

**Technical Specification**

**Transport and Main Roads Specifications  
MRTS210 Provision of Mains Power**

**November 2021**

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## 1 Introduction

This Technical Specification defines the design, supply, installation, testing and commissioning, removal, performance, documentation, training and maintenance requirements for low voltage, mains power for ITS field devices and other electrical installations.

These requirements include disconnection, removal and/or relocation and reconnection of existing switchboards necessary to complete the Works.

In this version, the requirement on harmonic filtering in Clause 9.3 was removed.

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

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

## 2 Definition of terms

The terms defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional terminology relevant to this Technical Specification is defined in Table 2.

**Table 2 – Definitions**

Term	Definition
AC	Alternating current
Connected Load	Sum of maximum running loads for all electrical equipment, including devices connected via socket outlet
Consumer's Mains	As defined in AS/NZS 3000
Electrical Legislation	<ul style="list-style-type: none"> <li>• <i>Electricity Act 1994</i> and Associated Amendments and Regulations</li> <li>• <i>Electrical Safety Act 2002</i> and Associated Amendments, Regulations and Codes of Practice</li> </ul>
Electricity entity	As defined in the Electrical Legislation
Extra-Low Voltage (ELV)	As defined in AS/NZS 3000
Field Cabinets	Telecommunications Field Cabinet in accordance with MRTS201 <i>General Equipment Requirements</i> , and/or an enclosure associated with an ITS device
Final sub-circuit	As defined in AS/NZS 3000
Installation	Switchboard, enclosure, earthing, and all cabling including consumer's mains
Low Voltage (LV)	As defined in AS/NZS 3000
Maximum demand	As defined in AS/NZS 3000
Point of Supply	As defined in AS/NZS 3000
Submains	As defined in AS/NZS 3000

Term	Definition
Switchboard	The entire functional unit, including electrical components and switchboard enclosure
Switchboard Enclosure	The switchboard mounting chassis
Wiring Rules	AS/NZS 3000

### 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 Technical Specification. Where there are inconsistencies between this Technical Specification and the referenced MRTS (including those referenced in MRTS201 *General Equipment Requirements*), the requirements specified in this Technical Specification shall take precedence.

**Table 3 – Referenced documents**

Reference	Title
AS/NZS 3000	<i>Electrical installations</i> (known as the Australian/New Zealand Wiring Rules)
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS201	<i>General Equipment Requirements</i>
MRTS228	<i>Electrical Switchboards</i>
MRTS256	<i>Power Cables</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS91	<i>Conduits and Pits</i>
MRTS93	<i>Traffic Signals</i>
QECM	<i>QLD Electricity Connection Manual</i>
QEMM	<i>QLD Electricity Metering Manual</i>
Standard Drawing 1327	<i>Traffic Signals / Road lighting – Mains Connection</i>
Standard Drawing 1423	<i>Traffic Signals – Traffic Signal Controller Base Installation Details</i>
Standard Drawing 1627	<i>Road Lighting – Switchboard Top Mounted</i>
Standard Drawing 1689	<i>ITS – Switchboard Typical Layout and Circuit Diagram MEN System</i>
TRUM Volume 4 Part 8	<i>Traffic and Road Use Manual Volume 4 Part 8 Electrical Verification Requirements for New or Altered Roadside Installations</i>

### 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 5.2 of MRTS01 *Introduction to Technical Specifications*.

The quality system requirements defined in Clause 4.2.2 of MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional quality system requirements for equipment provided under this Technical Specification are listed in Table 4.1 below.

There are no Milestones or Witness Points defined.

**Table 4.1 – Hold Points, Witness Points and Milestones**

Clause	Hold Point	Witness Point	Milestone
11.1	1. Disruption of existing power supply		
11.3	2. Submission of documents to Electricity entity		
11.4	3. Authorisation from Electricity entity		

## 5 Scope

The Contractor shall provide mains electricity supply suitable for the required load in accordance with the requirements of this Technical Specification. This may require a new mains power supply, or an existing power supply to be removed, altered and/or relocated. It may also require alterations to the local electricity supply network. In particular, the Contractor shall:

- a) where an existing mains power supply is unavailable or unsuitable for alteration, provide a new mains power supply
- b) where an existing mains power supply is available and suitable for alteration, perform alterations as necessary for the change in supply and/or connected load, including affected equipment and cabling that is entirely contained within the switchboard enclosure
- c) where necessary, provide Consumer's Mains and/or submains to existing, replacement and new switchboards, including those in field cabinets and traffic signal controllers
- d) where required to complete the mains power supply, provide pits, poles, conduits, footings and any other necessary materials, equipment and Works
- e) connect new / replacement switchboards to the point of supply
- f) act as the Principal's agent concerning all aspects relating to the electricity supply, and
- g) carry out all design, documentation, supply, installation, disconnection, removal, relocation, connection, testing and commissioning of the abovementioned Works.

The following items are excluded from the scope of this Technical Specification:

- a) Supply of switchboards other than as described above (for example: switchboards supplied with field equipment are out of the scope of this Technical Specification).
- b) Supply and installation of switchboards that are integral to either telecommunications field cabinets (which are described in MRTS201 *General Equipment Requirements*) or traffic signal controllers.
- c) Final sub-circuit cabling that is not entirely contained within the switchboard enclosure.
- d) Provision of non-mains source of electricity supply and associated auto-changeover equipment / control system.

The Principal will sign all forms prepared by the Contractor as required by the electricity entity.

## **6 Intended use**

The performance requirements defined in MRTS201 *General Equipment Requirements* apply to equipment provided under this Technical Specification. In addition and unless otherwise specified, field equipment and other electrical installations shall be powered by unmetered, LV AC mains power supply that meets the requirements of this Technical Specification.

## **7 Functional requirements**

Power shall be sourced from either an existing Transport and Main Roads switchboard or the electricity entity.

The mains power supply shall be metered when consistent daily power consumption cannot be reliably predicted (for example: buildings, mechanical plant), or when otherwise directed by the electricity entity or the Principal.

## **8 Equipment components**

The mains power supply includes Consumer's Mains, Submains (where applicable), switchboard electrics, switchboard enclosure, associated pits and conduits, and any other Works necessary to meet the functional requirements.

Switchboards shall comply with the requirements of MRTS201 *General Equipment Requirements* and MRTS228 *Electrical Switchboards*.

## **9 Operational requirements**

### **9.1 General**

The operational requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional operational requirements relevant to this Technical Specification are described below.

The mains power supply shall meet the power consumption requirements of each individual installation, and shall be as shown in the design documents. The switchboard shall protect supplied loads from transients and harmonics as may be expected when connected to a mains electricity supply. The electrical installation shall comply with the requirements of AS/NZS 3000, Electrical Legislation and the electricity entity.

Upon opening the outer doors of the switchboard enclosure, persons shall be protected from all points / surfaces at greater than ELV potential.

Wherever possible, the switchboard shall maintain uninterrupted electricity supply while being serviced.

Status outputs from equipment provided under this Technical Specification shall be displayed at the Principal's Transport Management Centre (TMC).

### **9.2 Mains power**

The mains power supply design shall be suitable for connection to the electricity network administered by the electricity entity, including the prospective fault at the point of supply.

Unless otherwise specified and/or required by the electricity entity, energy consumption for unmetered installations shall be based on the connected load.

### 9.3 *Transient suppression*

Removal of the requirement on harmonic filtering.

This clause does not apply to street lighting circuits.

Lightning surge suppression shall be provided on the load-side of the main switch. The suppression device shall be designed to withstand a minimum of three surge events. It shall display health status locally via integral indicators and provide volt-free contacts for remote indication.

### 9.4 *Automatic change-over switch*

Where specified, the mains power supply shall be designed to accommodate installation of a generator power source in accordance with this clause.

An automatic change-over switch shall be provided on the load side of the main switch. Upon detection of mains power failure, the change-over switch shall automatically switch to the alternate power source. Upon detection of mains power restoration in excess of one continuous minute, the change-over switch shall automatically switch back to mains power. The change-over switch shall display status locally via integral indicators and provide volt-free contacts for remote indication.

### 9.5 *Switchboards*

In addition to the requirements of this Technical Specification, switchboard electrics and enclosures shall comply with the requirements of:

- a) MRTS228 and Standard Drawing 1627 for Road lighting
- b) MRTS93 and Standard Drawing 1423 for Traffic Signal Controllers,
- c) MRTS226 and Standard Drawing 1689 for ITS cabinets, and
- d) MRTS201 for general ITS equipment.

## 10 **Mechanical and physical requirements**

The mechanical and physical requirements defined in MRTS201 *General Equipment Requirements* apply to equipment provided under this Technical Specification.

Where an alternate non-mains source of electricity supply is to be installed, the switchboard shall allow for the auto change-over and associated control system to be incorporated within the switchboard enclosure.

## 11 **Installation requirements**

### 11.1 *General*

Existing power supplies shall remain operational throughout the carrying out of the Works under the Contract. The Contractor shall give 14 days written notice to the Administrator of the intention to disrupt an existing supply. **Hold Point 1** The use of unmetered switchboards as a source of power for temporary Works during construction is permitted where approved in writing by the electricity entity. In such cases, the Contractor shall comply with the requirements of this Technical Specification and the electricity entity.

The Contractor shall perform all Works associated with the provision of mains power including:

- a) the earthing system as necessary
- b) conduits, pits, cables (including Consumer's Mains) and the Works defined Standard Drawing 1327, and
- c) all associated Works and materials.

## **11.2 Materials**

### **11.2.1 Supply**

All materials shall be supplied and installed by the Contractor and shall meet the requirements of the relevant Technical Specifications including MRTS228 *Electrical Switchboards*, MRTS256 *Power Cables* and Standard Drawing 1327.

### **11.2.2 Installation**

Where necessary to complete the mains power supply installation:

- a) provide electrical conduits and pits in accordance with the requirements of MRTS91 *Conduits and Pits*, and
- b) provide Consumer's mains in accordance with MRTS256 *Power Cables* and Standard Drawing 1327.

Where the switchboard is installed in the field on pre-cast plinths and as otherwise necessary, provide a dedicated earthing system that satisfies the requirements of AS/NZS 3000 and the relevant switchboard drawings.

Materials connecting directly to the electricity network shall also meet the requirements of the relevant electricity entity and in particular the QECM and the QEMM.

## **11.3 Contact with electricity entity**

The Contractor shall advise the electricity entity of changes to connected loads, and/or make applications for supply, on behalf of, and in the name of, the Principal. The Principal's relevant customer details and required Tariff will be provided upon the Contractor's request.

At least 28 days prior to contacting the electricity supply authority, the Contractor shall provide to the Administrator the following, locally approved documentation as a minimum:

A completed copy of any documents and supporting information the Contractor intends to forward to the electricity entity.

Calculations to determine the prospective fault current, connected load and maximum demand at the line side of the main switch.

The Contractor shall not forward the original documents to the electricity entity until the 28 days have elapsed or receiving written authorisation from the Administrator to forward the documents to the electricity entity. **Hold Point 2**

## **11.4 Commencement of works**

At least 28 days prior to planned commencement of the Works, the Contractor shall forward the following additional documentation to the Administrator as a minimum:

- a) Proposed switchboard and cabling Works shown in the design documentation.
- b) Details of any planned disruptions to supply to existing connected loads.

The Contractor shall not proceed with the Works until receiving written authorisation from the electricity entity. **Hold Point 3**

### **11.5 Connection to Principal's existing switchboard**

At the Principal's discretion, power may be obtained from an existing switchboard that supplies electricity to the Principal's road lighting, traffic signals and/or other field equipment.

All Works shall meet the requirements of AS/NZS 3000, MRTS228 *Electrical Switchboards*, MRTS256 *Power Cables*, MRTS201 *General Equipment Requirements* and the electricity entity.

### **11.6 Connection to electricity entity**

New connections to the local electricity entity (Energy Queensland) network shall comply with the requirements of the QECM and the QEMM.

## **12 Removal of mains connections**

Where shown in the Standard Drawing or where the mains connection is no longer required, the connection shall be removed.

The Contractor shall liaise with the Superintendent in providing details of intended de-energisation and de-commissioning of existing mains connections (i.e. site address, proposed date of disconnection). The Contractor must obtain written approval from the Superintendent before removing mains connections.

Consumer mains cabling shall be safely disconnected and removed between the point of supply and the associated switchboard with fuses removed as required.

Where mains connections are removed from electrical entity service poles, all associated pole mounted conduit and fixings (including cable guards, saddles and screws) shall be removed from the pole and disposed of. Underground conduit adjacent to the pole shall be suitably treated to eliminate trip risk to adjacent pedestrian traffic including maintenance workers. The ground surface shall be reinstated with material matching the surrounding area to the satisfaction of the Superintendent.

Where nominated, existing equipment shall be demolished and removed in a manner which avoids damage to any adjacent items.

Demolished equipment and debris shall be disposed of in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Specification*.

The Contractor shall record the date each of the mains connections is removed.

## **13 Testing and commissioning**

The testing and commissioning requirements defined in MRTS201 *General Equipment Requirements* apply to equipment provided under this Technical Specification. Additional testing and commissioning requirements for the Works provided under this Technical Specification are described below.

The mains power installations shall be tested in accordance with the Electrical Legislation, AS/NZS3000, MRTS228 *Electrical Switchboards*, MRTS256 *Power Cables* and TRUM Volume 4 Part 8. Where specified, the following tests shall also be undertaken:

- a) Thermal (infrared) image scan of the switchboard.
- b) Harmonic disturbance injected onto mains.
- c) Voltage fluctuations injected onto mains.
- d) Where an alternate power supply is used, changeover between mains and alternate power source(s) and back to mains.

All 'hot' joints identified on the thermal image scan shall be rectified and retested.

Harmonic disturbances and/or voltage fluctuations injected on to the mains that exceed the limits prescribed by the electricity entity shall be rectified and retested.

## **14 Documentation**

The documentation requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional documentation requirements relevant to this Technical Specification are described below.

The Contractor shall include copies of all documents relevant to this Technical Specification in the 'Mains Power Details' sections of the operations manual, including documents (including correspondence) submitted to, and received from, the electricity entity.

## **15 Maintenance**

The maintenance requirements defined in MRTS201 *General Equipment Requirements* apply to equipment provided under this Technical Specification.

## **16 Handover**

The handover requirements defined in MRTS201 *General Equipment Requirements* apply to equipment provided under this Technical Specification.

