Technical Specification

Transport and Main Roads Specifications
MRTS210 Provision of Mains Power

July 2015
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Transport and Main Roads Specifications, July 2015
1 Introduction

This Technical Specification defines the design, supply, installation, testing and commissioning, 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.

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 apply to this specification. Additional terminology relevant to this specification is defined in Table 2.

Table 2 – Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Alternating current</td>
</tr>
<tr>
<td>Connected Load</td>
<td>Sum of maximum running loads for all electrical equipment, including devices connected via socket outlet</td>
</tr>
<tr>
<td>Consumer’s Mains</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Electrical Legislation</td>
<td>• Electricity Act 1994 and Associated Amendments and Regulations</td>
</tr>
<tr>
<td></td>
<td>• Electrical Safety Act 2002 and Associated Amendments, Regulations and Codes of Practice</td>
</tr>
<tr>
<td>Extra-Low Voltage (ELV)</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Field Cabinets</td>
<td>Telecommunications Field Cabinet in accordance with MRTS201, and/or an enclosure associated with an ITS device</td>
</tr>
<tr>
<td>Final sub-circuit</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Installation</td>
<td>Switchboard, enclosure, earthing, and all cabling including consumer’s mains</td>
</tr>
<tr>
<td>Electricity entity</td>
<td>As defined in the Electrical Legislation</td>
</tr>
<tr>
<td>Low Voltage (LV)</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Maximum demand</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Point of Supply</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Switchboard Enclosure</td>
<td>The switchboard mounting chassis</td>
</tr>
<tr>
<td>Switchboard</td>
<td>The entire functional unit, including electrical components and switchboard enclosure</td>
</tr>
<tr>
<td>Submains</td>
<td>As defined in AS/NZS 3000</td>
</tr>
<tr>
<td>Wiring Rules</td>
<td>AS/NZS 3000</td>
</tr>
</tbody>
</table>
3 Reference documents

The requirements of the referenced documents listed in Table 3 of MRTS201 and Table 3 below apply to this specification. Where there are inconsistencies between this specification and the referenced MRTS (including those referenced in MRTS201), the requirements specified in this specification shall take precedence.

Table 3 – Referenced documents

<table>
<thead>
<tr>
<th>Document ID/short title</th>
<th>Document Name / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity Act 1994</td>
<td>Electricity Act 1994 and Associated Amendments and Regulations</td>
</tr>
<tr>
<td>AS/NZS 3000</td>
<td>Electrical installations (known as the Australian/New Zealand Wiring Rules)</td>
</tr>
<tr>
<td>Standard Drawing 1327</td>
<td>Mains Connection</td>
</tr>
<tr>
<td>Standard Drawing 1627</td>
<td>Road Lighting Switchboard Top Mounted</td>
</tr>
<tr>
<td>Standard Drawing 1423</td>
<td>Traffic Signal Controller Base Installation Details</td>
</tr>
<tr>
<td>MRTS91</td>
<td>Conduits and Pits</td>
</tr>
<tr>
<td>MRTS93</td>
<td>Traffic Signals</td>
</tr>
<tr>
<td>MRTS201</td>
<td>General Equipment Requirements</td>
</tr>
<tr>
<td>MRTS228</td>
<td>Electrical Switchboards</td>
</tr>
<tr>
<td>MRTS256</td>
<td>Power Cables</td>
</tr>
<tr>
<td>EX Manual 00294 Ver9/</td>
<td>QLD Electricity Connection and Metering Manual</td>
</tr>
<tr>
<td>EE NA000403R328 Ver9</td>
<td></td>
</tr>
</tbody>
</table>

4 Scope

The Contractor shall provide mains electricity supply suitable for the required load in accordance with the requirements of this 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, ducts, 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 specification:

- supply of switchboards other than as described above (for example: switchboards supplied with field equipment are out of the scope of this specification)
- 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
- final sub-circuit cabling that is not entirely contained within the switchboard enclosure, and
- 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.

5 Quality system requirements

The quality system requirements defined in MRTS201 apply to this specification. Additional quality system requirements for equipment provided under this specification are listed in Table 5 below.

Table 5 – Hold Point

<table>
<thead>
<tr>
<th>Clause</th>
<th>Hold Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1</td>
<td>1. Disruption of existing power supply</td>
</tr>
<tr>
<td>11.3</td>
<td>2. Submission of documents to Electricity entity</td>
</tr>
<tr>
<td>11.4</td>
<td>3. Authorisation from Electricity entity</td>
</tr>
</tbody>
</table>

6 Intended use

The performance requirements defined in MRTS201 apply to equipment provided under this 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 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 ducts, and any other Works necessary to meet the functional requirements.

Switchboards shall comply with the requirements of MRTS201.

9 Operational requirements

9.1 General

The operational requirements defined in MRTS201 apply to this specification. Additional operational requirements relevant to this 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 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 mains electricity network administered by the Electricity entity at both 230Vac and 240Vac. Unless otherwise specified, or advised in writing by the Electricity entity, the design shall be suitable for a prospective fault level of 250MVA at the point of supply. Unless otherwise specified, voltage drop shall be limited to 1.5% between the point of supply and terminals of final sub-circuit protection devices.

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

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.

Harmonic filtering to circuits supplying low voltage socket outlets, and other electronic equipment shall be provided.
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 specification, switchboard electrics and enclosures shall comply with the requirements of:

- MRTS228 and Standard Drawing 1627 for Road lighting
- MRTS93 and Standard Drawing 1423 for Traffic Signal Controller, and
- MRTS201 for other applications.

9.6 Exemption from Ambulance Levy

Where applicable, the Contractor shall make application as the Principal’s agent for exemption to Ambulance Levy for Sites with metered supply.

10 Mechanical and physical requirements

The mechanical and physical requirements defined in MRTS201 apply to equipment provided under this specification.

Where an alternate non-mains source of electricity supply is to be installed, the switchboard shall allow for the auto-changeover 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. 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 specification and the Electricity entity.

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

a) 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

The section has been amended to differentiate between materials supply and installation requirements

11.2.1 Supply

All materials shall be supplied and installed by the Contractor and shall meet the requirements of the relevant specifications including MRTS228, MRTS256 and TMR SD1327.

11.2.2 Installation

Where necessary to complete the mains power supply installation:

a) provide electrical ducts and pits in accordance with the requirements of MRTS91, and
b) provide Consumer's mains in accordance with MRTS95 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 the Wiring Rules.

Materials forming part of, or connecting directly to the mains electricity network shall also meet the requirements of the relevant Electricity entity.

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 documentation as a minimum:

a) a completed copy of any documents and supporting information the Contractor intends to forward to the Electricity entity, and
b) calculations to determine the prospective unfused 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, and
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 Rate 3 road lighting, traffic signals and/or other field equipment.

All Works shall meet the requirements of the Wiring Rules, MRTS228, MRTS256, MRTS201 and the Electricity entity.

11.6 **Connection to mains supply**

11.6.1 **Electricity Supply Authority**

Previously, the referenced manual was developed by Energex only. This current manual is a joint publication by Energex and Ergon.

New connections to the local electricity supply authority (Energex/Ergon) network shall comply with the requirements of the *QLD Electricity Connection and Metering Manual*, Section 2.6 - Unmetered supply.

12 **Testing and commissioning**

The testing and commissioning requirements defined in MRTS201 apply to equipment provided under this specification. Additional testing and commissioning requirements for the Works provided under this specification are described below.

The mains power installations shall be tested in accordance with the Electrical Legislation, Wiring Rules and MRTS228 and MRTS256. Where specified, the following tests shall also be undertaken:

a) thermal (infrared) image scan of the switchboard
b) harmonic disturbance injected on to mains
c) voltage fluctuations injected on to mains, and
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.

13 **Documentation**

The documentation requirements defined in MRTS201 apply to this specification. Additional documentation requirements relevant to this specification are described below.

The Contractor shall include copies of all documents relevant to this specification in the “Mains Power Details” sections of the operations manual, including:

a) documents (including correspondence) submitted to, and received from, the Electricity entity, and
b) documents concerning exemption from Ambulance levy as applicable.
14 Maintenance

The maintenance requirements defined in MRTS201 apply to equipment provided under this specification.

15 Handover

The handover requirements defined in MRTS201 apply to equipment provided under this specification.