, 3 kA 8/20 μ s impulse shall be less than 900 V when measured at the surge diverter terminals.

9.8.3 Surge Filters

A surge filter shall be supplied and installed on the load side of the surge diverter, and on the line side of the earth leakage protective devices. The surge filter shall provide fine protection against multiple impulses caused by lightning or other transient disturbances. The surge filter shall be connected between phase and neutral in accordance with Australian standard AS 4070.

The surge filter shall have a minimum load current rating of 10 A per phase.

The surge filter shall have a single shot 8/20 μ s rating of 16 kA per mode and shall be suitably rated to withstand multiple impulses as defined by location category B in AS 1768-1991.

The surge filter shall be based upon MOV technology. The line side MOVs shall be internally fused such that they are disconnected if the unit experiences a surge that exceeds its rating.

The surge filter shall have visual tags and LED indicating, "power" and "status" for each phase. The power LED shall extinguish when power to the unit is lost. The status visual tags and LEDs shall extinguish when the MOV fuse operates; when power to the unit is lost; or when the unit experiences a thermal overload. In the event of a thermal overload the protection shall remain in circuit.

A voltage free changeover contact (Alarm output) shall be incorporated in the surge filter. This shall activate upon any MOV failure, power failure or temperature overload condition. The contact shall be isolated to 4kV to all active circuitry.

The surge filter shall be rated for a nominal operating voltage of 240 V and a maximum operating voltage of 275V rms. Let through voltage for a 6 kV 1.2/50 μ s, 3 kA 8/20 μ s impulse shall be less than 600 V when measured at the surge filter terminals.

10 TELECOMMUNICATION REQUIREMENTS

10.1 Provision for Connection to Telecommunication Lines

Provision for telecommunications lines shall be provided in accordance with the requirements of ACIF and AS 3085.1.

The cabinet works incorporating conduits for communication cables shall comply with the requirements of the ACIF 009.

10.2 Telecommunications Service

Where specified, the Contractor shall act as the Principal's agent in arranging for connection of a telecommunications service to the site in the name of the Principal.

Within 14 days of written request, the Principal shall provide relevant details to enable the Contractor to complete the forms required by the telecommunications entity.

11 DOCUMENTATION

The documentation requirements defined in MRTS201 *General Equipment Requirements* apply to standard. Additional documentation requirements relevant to this standard are defined below:

Prior to the commencement of manufacturing works, the Contractor shall prepare and request approval of the Principal/Administrator of three copies of the following documents:

- a) fabrication and assembly drawings, detailing all of the components to be installed
- b) manufacturer's specifications of cabinet and of all major components detailing ratings and performance characteristics
- c) a schematic layout of components, building details and interconnection diagrams
- d) recommendations for routine maintenance tasks
- e) recommendations on spare parts

Hold Point 4

The Contractor shall provide to the satisfaction of the Principal/Administrator, the following documents prior to the delivery of the cabinets to site:

- a statement confirming the warranty provisions associated with the field cabinet and associated equipment
- compliance details of all components as required or implied under this document
- records of tests conducted by the Contractor to demonstrate compliance to this Standard

Hold Point 5

Prior to issue of Practical Completion, the Contractor shall provide a laminated A3 sized copy of the "As Constructed" switchboard schematic and wiring diagrams, together with all FATs, Commissioning and Operating / Maintenance documentation to the satisfaction of the Administrator. **Hold Point 6**

12 GUARANTEE / WARRANTY

The Contractor shall guarantee the equipment supplied for a period of twelve (12) months after the date of practical completion.

13 SPARE COMPONENTS

The Contractor shall provide a schedule of spare components, and prices, recommended for retention for service and/or fault maintenance purposes and shall maintain a stock of such items. The Contractor shall guarantee that such spare components will be available for a minimum of seven (7) years after the date of practical completion.

The Principal may elect to purchase all or some of the recommended maintenance stocks upon completion of the warranty period.

14 PACKAGING AND SHIPPING

The equipment shall be securely packed and sealed to prevent damage prior to shipping. The Contractor shall repair or replace to the satisfaction of the Principal/Administrator, any damage that occurs prior to issue of Practical Completion. Costs associated with the repair or replacement shall be at the Contractor's expense.

15 NON CONFORMING PRODUCT

Equipment that does not meet the specified design quality and weather resistance tests to the satisfaction of the Administrator shall be rejected.

The Contractor shall rectify any consequential damage to the satisfaction of the Administrator. The Contractor shall bear all costs associated with the replacement of the non-conforming product and/or consequential damage.

16 SAMPLE FOR EVALUATION

The Contractor shall provide a sample of a complete cabinet for evaluation in accordance with Clause 4.2 of MRTS201 *General Equipment Requirements* at least 14 days prior to the planned commencement of fabrication.

17 ACCEPTANCE TESTING AND CERTIFICATION

The testing, commissioning and certifications requirements defined in MRTS201 *General Equipment Requirements* apply to this standard. In addition, test sheets shall demonstrate compliance with the technical requirements of this Standard prior to the delivery of the equipment to site. **Hold Point 7**

18 PROGRAM SCHEDULE

Within fourteen (14) days of the Letter of Acceptance, the Contractor shall submit and maintain, a program schedule that includes: **Milestone**

- i. detailed drawings, manufacturers specifications and schematic layout of components for approval by the Principal
- ii. submit Quality plans for fabrication approval
- iii. submit FAT Plan
- iv. where applicable, witness of factory tests by the Principal, and submission of test certificates
- v. Delivery

The Contractor shall update the program of works and provide to the Administrator on a fortnightly basis.

